



金沢市文化ホール
 金沢400年を記念して広く文化活動などの場を提供し、市
 および向上を図るため、昭和57年の「文化の日」にオープン

PROCEEDINGS BOOK

InCIT 2024 The 8th
INTERNATIONAL CONFERENCE
ON INFORMATION TECHNOLOGY

BURAPHA
UNIVERSITY

InCIT

The 8th
International Conference
on Information Technology
2024



NCIT

2024

14th - 15th November 2024

InCIT 2024 @Faculty of Informatics, Burapha
University, Chonburi, Thailand
And @Kanazawa (Japan)

The 8th International Conference on Information Technology 2024 (InCIT2024)

Organized by
College of Digital Innovation Technology
Rangsit University



Proceedings Book

Contact us: incit2024@rsu.ac.th
Web site: <https://dit.rsu.ac.th/incit2024/en/>
<https://dit.rsu.ac.th/ncit2024/>

14–15 November 2024
Chonburi, Thailand

The 8st International Conference 2024 (InCIT2024) on
Is co-organized by IEEE Thailand Section
(IEEE Computer Society Thailand Chapter)
And
College of Digital Innovation Technology,
Rangsit University.

Accepted papers will be submitted for
inclusions in IEEE Xplore Digital Library subject to
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โดย

วิทยาลัยนวัตกรรมการศึกษาเทคโนโลยี

มหาวิทยาลัยรังสิต

NCIT 2024

วันที่ 14 - 15 กันยายน 2567

คณะวิทยาการสารสนเทศ มหาวิทยาลัยบูรพา

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About InCIT 2024

An International Conference on Information Technology (InCIT) has been organized by Council of IT Deans in Thailand every year. In 2024, RSU intend to organize InCIT 2024 on November, 14,15 2024.

The Association of Council of IT Deans (CITT)

Currently, information technology has played a significant role in improving quality and sustaining life in society, as well as the economic competitiveness of Thailand and the world. Organizations of all types have incorporated information technology as an essential tool in their strategies and operations for increased efficiency and effectiveness. This has resulted in a high demand for personnel and innovations in the field of information technology. Consequently, one of the critical roles of higher education institutions is to serve society and contribute to the country's development. Many institutions have recognized the importance of information technology and have developed curricula and teaching programs in related fields over the past decade.

In Thailand, several universities have acknowledged the importance of producing high-quality graduates in these fields by establishing faculties or units responsible for teaching information technology and related subjects. These faculties are usually named the Faculty of Information Technology, although some universities may have similar names such as the Faculty of Information Science, the Faculty of Information Technology and Communication, or the Faculty of Science and Information Technology. At present, the Faculty of Information Technology is a widely recognized educational institution in the public, industrial, and educational sectors, attracting numerous students interested in studying and pursuing careers in information technology and related fields.

Since 2006, the deans of faculties of information technology or related faculties from nine universities have been meeting regularly to discuss and exchange academic ideas, research, and community service. One outcome of these meetings is the organization of the National Conference on Information Technology, which has been hosted by different universities to date. Additionally, they have published the Journal of Information Science and Technology and initiated activities to reduce the digital divide.

Furthermore, the establishment of the council will help higher education institutions have a representative academic organization for information technology and related fields, which can contribute to the development of society, economy, and the nation, and prepare for the ASEAN community in the future.

InCIT Past Conferences

InCIT History	Years
The 1st International Conference on Information Technology (InCIT 2017)	2017
The 2nd International Conference on Information Technology (InCIT 2018)	2018
The 3th International Conference on Information Technology (InCIT 2019)	2019
The 4th International Conference on Information Technology (InCIT 2020)	2020
The 5th International Conference on Information Technology (InCIT 2021)	2021
The 6th International Conference on Information Technology (InCIT 2022)	2022
The 7th International Conference on Information Technology (InCIT 2023)	2023
The 8th International Conference on Information Technology (InCIT 2024)	2024

Welcome Message from The President of Rangsit University, Thailand



Dr. Attawit Ourairat
President of Rangsit University

On behalf of Rangsit University (RSU), I am delighted to welcome you all to the 8th International Conference on Information Technology (InCIT2024) and the 16th National Conference on Information Technology (NCIT2024). InCIT is co-organized by IEEE Thailand Section (IEEE Computer Society Thailand Chapter) and College of Digital Innovation Technology, Rangsit University. NCIT has been co-organized with The Association of Council of IT Deans (CITT) and College of Digital Innovation Technology, Rangsit University

The inception of the institute, InCIT was organized as a peer reviewed international conference with the papers getting included in IEEE Xplore digital library which the papers included in the proceeding is normally indexed by SCOPUS. This conference is one of the few peers reviewed international conferences conducted by professional organizations and societies in Thailand.

We received almost 247 papers from 10 countries in four continents around the world and 159 are accepted for presentation. All these papers were peer reviewed by experts in the respective fields of research.

A handwritten signature in blue ink, appearing to be 'Attawit Ourairat', written in a cursive style.

Dr. Attawit Ourairat,
President, Rangsit University, Thailand

Message from General Chair



Associate Professor Dr. Chetneti Srisa-an
General Chair InCIT2024

On behalf of the InCIT 2024 organizing committee, I am delighted to welcome you for the 8st International Conference on Information Technology. After 16 years, InCIT continues to be a leading Information Technology conference, where researchers, practitioners, and educators come together to present, discuss, and debate the most recent research results, innovations, trends, and concerns in the field. The main conference is preceded by four days of 15 sessions, including regular paper sessions, poster sessions, invited speaker sessions, and keynote sessions.

With over 100 presentations, covering topics such as image processing, machine learning, Data security, data privacy, computer education, cybersecurity, data science, Blockchain, human-computer interaction, information retrieval, natural language processing, computer networks and communications, and artificial intelligence applications, there is something of interest for everyone.

I am especially pleased to welcome two distinguished keynote speakers:

1. Prof. Dr. Akihiko Wakai
(Graduate School of Science and Technology, Gunma University, Japan)
2. Prof. Dr. Nobuo Funabiki,
(Japan vice president at IEEE Consumer Technology Society, Japan)
3. Mr. Betsukawa Minoru,
(President of Betsukawa Corporation, Japan)
4. AVM Amorn Chomchoey
(Secretary General of National Cyber Security of Thailand)
5. Surachai Atthamongkolchai
(Compute and Digital Sales & Data Services and Storage) Hewlett Packard Enterprise, Thailand

I would like to thank Assoc. Prof. Supavadee Aramvith (President, IEEE Thailand Section), IEEE Computer Society Thailand Chapter, InCIT Committee members for their continued sponsorship of InCIT.

I am also deeply grateful to our corporate sponsors for their generous support.

Finally, thank you to all the reviewers, authors, and speakers for your contributions to InCIT. You are the reason why InCIT remains a leading conference in Information Technology.

Enjoy the conference! I hope you find the technical program full of interesting sessions and speakers, and that you take advantage of the many opportunities for discussions and networking in the social program. Additionally, I encourage you to explore and enjoy the beautiful island of Chonburi, Thailand.



Associate Professor Dr. Chetneti Srisa-an
President, CITT (Thailand)

Message from the Chair of IEEE Computer Society, Thailand Chapter



On behalf of the IEEE Computer Society, Thailand Chapter, I warmly welcome all participants to InCIT-2024. This conference serves as a crucial venue for exchanging innovative ideas, showcasing cutting-edge research, and fostering collaboration among leading experts, academics, and professionals in our dynamic field. Additionally, the event is supported by the IEEE Thailand Section, and all accepted and presented papers will be considered for inclusion in the prestigious IEEEXplore® Digital Library, provided they meet the rigorous quality and scope requirements.

Congratulations to all the authors whose papers have been accepted for presentation at this respected conference. As researchers gather to share ideas and breakthroughs, it's crucial to focus on the quality of your submissions, especially since we aim to include your work in the IEEEXplore Digital Library. The value and credibility of your research depend on careful preparation, solid validation, and a clear presentation of your findings. I encourage all authors to meet these standards to ensure your work adds to our shared knowledge and upholds the strong reputation of IEEE and our academic community.

Finally, I wish you all a highly productive and inspiring conference experience. May this event spark new perspectives, promote insightful discussions, and foster long-lasting collaborations. I encourage you to make the most of your time in Chonburi while adapting to the changes brought about by our evolving societal norms. Thank you for your active participation and continued commitment to advancing the fields of computer science, information technology, and computational intelligence.



Assoc. Prof. Dr. Krisana Chinnasarn
Chair of IEEE Computer Society, Thailand Chapter &
Chair of Conference Quality Committee (CQC), IEEE Thailand Section

Keynote Speaker



Keynote Speaker 1

Prof. Dr. Akihiko Wakai

Graduate School of Science and Technology, Gunma University (Civil & Environmental Engineering)

Topic: Geotechnical numerical modeling (3D FEM) of the earthquake-induced landslides with the 2024 Noto Peninsula Earthquake in Japan.

Keynote Speaker 2

Prof. Dr. Nobuo Funabiki

Okayama university, Japan vice president at IEEE Consumer Technology Society

Topics : Programming learning assistant system and video game system with hand gestures



Keynote Speaker 3

Mr. Betsukawa Minoru

Betsukawa Corporation President

Topics : Smart Factory towards future digital ages.

Keynote Speaker 4

AVM Amorn Chomchoey

Secretary General of National Cyber Security of Thailand

Topics : Lessons learned about how to enforce Cybersecurity Act in Thailand: The journey so far.



Keynote Speaker 5

Surachai Atthamongkolchai

(Compute and Digital Sales & Data Services and Storage)

Hewlett Packard Enterprise, Thailand

Topics : Smart organization with High computing cloud structure.

InCIT2024 Conference Committee

Honorary Chairs

- Dr. Attawit Ourairat, President, Rangsit University

General Chair

- Chetneti Srisa-an, RSU, Thailand (CITT president)

General Co-chair

- Aziz Nanthaamornphong , College of Computing, Prince of Songkla University, Thailand
- Teeravisit Laohapensaeng, MFU, Thailand

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- Ruttikorn Varakulsiripunth, Thai-Nichi Institute of Technology
- Takako Ochi, Gunma University, Japan
- Virach Sornlertlamvanich, Musashino University, Japan
- Nobuo Funabiki, Okayama university, japan
- Pisit Charnkeitkong, PIM, Thailand
- Jean-Marc THIRIET, UGA, France
- Emil Novakov, UGA, France
- Hamed Yahoui, UCBL, France
- Taegkeun Whangbo, Gachon University, Korea
- Cheong Ghil Kim, NSU, Korea
- Seung Hyun Lee, KWU, Korea
- Nina Bencheva, RU, Bulgaria
- Ingrid Moerman, UGent, Belgium
- Nauman Aslam, UNN, United Kingdom
- Prasong Praneetpolgrang, Sripatum University, Thailand

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- Krishna Chimmanee, RSU, Thailand
- Pornthep Rojanavasuu, UP, Thailand

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- Natthawut Kertkeidkachorn, Japan Advanced Institute of Science and Technology (JAIST), Japan
- Moirangthem Marjit Singh, NERIST, India
- Wimalyn Bovenizer, Phoenix QC, United Kingdom
- Thannob Aribarg, RSU, Thailand
- Surapong Uttama, MFU, Thailand
- Krisana Chinnasarn, BUU, Thailand
- Datchakorn Tancharoen, PIM, Thailand
- Ambuj Kumar, AU, Denmark
- Sokha Heng, RUPP, Cambodia
- Adnan Shahid, UGent, Belgium
- Xiaomin Chen, UNN, United Kingdom
- Shanfeng Hu, UNN, United Kingdom

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- Phattanapon Rhienmora, BU, Thailand

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- Sathaporn Promwong, KMITL, Thailand

Publication Co-Chairs

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- Wanus Srimaharaj, PYU, Thailand

Local Arrangement Chair

- Takako Ochi, Gunma University, Japan
- Virach Sornlertlamvanich, Musashino University, Japan
- Nobuo Funabiki, Okayama university, japan

Special Session Chair

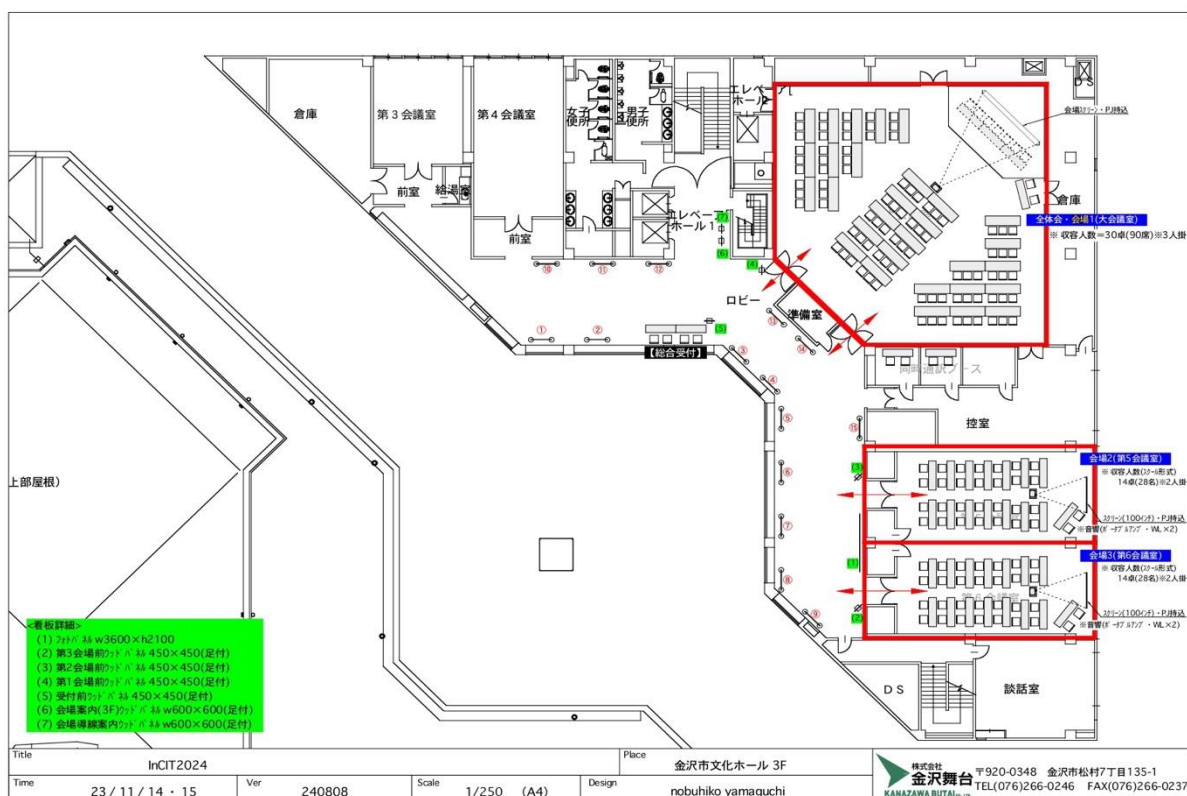
- Punnarumol Temdee, MFU, Thailand

Information Chairs

- Chayapol Kamyod, MFU, Thailand
- Mahamah Sebakor, MFU, Thailand
- Dechanuchit Katanyutaveetip, SU, Thailand

Conference venue (Japan) Program at Kanazawa City Cultural Hall (Japan)

Room A (Convention Hall) Floor 3rd



Floor 3rd (Japan)
 Room A (全体会・会場1(大会議室))
 Nov 14, (Prof. Dr. Suejit Pechprasarn)

Paper ID	Author name	Time
1571071249	Chi Sulin and Tetsuya Shimamura	11:00-11:20
1571068141	Yukinobu Miyamoto	11:20-11:40
1571054264	Mintra Boondach and Parkpoom Chaisiriprasert	13:00-13:20
1571054095	Julia Petunkin and Parkpoom Chaisiriprasert	13:20-13:40
1571054298	Nattamon Phalajivin and Parkpoom Chaisiriprasert	13:40-14:00
1571064305	Chun-Chen Hu	14:00-14:20
1571051681	Tossaphorn Maniam, Yoshikazu Miyanaga, Pornthep Rojanavas, Napa Rachata, Jirabhorn Chaiwongsai and Thitirath Chaewsuan	14:20-14:40
1571079203	Anintaya Khamkanya and Narawadee Sitthidetchtamroung	14:40-15:00
1571068213	Anucha Aribarg	15:00-15:20
1570996285	Nattapong Sanchan and Supatthra Narawatthana	15:20-15:40
1571044681	Jaratpong Tepmanee	15:40-16:00
1571024554	Chutima Beokhaimook	16:00-16:20
1571078169	Chotanansub Sophaken, Kantapong Vongpanich, Wachirawit Intaphan, Chutamas Deepho, Tharathon Utasri, and Akkharawoot Takhom	16:20-16:40
1571078985	Pawat Vongpradit, Aurawan Imsombut, Sarawoot Kongyoung, Chaianun Damrongrat, Sitthaa Phaholphinyo and Tanik Tanawong	16:40-17:00

Floor 3 (Japan)
 Room B (会場2(第5会議室))
 Nov 14 (Asst. Prof. Dr. PHICHETE JULRODE)

Paper ID	Author name	Time
1571078457	Sibsans Suksuchano	11:20-11:40
1571078304	Rergchai Srisombut	11:40-12:00
1571000362	Nattapat Petchsuwan and Parkpoom Chaisiriprasert	13:00-13:20
1571036103	Khachonkit chuiad and Parkpoom Chaisiriprasert	13:20-13:40
1571035894	Teerath Thesniyom, Karn Yongsiriwit and Parkpoom Chaisiriprasert	13:40-14:00
1571020545	Apicha Deearom, Thannob Aribarg and Parkpoom Chaisiriprasert	14:00-14:20
1571055853	Pijitra Namsinan and Parkpoom Chaisiriprasert	14:20-14:40
1571072585	Komsan Srivisut	14:40-15:00
1571071068	Pratya Phanomupatum, Ravee Phromlounsri, Decha Wongpatsa, Tiwat Pongthavornkamol, Phatcharanat Saeng-on, Somchat Sonasang	15:00-15:20
1571072935	Warakorn Karasaeng, Jitjark Nualkham, Chaiya Chomchalao, Tiwat Pongthavornkamol, Decha Wongpatsa and Somchat Sonasang	15:20-15:40
1571073275	Ravee Phromlounsri, Thanapat Cheawchanwattana, Somkuan Srisawat, Krittachai Boonsivanon, Somchat Sonasang and Mitchai Chongcheawchamnan	15:40-16:00
1571071832	Somkuan Srisawat, Ravee Phromlounsri, Apichan Kanjanavapastit, Kritsanapong Somsuk, Somchat Sonasang and Mitchai Chongcheawchamnan	16:00-16:20
1571078834	Thongchai Kaewkiriya	16:40-17:00
1571029651	Phaisarn Jeefoo	15:00-15:20
1571078904	Suriya Jirasatitsin	11:00-11:20

Floor 3 (Japan)
 Room C : (会場3(第6会議室))
 Nov 14 (Assoc. Prof. Dr. Krishna Chimmanee)

Paper ID	Name	Time
1571058385	Veeraporn Siddoo	11:00-11:20
1571060509	Michael W. Hickey	11:20-11:40
1571066700	Chatchai Wangwiwattana	11:40-12:00
	LUNCH	
		12:00 - 13:00
1571056173	Praephat Sinchaithanakit, Papangkorn Pidchayathanakorn and Parkpoom Chaisiriprasert	13:00-13:20
1571061134	Nitthanet Natthakunlanan	13:20-13:40
1571056172	Kanyaphat Korakun, Sangob Sasipong and Parkpoom Chaisiriprasert	13:40-14:00
1571056144	Nithaphat Ketnoi, Thanwarat Daenglim and Parkpoom Chaisiriprasert	14:00-14:20
1571037539	Sokliv Kork, Tanaporn Ngamjit and Parkpoom Chaisiriprasert	14:20-14:40
	Coffee break	
		14:00 - 15:00
1571029651	Phaisarn Jeefoo	15:00-15:20
1571046641	Siranee Nuchitprasitchai, Saranlita Chotirat and Apichaya Nimkoompai	15:20-15:40
1570988706	Phichete Julrode	15:40-16:00
1571066437	Jirawat Sookkaew	16:00-16:20
1571078696	Thitipan Satidkarn	16:20-16:40

Floor 3 (Japan)
 Room B (会場2(第5会議室))
 Nov 15 (Assoc. Prof. Dr. Chetneti Srisa-an)

Time	Paper ID	Time
1570984586	Thawit Sae-ow	08:20-8:40
1570985012	Watcharinthorn Neamhom	08:40-9:00
1570984585	Woratat Makasiranondh	09:00-9:20
1571056986	Mathupayas Thongmak	09:00-9:30
1570985040	Somchit Kittongpul	09:20-9:40
1570985037	Boonyanuch Kamkla and Anucha Aribarg	09:40-10:00
1570988065	Wipawee Manoritthiyarn	10:00-10:20
1571000254	Nattapol Prasopdee	10:20-10:40
1570985622	nanthiya siriphongpanich	10:40-11:00
1571078622	Pudsadee Boonrawd and Kittipong Yoonirundorn	10:40-11:00
1570988692	Talwarit Manoritthiyarn	11-00-11:20
1571071792	Sakol Vongsuvat	11:20-11:40
1571078047	Theresia Dwi Hastuti	11:20-11:40
1570988737	Pradchaya Pintobtang	11:40-12:00

Floor 3 (Japan)
Room C : (会場3(第6会議室))
Nov 15 (Assoc. Prof. Dr. Krishna Chimmanee)

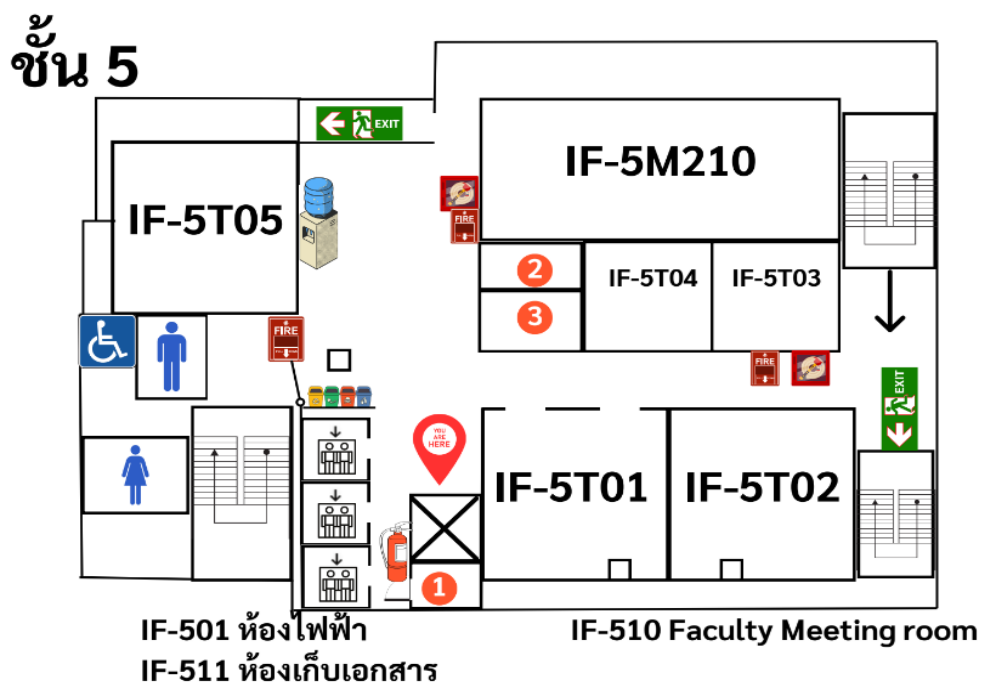
Paper ID	Name	Time
1571062142	Yanee Charoensuk	08:00-8:20
1571062147	Piyapol Suwimol	08:20-8:40
1571062146	Thana Sarkorn	08:40-9:00
1571077922	Ruj Mateedulsatit	09:00-9:20
1570986242	Thiwhat Vilaidaraga	09:20-9:40
1571078388	Natapon Suk-on	09:40-10:00
1571049040	Waraporn Jirapanthong	10:00-10:20
1571078461	Ridwan Sanjaya	11:00-11:20
1571078047	Theresia Dwi Hastuti	11:20-11:40
1571067515	Stephani Inggrit Swastini Dewi	11:40-12:00
LUNCH		
1571076976	Ms.Suwanna Bulao	13:00-13:20
1571078534	Narit Hnoohom	13:20-13:40
1571079084	Mondheera Pituxcoosuvorn	13:40-14:00
1571079242	Mizuki Motozawa	14:00-14:20
1571044145	Sayamon Poodpor	14:20-14:40
1571078861	Yue Zhang	14:40-15:00

Room IF-10M32 (Nov 14, Thailand)
(Dr. Olarik Surinta)



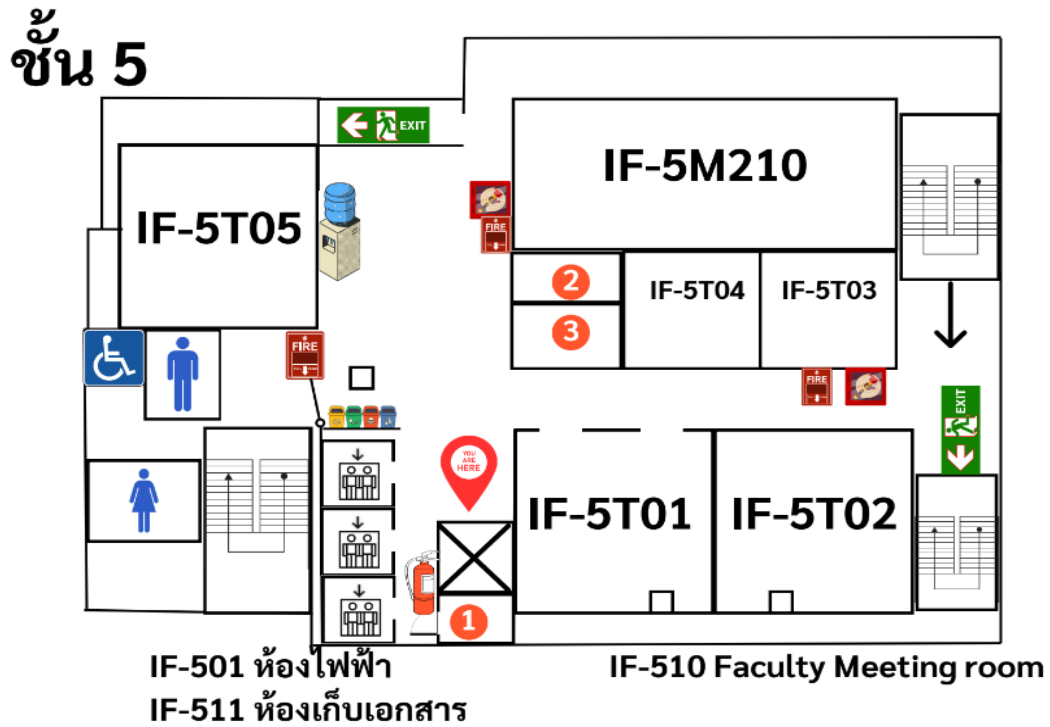
Paper ID	Name	Time
1571079170	Suvipa Sacheewapasuk	13:00-13:20
1571078537	Pakorn Juleang	13:20-13:40
1571078610	Wuttichai Vijitkunsawat	13:40-14:00
1571078832	Buncha Chinda	14:00-14:20
1571079304	Kezia Octaviana Budiman	14:20-14:40
1571078779	Kobthong ladkoom	15:00-15:20
1571079241	Methasit Khunnen	15:40-16:00
1571079067	Natasha Mulyadinata	16:00-16:20
1571078541	Bhusana Kongon	16:20-16:40
1571078672	Jiranun Sangrueng	16:40-17:00

Room IF-5T01(Nov 14, Thailand) (Dr.Datchakorn Tancharoen)



Paper ID	Name	Time
1571041420	Niorn Suchonwanich	13:00-13:20
1571068210	Jirayus Preechadech	13:20-13:40
1571066375	Amanda Aurellie Utami	13:40-14:00
1571064450	Ivan Maulana Razzaq and Muhardi Saputra	14:00-14:20
1571067304	Panuwat Niranon and Tuul Triyason	14:20-14:40
1571057653	Muhardi Saputra	15:00-15:20
1571059015	Asti Amalia Nur Fajrillah	15:20-15:40
1571059919	Chayatad Kamnerddee, Pruet Putjorn and Jitrapol Intarasirisawat	15:40-16:00
1571062866	Lojrutai Jocknoi	16:00-16:20
1571047835	Muhardi Saputra	16:20-16:40
1571056400	Sirapat Prachapinya	16:40-17:00

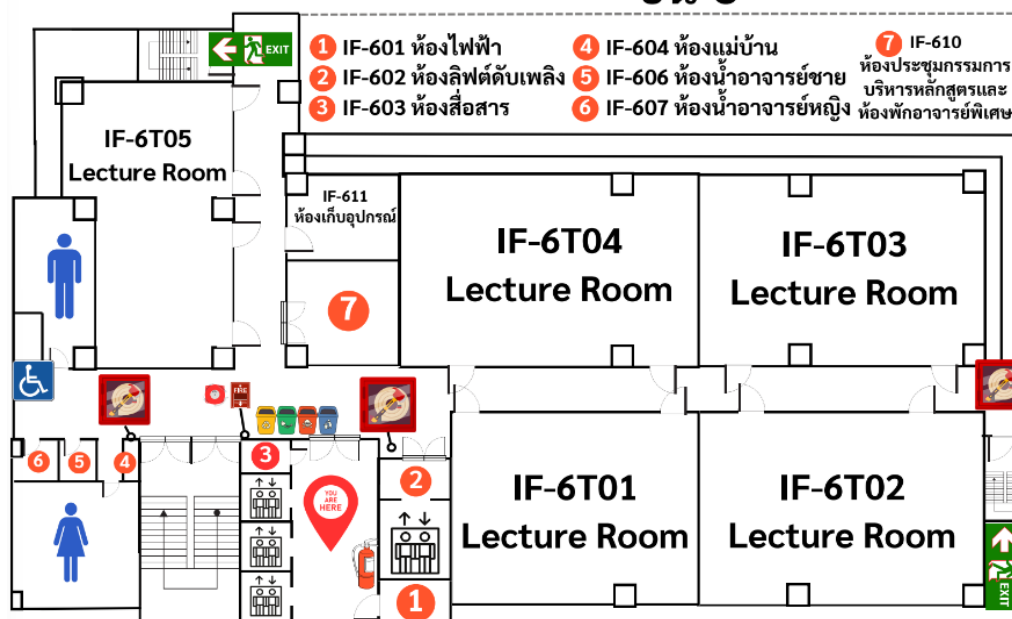
Room IF-5T05(Nov 14, Thailand)
(Dr.Korrawit Thaichay)



Paper ID	Name	Time
1571062233	Sane Yu, Wanus Srimaharaj and Roungsan Chaisricharoen	13:00-13:20
1571062712	Muhammad Fachrie, Aina Musdholifah and Sri Hartati	13:20-13:40
1571065576	Thirawat Chinnarong	14:00-14:20
1571058973	Sarita Trisri	14:20-14:40
1571064445	Songsri Tangsripairoj	15:00-15:20
1571079539	Nattapong Jundang	15:20-15:40
1571079122	Punyakon Patchkaew	16:20-16:40
1571068981	Sutham Sathamsakul	16:40-17:00
1571069617	Etienne Mueller and Wei Qin	17:00-17:20

Room IF-6T01 (Nov 14, Thailand)
(Assoc. Prof. Dr. Rong Phoophuangpairoj)

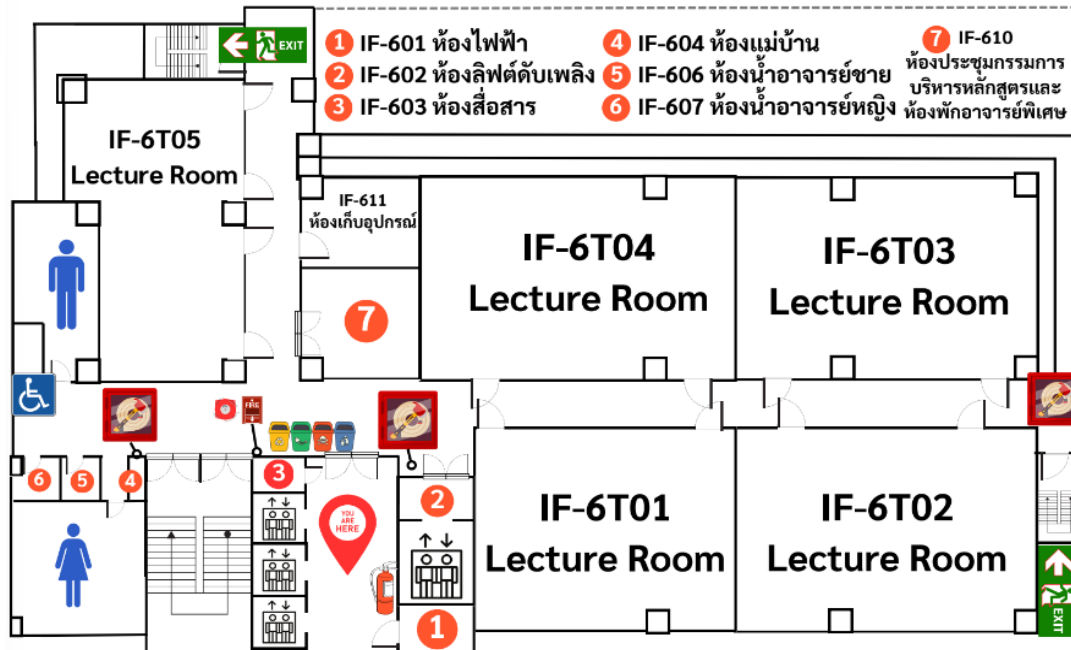
ชั้น 6



Paper ID	Name	Time
1571065667	Mr.Anusorn Laoprakiang	13:00-13:20
1571065755	Firman Tempola	13:20-13:40
1571065867	Pimpicha Phatisena, Sirawit Chinafoei, Kaidet Kukreya, Patiphan Saeyoh, Anchalee Katramee and Kemachart Kemavuthanon	13:40-14:00
1571066373	Kaewmanee Marasri	14:00-14:20
1571032735	Ekapong Nopawong	14:20-14:40
1571066453	Thananan Setajit, Chanathip Khamchan, Amornphong Naitip, Chuntawat Thongmee, Kwanhata Tanongjid and Sujitra Arwatchananukul	15:00-15:20
1571067528	May Htet Htet Khine and Nattapol Aunsri	15:20-15:40
1571066722	Ruixue Si	16:20-16:40
1571067660	Kitsanachai Kairassamee	16:20-16:40

Room IF-6T02 (Nov 14, Thailand)
(Dr. Worasak Ruangsirrak)

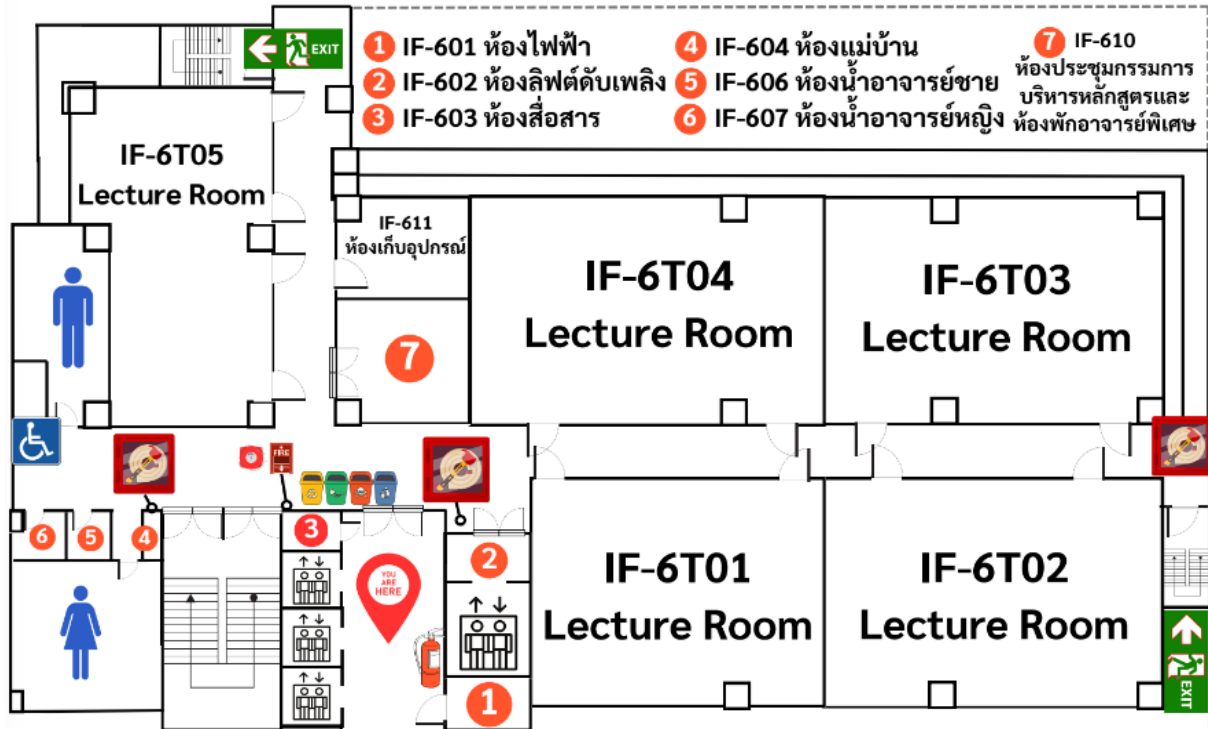
ชั้น 6



Paper ID	Name	Time
1571069704	Arief Kelik Nugroho, Afiahayati, Moh Edi Wibowo and Hardyanto Soebono	13:00-13:20
1571046494	Asst. Prof. Dr. Jian QU	13:20-13:40
1571042993	Saucha Diwandari	13:40-14:00
1571068536	Shohel Ahmed	14:20-14:40
1571066821	Piyawat Paramee, Worasak Rueangsirarak and Surapong Utama	15:20-15:40
1571064344	Nilubon Kurubanjerdjit, Soontarin Nupap, Swan Htet Htun, Aung Paing Oo, Nang Nway Zin Lynn Htet and Htin Lin Ko	16:00-16:20
1571077702	Petrus Wolo, Aina Musdholifah and Sri Mulyana	16:40-17:00

Room IF-6T03 (Nov 14, Thailand)
(Dr.Nattapol Aunsri)

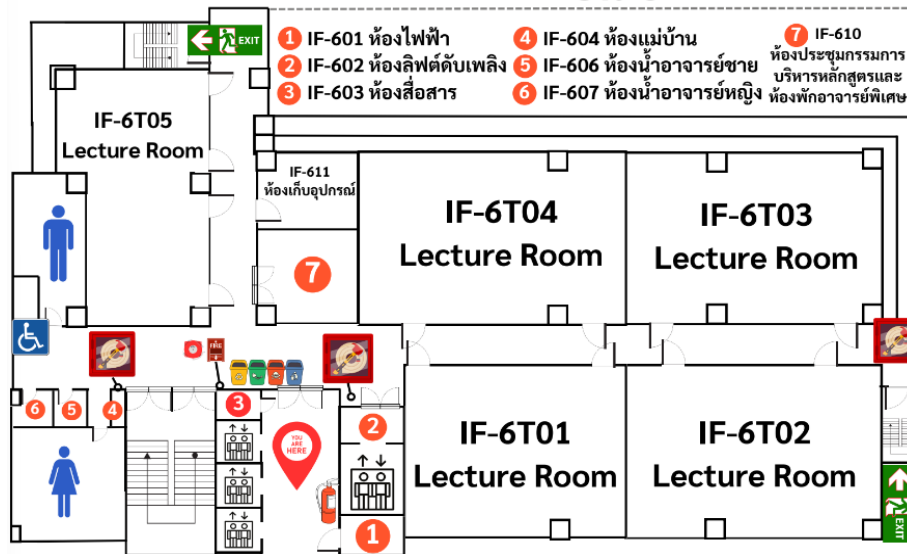
ชั้น 6



Paper ID	Name	Time
1571078563	Tanat Kanangnanon	13:00-13:20
1571068439	Jirapan Tunpita	14:00-14:20
1571073632	Nicha Sirikong	14:20-14:40
1571062233	Sane Yu	14:40-1500
1571079145	Yuwanut Kosungnoen	15:00-15:20
1571064468	Htin Lin Ko	15:00-15:20
1571064509	Chuntawat Thongmee	15:20-15:40
1571064669	Theint Zar Lwin Kyaw	15:40-16:00
1571078410	Jantima Polpinij	16:20-16:40
1571078102	Lucksanan Sukaraj	16:40-17:00
1571079304	Kezia Octaviana Budiman	17:00-17:20

Room IF-6T04 (Nov 14, Thailand) (Dr.Pruet Putjorn)

ชั้น 6



Paper ID	Name	Time
1571077066	JinChun LU	13:00-13:20
1571078728	Pratch Suntichaikul	13:20-13:40
1571077013	Patcharaporn Panwong	13:20-13:40
1571076212	Piyawan Sukyen	13:40-14:00
1571075382	Pruet Putjorn	14:00-14:20
1571075012	Nikorn Rongbutsri	14:20-14:40
1571073921	Mr. Hitler Xayakot	15:00-15:20
1571073632	Nicha Sirikong	15:20-15:40
1571072258	Langlana Xayavongsa	15:40-16:00
1571072207	Rahmat Fauzi, Adhistya Erna Permanasari and Silmi Fauziati	16:00-16:20
1571071906	Erdhi Widyarto, Mustafid Professor and Luhur Bayuaji	16:20-16:40
1571070252	Paruch Thong-ou and Winai Nadee	16:40-17:00
1571079145	Yuwanut Kosungnoen	17:00-17:20

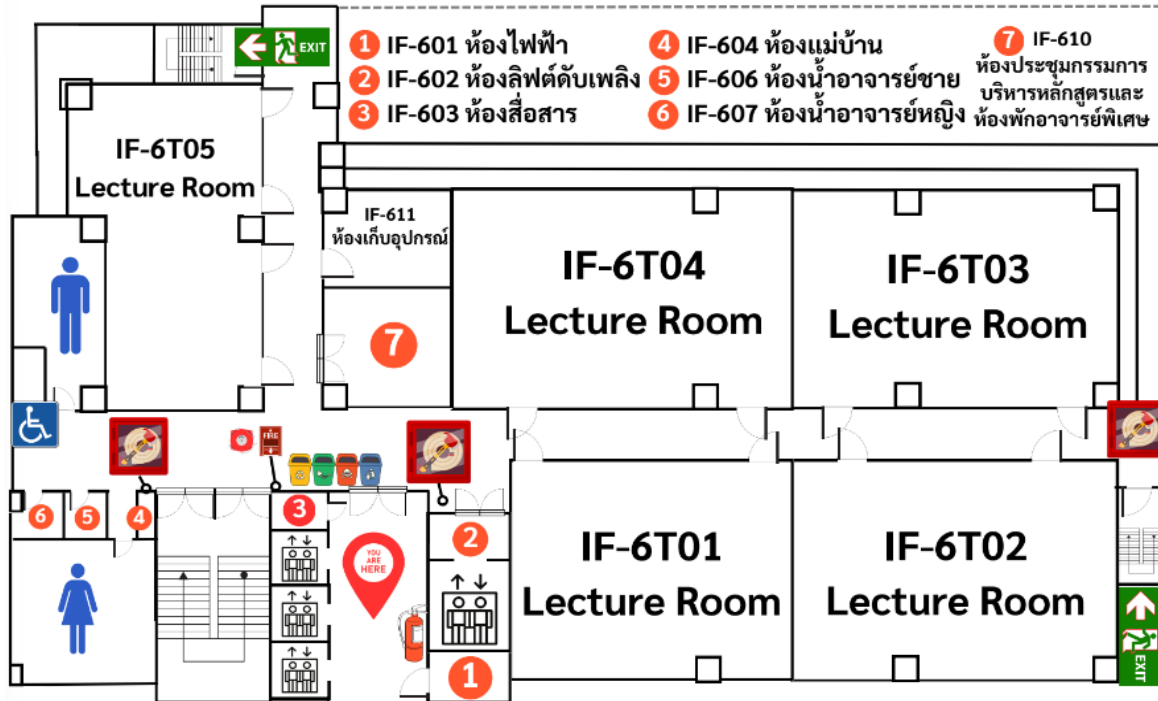
Room IF-7T05 (Nov 14, Thailand) (Dr. Jantima Polpinij)



Paper ID	Name	Time
1571046217	Apichaya Nimkoomphai	13:00-13:20
1571079058	Panha Heng	13:20-13:40
1571078320	Arnut Boonlert	13:40-14:00
1571078471	Kumpee Teeravech	14:00-14:20
1571078684	Jiranun Sangrueng	14:20-14:40
1571078728	Korawee Peerasantikul	15:00-15:20
1571078466	Bordin Rattanachareet	15:20-15:40
1571058597	Etienne Mueller and Wei Qin	15:40-16:00
1571078047	Theresia Dwi Hastuti	16:00-16:20

Room IF-6T05 (Nov 14)
(Dr.Surapong Uttama)

ชั้น 6

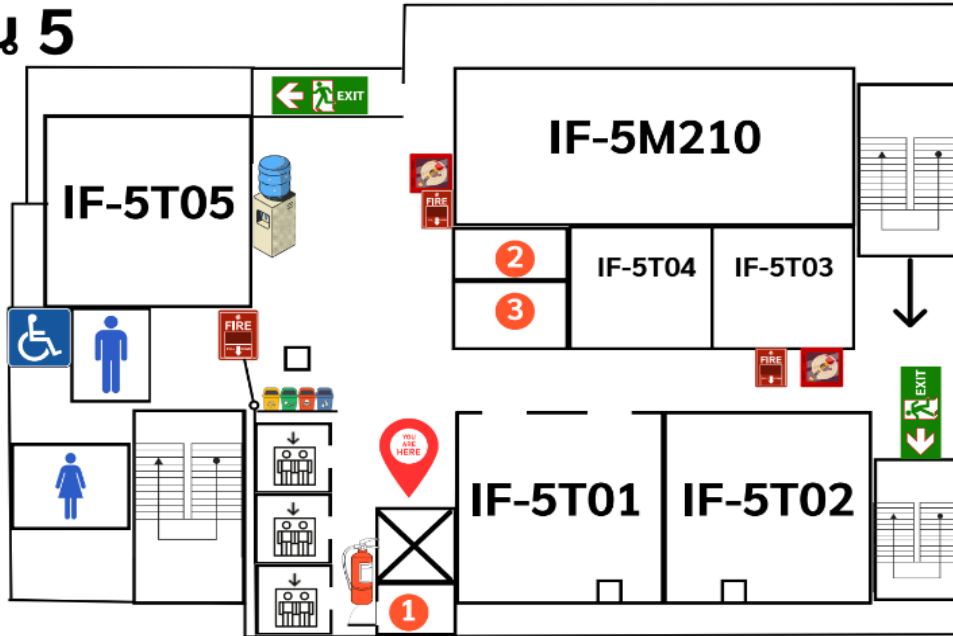


Paper ID	Name	Time
1571069747	Manassanun Krutta	13:00-13:20
1571077353	Ponglert Sangkaphet	13:20-13:40
1571069552	Tharnsaihong Hirunsri	13:40-14:00
1571068996	Leon Wirz	14:00-14:20
1571079197	Albertus Dwiyoga Widianoro	15:00-15:20
1571068996	Leon Wirz	14:20-14:40
1571078834	Thongchai Kaewkiriya	15:20-15:40
1570994005	Suparoek and Paralee Maneerat	15:40-16:00

Nov 15, Thailand
Room IF-5T01

(Asst. Prof. Dr. Rachasak Somyanonthanankul)

ชั้น 5



IF-501 ห้องไฟฟ้า

IF-510 Faculty Meeting room

IF-511 ห้องเก็บเอกสาร

TIME	Name	PaperID
8:00-8:20	Thatphong Thepcha	NCIT2024_001:
9:00-9:30	Wichai Pensaksanguan	NCIT2024_002:
9:20-9:40	Pakawan Angsunak	NCIT2024_003:
9:40-10:00	Surasak Thippawan	NCIT2024_023:
10:00-10:20	Nitirat Tanthavech, Teerasit Pimkitidaj and Apichaya	NCIT2024_005:
10:20-10:40	Teerapong Bunkrue and Onjira Sitthisak	NCIT2024_006:
10:40-11:00	Natcha Niemsawake	NCIT2024_011:
11:00-11:20	Pennapa Kumpang	NCIT2024_019:
11:20-11:40	Poonlap Tangasanawit and Wantanee Chiansunan	NCIT2024_017:
11:40-12:00	Hataichanok Puttaraksa	NCIT2024_015:

TIME	Name	PaperID
LUNCH		
13:00-13:20	Tharnida Wannaraksa	NCIT2024_013:
13:20-13:40	Nattakorn Voranitiyorvapa	NCIT2024_012:
13:40-14:00	Chanya Naraphong	NCIT2024_018:
14:00-14:20	Nipon Butrpanya	NCIT2024_014:
14:20-14:40	นรวิษณุ สวัสดิ์ดี, อภิชา ตีอารมย์	NCIT2024_031:
14:40-15:00	Pinrada Dechapakdeekultorn	NCIT2024_029:
15:00-15:20	Kittitee Chokerungreang and Pramote Kuachaoren	NCIT2024_004
15:20-15:40	Praphansak Phinitphak and Waraporn Jirapanthong	NCIT2024_016
15:40-16:00	Thitiporn Chansiriwat, Virasinee Thaweesri and Theerada Chotipant	NCIT2024_007:
16:00-16:20	Nateetorn Puangbubpa and Watsawee Sansrimahachai	NCIT2024_008
16:20-16:40	Chaivichit Kaewklom, Saowaluk Thaiklang and Santanee Kitpermkiat	NCIT2024_010:
16:40-17:00	Saowaluk Thaiklang, Chaivichit Kaewklom, Tanarat Chotipant	NCIT2024_009:

Nov 15, Thailand
Room IF-5T02
(ผู้ช่วยศาสตราจารย์ ดร.อุไรวรรณ บัวตุม)

TIME	NAME	PaperID
9:00-9:30	Aujchariyapol Suriya, Suphawit Kankam, Benchaporn	NCIT2024_020
9:20-9:40	รัชชชาติ เกตุบุญลือ, อรรถพร หมั่นสกุล and ประมุข บุญเสียง	NCIT2024_021:
9:40-10:00	Virasinee Thaweessri, Korawit Chorasat and Theerada Chotipant	NCIT2024_022:
10:00-10:20	Jongphon Chantharangsee, Kumpee Teeravech and Amornchai	NCIT2024_024:
10:20-10:40	Nutthawut Prachamkit, Kornkamon Iemthong, Pramin	NCIT2024_026:
10:40-11:00	Kittipong Khaimeepeth, Krishana Chimmanee and Papangkorn Pidchayathanakorn	NCIT2024_027:
11:00-11:20	Aphicha Inmathanyatorn, Krishana Chimmanee and Papangkorn Pidchayathanakorn	NCIT2024_028:
11:20-11:40	Pinrada Dechapakdeekultorn and Karn Yongsiriwit	NCIT2024_029:
11:40-12:00	Jakarin Sirikulthorn and Wongsakorn Charoenpanitseri	NCIT2024_030:
LINCH		
13:00-13:20	Koson Kojorntanakit	NCIT2024_032:
13:20-13:40	Suthinee Wantha and Waraporn Jirapanthong	NCIT2024_033:
13:40-14:00	Arnon Prommoon and Waraporn Jirapanthong	NCIT2024_034:
14:00-14:20	Thawinee Lohawatcharanon, Tanaporn Ngamjit and Papangkorn Pidchayathanakorn	NCIT2024_035:
14:20-14:40	Vimolchad Thaeptong, Khachonkit Chuiad	NCIT2024_025:

InCIT2024: Program Schedule



Paper ID	Author name	Room	Time
1571078537	Pakorn Juleang, Sawatsakorn Chaiyasoonthorn and Somsak Mitatha	Nov 14, ROOM IF-10M32	13:20-13:40
1571078541	Bhusana Kongon	Nov 14, ROOM IF-10M32	16:20-16:40
1571078610	Wuttichai Vijitkunsawat	Nov 14, ROOM IF-10M32	13:40-14:00
1571078672	Jiranun Sangrueng ,Watcharaphong Yookwan,Pusit Kulkasem,Suwanna Rasmequan , Supatra Sahaphongs, Apirak Jirayusakul, ,Annupan Rodtook and Krisana Chinnasarn	Nov 14, ROOM IF-10M32	16:40-17:00
1571079241	Methasit Khunnen, Chalermpan Fongsamut, Benchaporn Jantarakongkul and Prajaks Jitngernmadan	Nov 14, ROOM IF-10M32	15:40-16:00
1571047835	Muhardi Saputra	Nov 14, ROOM IF-5T01	16:20-16:40
1571057653	Muhardi Saputra	Nov 14, ROOM IF-5T01	15:00-15:20
1571059015	Asti Amalia Nur Fajrillah	Nov 14, ROOM IF-5T01	15:20-15:40
1571059919	Chayatad Kamnerddee, Pruet Putjorn and Jittrapol Intarasirisawat	Nov 14, ROOM IF-5T01	15:40-16:00
1571062866	Lojrutai Jocknoi and Pramote Kuacharoen	Nov 14, ROOM IF-5T01	16:00-16:20
1571056400	Sirapat Prachapinya	Nov 14, ROOM IF-5T01	16:40-17:00
1571058973	Sarita Trisri	Nov 14, ROOM IF-5T05	14:20-14:40
1571032735	Ekapong Nopawong and Rawinan Praditsangthong	Nov 14, ROOM IF-6T01	14:20-14:40
1571046494	Shang Shi, Pisit Charnkeitkong and Jian Qu	Nov 14, ROOM IF-6T02	13:20-13:40
1570994005	Suparoek and Paralee Maneerat	Nov 14, ROOM IF-6T05	15:40-16:00
1571042993	Saucha Diwandari	Nov 14, Room 4 (6T02)	13:40-14:00

1571058597	Bordin Rattanachareet	Nov 14, ROOM 7T05	15:20-15:40
1571041420	Niorn Suchonwanich	Nov 14, Room A (5T01)	13:00-13:20
1571078779	Kobthong ladkoom	Nov 14, ROOM IF-10M32	15:00-15:20
1571079067	Natasha Mulyadinata	Nov 14, ROOM IF-10M32	16:00-16:20
1571079170	Suvipa Sacheewapasuk	Nov 14, ROOM IF-10M32	13:00-13:20
1571066375	Amanda Aurellie Utami,Asti Amalia Nur Fajrillah, and Iqbal Yulizar Mukti	Nov 14, ROOM IF-5T01	13:40-14:00
1571068210	Jirayus Preechadech	Nov 14, ROOM IF-5T01	13:20-13:40
1571064450	Ivan Maulana Razzaq and Muhardi Saputra	Nov 14, ROOM IF-5T01	14:00-14:20
1571068981	Sutham Sathamsakul and Rojanee Khummongkol	Nov 14, ROOM IF-5T05	16:40-17:00
1571069617	Etienne Mueller and Wei Qin	Nov 14, ROOM IF-5T05	17:00-17:20
1571079122	Punyakon Patchkaew	Nov 14, ROOM IF-5T05	16:20-16:40
1571079539	Nattapong Jundang	Nov 14, ROOM IF-5T05	15:20-15:40
1571062233	Sane Yu, Wanus Srimaharaj and Rounsang Chaisricharoen	Nov 14, ROOM IF-5T05	13:00-13:20
1571062712	Muhammad Fachrie, Aina Musdholifah and Sri Hartati	Nov 14, ROOM IF-5T05	13:20-13:40
1571064445	Songsri Tangsripairoj, Nuttapat Nunthapatpokin, Prapakorn Saelim and Chavalit Savittrakul	Nov 14, ROOM IF-5T05	15:00-15:20
1571065576	Thirawat Chinnarong	Nov 14, ROOM IF-5T05	14:00-14:20
1571065755	Firman Tempola	Nov 14, ROOM IF-6T01	13:20-13:40
1571065867	Pimpicha Phatisena, Sirawit Chinafoei,Kaidet Kukreya,Patiphan Saeyoh,Anchalee Katramee and Kemachart Kemavuthanon	Nov 14, ROOM IF-6T01	13:40-14:00

1571065667	Mr.Anusorn Laoprakiang	Nov 14, ROOM IF-6T01	13:00-13:20
1571066373	Kanuengnij Kubola,Pichet Wayalun,Ungsumalee Suttapakti,Pitchayaporn Tawornwong,Kaewmanee Marasri,Warissara Kanjana and Paweena Chinasri	Nov 14, ROOM IF-6T01	14:00-14:20
1571066453	Thananan Setajit, Chanathip Khamchan, Amornphong Naitip, Chuntawat Thongmee,Kwanhata Tanongjid and Sujitra Arwatchananukul	Nov 14, ROOM IF-6T01	15:00-15:20
1571066722	Ruixue Si and Rong Phoophuangpairo	Nov 14, ROOM IF-6T01	16:20-16:40
1571067528	May Htet Htet Khine and Nattapol Aunsri	Nov 14, ROOM IF-6T01	15:20-15:40
1571067660	Kitsanachai Kairassamee	Nov 14, ROOM IF-6T01	16:20-16:40
1571064344	Nilubon Kurubanjerdjit,Soontarin Nupap, Swan Htet Htun,Aung Paing Oo,Nang Nway Zin Lynn Htet and Htin Lin Ko	Nov 14, ROOM IF-6T02	16:00-16:20
1571066821	Piyawat Paramee, Worasak Rueangsirarak and Surapong Uttama	Nov 14, ROOM IF-6T02	15:20-15:40
1571068536	Shohel Ahmed	Nov 14, ROOM IF-6T02	14:20-14:40
1571069704	Arief Kelik Nugroho, Afiahayati, Moh Edi Wibowo, Hardyanto Soebono	Nov 14, ROOM IF-6T02	13:00-13:20
1571077702	Petrus Wolo, Aina Musdholifah and Sri Mulyana	Nov 14, ROOM IF-6T02	16:40-17:00
1571064509	Chuntawat Thongmee, Thananan Setajit, Amornphong Naitip, Chanathip Khamchan, Kwanhata Tanongjid, and Sujitra Arwatchananukul	Nov 14, ROOM IF-6T03	15:20-15:40
1571064669	Theint Zar Lwin Kyaw,Surapong Uttama and Patcharaporn Panwong	Nov 14, ROOM IF-6T03	15:40-16:00
1571068439	Jirapan Tunpita	Nov 14, ROOM IF-6T03	14:00-14:20
1571078563	Tanat Kanangnanon	Nov 14, ROOM IF-6T03	13:00-13:20
1571079304	Kezia Octaviana Budiman	Nov 14, ROOM IF-6T03	17:00-17:20

1571064468	Htin Lin Ko, Khemjira Sai-Udomsin, Yanaphat Changmai, Benyapa Chaiwan, Nilubon Kurubanjerdjit, and Soontarin Nupap	Nov 14, ROOM IF-6T03	15:00-15:20
1571078102	Lucksanan Sukaroj	Nov 14, ROOM IF-6T03	16:40-17:00
1571078410	Jantima Polpinij	Nov 14, ROOM IF-6T03	16:20-16:40
1571070252	Paruch Thong-ou and Winai Nadee	Nov 14, ROOM IF-6T04	16:40-17:00
1571071906	Erdhi Widyarto, Mustafid Professor and Luhur Bayuaji	Nov 14, ROOM IF-6T04	16:20-16:40
1571072207	Rahmat Fauzi, Adhistya Erna Permasari and Silmi Fauziati	Nov 14, ROOM IF-6T04	16:00-16:20
1571072258	Langlana Xayavongsa, Nalinpat Bhumpenpein and Siranee Nuchitprasitchai	Nov 14, ROOM IF-6T04	15:40-16:00
1571073632	Nicha Sirikong and Porawat Visutsak	Nov 14, ROOM IF-6T04	15:20-15:40
1571073921	Mr. Hitler Xayakot	Nov 14, ROOM IF-6T04	15:00-15:20
1571075012	Nikorn Rongbuttsri and Md. Saifuddin	Nov 14, ROOM IF-6T04	14:20-14:40
1571075382	Pruet Putjorn	Nov 14, ROOM IF-6T04	14:00-14:20
1571076212	Piyawan Sukyen	Nov 14, ROOM IF-6T04	13:40-14:00
1571077066	JinChun LU, Rachsuda Setthawong and Pisal Setthawong	Nov 14, ROOM IF-6T04	13:00-13:20
1571079145	Yuwanut Kosungnoen and Thepparit Banditwattanawong	Nov 14, ROOM IF-6T04	17:00-17:20
1571078728	Pratch Suntichaikul	Nov 14, ROOM IF-6T04	13:20-13:40
1571077013	Patcharaporn Panwong	Nov 14, ROOM IF-6T04	13:20-13:40
1571079197	Albertus Dwiyoaga Widiatoro	Nov 14, ROOM IF-6T05	15:40-16:00
1571068996	Leon Wirz and Pattarasinee Bhattarakosol	Nov 14, ROOM IF-6T05	14:20-14:40

1571069552	Tharnsaithong Hirunsri and Winai Nadee	Nov 14, ROOM IF-6T05	14:00-14:20
1571078684	Jiranun Sangrueng , Watcharaphong Yookwan, Suwanna Rasmeequan, Annupan Rodtook, Athita Onuean, Krisana Chinnasarn and Thanin Methiyothin	Nov 14, ROOM IF-7T05	14:20-14:40
1571079058	Panha Heng	Nov 14, ROOM IF-7T05	13:20-13:40
1571078320	Arnut Boonlert, Chotipat Pornavalai, Panwit Tuwanut and Sarayoot Tanessakulwattana	Nov 14, ROOM IF-7T05	13:40-14:00
1571078471	Kumpee Teeravech	Nov 14, ROOM IF-7T05	14:00-14:20
1570996285	Nattapong Sanchan and Supatthra Narawatthana	Room A (全体会 ・会場1(大会議室)) 14 Nov	15:20-15:40
1571024554	Rachun Phuttachai and Chutima Beokhaimook	Room A (全体会 ・会場1(大会議室)) 14 Nov	16:00-16:20
1571044681	Jaratpong Tepmanee	Room A (全体会 ・会場1(大会議室)) 14 Nov	15:40-16:00
1571051681	Tossaphorn Maniam, Yoshikazu Miyana, Pornthep Rojanavas, Napa Rachata, Jirabhorn Chaiwongsai and Thitirath Chaewsuwan	Room A (全体会 ・会場1(大会議室)) 14 Nov	14:20-14:40
1571054095	Julia Petunkin and Parkpoom Chaisiriprasert	Room A (全体会 ・会場1(大会議室)) 14 Nov	13:20-13:40
1571054264	Mintra Boondach and Parkpoom Chaisiriprasert	Room A (全体会 ・会場1(大会議室)) 14 Nov	13:00-13:20
1571054298	Nattamon Phalajivin and Parkpoom Chaisiriprasert	Room A (全体会 ・会場1(大会議室)) 14 Nov	13:40-14:00
1571064305	Chun-Chen Hu, Drixter Velayo Hernandez, Chia-Hsuan Wu, Wan-Ju Tu and Yu-Kuen Lai	Room A (全体会 ・会場1(大会議室)) 14 Nov	14:00-14:20

1571068141	Yukinobu Miyamoto (Japan)	Room A (全体会 ・会場1(大会議室)) 14 Nov	11:20-11:40
1571068213	Anucha Aribarg and Supanat Jintawatsakoon	Room A (全体会 ・会場1(大会議室)) 14 Nov	15:00-15:20
1571071249	Chi Sulin and Tetsuya Shimamura	Room A (全体会 ・会場1(大会議室)) 14 Nov	11:00-11:20
1571078169	Chotanansub Sophaken, Kantapong Vongpanich,Wachirawit Intaphan, Chutamas Deepho,Tharathon Utasri, and Akkharawoot Takhom	Room A (全体会 ・会場1(大会議室)) 14 Nov	16:20-16:40
1571078985	Pawat Vongpradit, Aurawan Imsombut, Sarawoot Kongyoung, Chaianun Damrongrat, Sitthaa Phaholphinyo and Tanik Tanawong	Room A (全体会 ・会場1(大会議室)) 14 Nov	16:40-17:00
1571079203	Anintaya Khamkanya	Room A (全体会 ・会場1(大会議室)) 14 Nov	14:40-15:00
1571078904	Suriya Jirasatitsin	Room B (会場2(第 5会議室) 14 Nov	11:00-11:20
1571000362	Nattapat Petchsuwan and Parkpoom Chaisiriprasert	Room B (会場2(第 5会議室) 14 Nov	13:00-13:20
1571020545	Apicha Deearom, Thannob Aribarg and Parkpoom Chaisiriprasert	Room B (会場2(第 5会議室) 14 Nov	14:00-14:20
1571035894	Teerath Thesniyom, Karn Yongsiriwit and Parkpoom Chaisiriprasert	Room B (会場2(第 5会議室) 14 Nov	13:40-14:00
1571036103	Khachonkit chuiad and Parkpoom Chaisiriprasert	Room B (会場2(第 5会議室) 14 Nov	13:20-13:40
1571055853	Pijitra Namsinan and Parkpoom Chaisiriprasert	Room B (会場2(第 5会議室) 14 Nov	14:20-14:40

1571071068	Pratya Phanomupatum, Ravee Phromloungsri, Decha Wongpatsa, Tiwat Pongthavornkamol, Phatcharanat Saeng-on, Somchat Sonasang	Room B (会場2(第5会議室) 14 Nov	15:00-15:20
1571071832	Somkuan Srisawat, Ravee Phromloungsri, Apichan Kanjanavapastit, Kritsanapong Somsuk, Somchat Sonasang and Mitchai Chongcheawchamnan	Room B (会場2(第5会議室) 14 Nov	16:00-16:20
1571072585	Komsan Srivisut and Tanapon Kongjaroensuk	Room B (会場2(第5会議室) 14 Nov	14:40-15:00
1571072935	Warakorn Karasaeng, Jitjark Nualkham, Chaiya Chomchalao, Tiwat Pongthavornkamol, Decha Wongpatsa and Somchat Sonasang	Room B (会場2(第5会議室) 14 Nov	15:20-15:40
1571073275	Ravee Phromloungsri, Thanapat Cheawchanwattana, Somkuan Srisawat, Krittachai Boonsivanon, Somchat Sonasang and Mitchai Chongcheawchamnan	Room B (会場2(第5会議室) 14 Nov	15:40-16:00
1571078304	Rergchai Srisombut	Room B (会場2(第5会議室) 14 Nov	11:40-12:00
1571078457	Sibsan Suksuchano	Room B (会場2(第5会議室) 14 Nov	11:20-11:40
1571078834	Thongchai Kaewkiriya	Room B (会場2(第5会議室) 14 Nov	16:40-17:00
1570984585	Woratat Makasiranondh	Room B (会場2(第5会議室) 15 Nov	9:00-9:20
1570984586	Thawit Sae-ow	Room B (会場2(第5会議室) 15 Nov	8:20-8:40
1570985012	Watcharinthorn Neamhom	Room B (会場2(第5会議室) 15 Nov	8:40-9:00
1570985037	Boonyanuch Kamkla	Room B (会場2(第5会議室) 15 Nov	9:40-10:00

1570985040	Somchit Kittongpul	Room B (会場2(第5会議室) 15 Nov	9:20-9:40
1570985622	nanthiya siriphongpanich	Room B (会場2(第5会議室) 15 Nov	10:40-11:00
1570988065	Wipawee Manoritthiyarn	Room B (会場2(第5会議室) 15 Nov	10:00-10:20
1570988692	Talwarit Manoritthiyarn	Room B (会場2(第5会議室) 15 Nov	11-00-11:20
1570988737	Pradchaya Pintobtang	Room B (会場2(第5会議室) 15 Nov	
1571000254	Nattapol Prasopdee	Room B (会場2(第5会議室) 15 Nov	10:20-10:40
1571071792	Sakol Vongsuvat	Room B (会場2(第5会議室) 15 Nov	11:20-11:40
1571078047	Theresia Dwi Hastuti	Room B (会場2(第5会議室) 15 Nov	11:20-11:40
1571078622	Pudsadee Boonrawd	Room B (会場2(第5会議室) 15 Nov	10:40-11:00
1571079327	Teeravisit Laohapensaeng	Room B (会場2(第5会議室) 15 Nov	16:20-16:40
1571056986	Mathupayas Thongmak	Room B (会場2(第5会議室) 15 Nov (ONLINE)	9:00-9:30
1571029651	Phaisarn Jeefoo, Watcharaporn Preedapirom Jeefoo, Pornthep Rojanavasuj, Sakorn Mekruksavanich, Sawarin Lerk-U-Suke, Krittika Kantawong, Jirabhorn Chaiwongsai, and Napa Rachata	Room C (会場3(第6会議室) 14 Nov	15:00-15:20
1571037539	Sokliv Kork, Tanaporn Ngamjit and Parkpoom Chaisiriprasert	Room C (会場3(第6会議室) 14 Nov	14:20-14:40
1571046641	Siranee Nuchitprasitchai, Saranlita Chotirat and Apichaya Nimkoompai	Room C (会場3(第6会議室) 14 Nov	15:20-15:40
1571056144	Nithaphat Ketnoi, Thanwarat Daenglim and Parkpoom Chaisiriprasert	Room C (会場3(第6会議室) 14 Nov	14:00-14:20
1571056172	Kanyaphat Korakun, Sangob Sasipong and Parkpoom Chaisiriprasert	Room C (会場3(第6会議室) 14 Nov	13:40-14:00

1571056173	Praephat Sinchaithanakit, Papangkorn Pidchayathanakorn and Parkpoom Chaisiriprasert	Room C (会場3(第6会議室) 14 Nov	13:00-13:20
1571058385	Veeraporn Siddoo, Kamontorn Prompitak and Kwankamon Dittakan	Room C (会場3(第6会議室) 14 Nov	11:00-11:20
1571060509	Michael W. Hickey	Room C (会場3(第6会議室) 14 Nov	11:20-11:40
1571061134	Nitthanet Natthakunlanan and Rawinan Praditsangthong	Room C (会場3(第6会議室) 14 Nov	13:20-13:40
1571066437	Jirawat Sookkaew	Room C (会場3(第6会議室) 14 Nov	16:00-16:20
1571066700	Chatchai Wangwiwattana and Worawut Jantarick	Room C (会場3(第6会議室) 14 Nov	11:40-12:00
1571078696	Thitipan Satidkarn, and Aurawan Imsombut	Room C (会場3(第6会議室) 14 Nov	16:40-17:00
1570988706	Phichete Julrode	Room C (会場3(第6会議室) 14 Nov	15:40-16:00
1570986242	Thiwhat Vilaidaraga	Room C (会場3(第6会議室) 15 Nov	9:20-9:40
1571016165	Wilawan Inchamnan, Panupong Nacharoenkul and Thanatporn Threetong	Room C (会場3(第6会議室) 15 Nov	
1571044145	Sayamon Poodpor and Siranee Nuchitprasitchai	Room C (会場3(第6会議室) 15 Nov	14:20-14:40
1571049040	Waraporn Jirapanthong, Komsan Sukwinya and Banyapon Poolsawas	Room C (会場3(第6会議室) 15 Nov	10:00-10:20
1571062142	Yanee Charoensuk	Room C (会場3(第6会議室) 15 Nov	8:00-8:20
1571062146	Thana Sarkorn	Room C (会場3(第6会議室) 15 Nov	8:40-9:00

1571062147	Piyapol Suwimol	Room C (会場3(第6会議室) 15 Nov	8:20-8:40
1571067515	Stephani Inggrit Swastini Dewi	Room C (会場3(第6会議室) 15 Nov	11:40-12:00
1571076976	Ms.Suwanna Bulao	Room C (会場3(第6会議室) 15 Nov	13:00-13:20
1571077922	Ruj Mateedulsatit	Room C (会場3(第6会議室) 15 Nov	9:00-9:20
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1571078534	Narit Hnoohom,Anuchit Jitpattanakul and Sakorn Mekruksavanich	Room C (会場3(第6会議室) 15 Nov	13:20-13:40
1571078861	Yue Zhang	Room C (会場3(第6会議室) 15 Nov	14:40-15:00
1571079084	Mondheera Pituxcoosuvann	Room C (会場3(第6会議室) 15 Nov	13:40-14:00
1571079242	Mizuki Motozawa	Room C (会場3(第6会議室) 15 Nov	14:00-14:20
1571067304	Panuwat Niranon and Tuul Triyason	Nov 14, ROOM IF-5T01	14:20-14:40

NCIT2024: Program Schedule (Thailand)



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9:40-10:00	Surasak Thippawan	NCIT2024_023:
10:00-10:20	Nitirat Tanthavech, Teerasit Pimkitidaj and Apichaya	NCIT2024_005:
10:20-10:40	Teerapong Bunkrue and Onjira Sitthisak	NCIT2024_006:
10:40-11:00	Natcha Niemsawake	NCIT2024_011:
11:00-11:20	Pennapa Kumpang	NCIT2024_019:
11:20-11:40	Poonlap Tangasanawit and Wantanee Chiansunan	NCIT2024_017:
11:40-12:00	Hataichanok Puttaraksa	NCIT2024_015:
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13:20-13:40	Nattakorn Voranitiyorvapa	NCIT2024_012:
13:40-14:00	Chanya Naraphong	NCIT2024_018:
14:00-14:20	Nipon Butrpanya	NCIT2024_014:
14:20-14:40	นรวิษณุ สวัสดิ์, อภิชา ตีอารมย์	NCIT2024_031:
14:40-15:00	Pinrada Dechapakdeekultorn	NCIT2024_029:
15:00-15:20	Kittitee Chokerungreang and Pramote Kuachaoren	NCIT2024_004
15:20-15:40	Praphansak Phinitphak and Waraporn Jirapanthong	NCIT2024_016
15:40-16:00	Thitiporn Chansiriwat, Virasinee Thaweesri and Theerada Chotipant	NCIT2024_007:
16:00-16:20	Nateetorn Puangbubpa and Watsawee Sansrimahachai	NCIT2024_008
16:20-16:40	Chaivichit Kaewklom, Saowaluk Thaiklang and Santanee Kitpermkiat	NCIT2024_010:
16:40-17:00	Saowaluk Thaiklang, Chaivichit Kaewklom, Tanarat Chotipant	NCIT2024_009:

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9:20-9:40	รัชชชาติ เกตุบุญลือ, อรรณพ หมั่นสกุล and ประมุข บุญเสียง	NCIT2024_021
-	Virasinee Thaweesri, Korawit Chorasat and Theerada Chotipant	NCIT2024_022
10:00-10:20	Jongphon Chantharangsee, Kumpee Teeravech and Amornchai	NCIT2024_024
10:20-10:40	Nutthawut Prachamkit, Kornkamon Iemthong, Pramin	NCIT2024_026
10:40-11:00	Kittipong Khaimeepeth	NCIT2024_027
11:00-11:20	Aphicha Inmathanyatorn	NCIT2024_028
11:20-11:40	Pinrada Dechapakdeekultorn	NCIT2024_029
11:40-12:00	Jakarin Sirikulthorn and Wongsakorn Charoenpanitseri	NCIT2024_030
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13:00-13:20	Koson Kojorntanakit	NCIT2024_03
13:20-13:40	Suthinee Wantha and Waraporn Jirapanthong	NCIT2024_033
13:40-14:00	Arnon Prommoon and Waraporn Jirapanthong	NCIT2024_034
14:00-14:20	Thawinee Lohawatcharanon, Tanaporn Ngamjit and Papangkorn Pidchayathanakorn	NCIT2024_035
14:20-14:40	Vimolchad Thaepthong, Khachonkit Chuiad	NCIT2024_025

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1571029651	Phaisarn Jeefoo
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1571044681	Jaratpong Tepmanee
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1571046494	Asst. Prof. Dr. Jian QU
1571046641	Siranee Nuchitprasitchai, Saranlita Chotirat and Apichaya Nimkoompai
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1571049040	Waraporn Jirapanthong
1571051681	Tossaphorn Maniam
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InCIT2024 Abstracts



- 1) 1571058597: Stacked Machine Learning Models for Diagnosing Durian Leaf Disease Using Hand-Crafted Features:

Abstract—Durian is a major agricultural commodity, and its production faces diverse challenges, among which leaf diseases pose a persistent threat to yield and fruit quality. In recent years, advances in artificial intelligence (AI) technologies, particularly machine learning, have shown significant potential in the field of plant disease detection and classification. In this study, we propose a durian leaf disease classification model based on hand-crafted feature extraction and machine learning. We evaluate the performance of several machine learning models for the classification of durian leaf diseases, specifically targeting algal leaf spot, leaf blight, and healthy leaves. The stacked model demonstrates superior performance in terms of accuracy (90.00%) and balanced metrics across the classes compared to the individual models.

Keywords—durian, durian diseases, feature extraction, leaf diseases

2) 1571066700: Building Intelligent Academic Service Agents: FAQ Extraction and Chatbots with Large Language Models

Abstract—This study proposes an academic chatbot system utilizing large language models (LLMs) to assist students with university-related tasks. The system is designed to simplify the maintenance of school information by extracting FAQs directly from instant messaging platforms. To ensure safety and reliability, the system incorporates a two-step filtering process. In this study, 300 real-world conversations were analyzed, resulting in the extraction of 95 registrar-related Q&A pairs that were subsequently trained into the system. The system’s performance was evaluated based on three key metrics: context relevance, answer relevance, and groundedness. The results demonstrated high satisfaction levels, with scores of 0.94, 0.93, and 0.92, respectively.

Keywords—*Large Language Models (LLMs), education, chatbot*

3) 1571071249: Block-Variable-Adaptive Approach for Distributed Blind Equalization Over Wireless Sensor Network

Abstract—Recently, the distributed blind equalization in wireless sensor network (WSN) is commonly employed for signal estimation. However, the performance of distributed blind equalization is highly sensitive to the transmission channel condition, especially for ill-channel condition, leading to inaccuracies in predicting the transmitted data signal. In order to mitigate the impact of the ill-channel condition on others, a block-variable-adaptive approach is proposed to redesign the weight for each sensor node and adjust the step-size for distributed blind equalization under the current condition of channel based on the analysis of eigenvalue spread of received signal at each sensor node every \mathcal{K} data samples. In the computer simulations, we use the mean-square error to evaluate the performance of distributed blind equalization. Compared with the conventional approach, the proposed approach demonstrates a lower MSE and faster convergence.

Keywords —distributed blind equalization, wireless, sensor network, signal estimation, error

4) **1571064305**: Prototyping a Gesture-Controlled Smart Home Assistant - an IoT Integration Approach

Abstract—The rise of IoT has revolutionized appliance management, but current voice-controlled systems face limitations in noisy environments and for individuals with hearing or speech impairments. Additionally, integrating different connectivity methods for various appliances remains a challenge. This paper presents a gesture-controlled smart home assistant designed to address these issues. By integrating MQTT and HTTP protocols, the system offers flexible control of diverse smart home devices. Utilizing a Raspberry Pi 4B with OpenCV and MediaPipe for gesture recognition can increase accessibility for individuals with hearing or speech impairments. Experimental results validate its effectiveness in accurately recognizing gestures and managing appliances, improving user interaction with smart home technologies in varied environments.

Keywords—Internet of Things (IoT), Gesture Recognition, Household Appliances, MQTT, Home Assistant, Hearing and speech Impairments

5) 1571064468: Business Transformation Framework for Supporting Thai SMEs Viability

Abstract— Small and medium-sized enterprises (SMEs) play an essential role in the global economy by driving innovation, creating employment opportunities, and fostering economic growth. The COVID-19 pandemic has forced SMEs worldwide to hastily adopt digital business models to adapt and thrive in these challenging times. Thai SMEs are similarly compelled to transform to survive the crisis, enhance operational efficiency, and achieve a competitive advantage. Business transformation is relatively new for SMEs in Thailand, with few established success stories to follow as standard practices. This study aims to introduce a novel business transformation framework by applying the SOSTAC model, Joint Application Development (JAD), E-Commerce, and Gap Analysis to 25 SMEs in the restaurant sector based in Chiang Rai, Thailand. Initial findings suggest that this transformation has been successful, with improvements measured across four key business objectives: promoting the business online, providing easy customer access, accepting orders online, and increasing sales.

Keywords— *Small and Medium Enterprises, Business Transformation, SOSTAC, JAD, E-Commerce and GAP Analysis*

6) 1571062146: Review on Zero Trust Architecture Apply in Enterprise Next Generation Firewall

Abstract— The modern cybersecurity threat landscape requires a paradigm change in network defense strategies. Zero Trust Architecture (ZTA), that significant difference from traditional security models, by limiting the total trust tacit within an organization's network. This paper presents a literature review on the comprehensive application of Zero Trust principles within Next Generation Firewall (NGFW) devices by integrating the improved ZTA and NGFW to provide durable security controls thorough and continuously updated. This is necessary to mitigate and prevent the complexity of cyber threats. The article will examine key elements of the ZTA, including user authentication. Subdivision and implementation of least privileged access within existing NGFW devices are also discussed. Case studies and current progress are discussed to demonstrate the practical benefits and challenges of this integration. The results show that integrating the ZTA architecture with NGFW devices not only strengthens security measures but also enhances security. It also provides a scalable and adaptable solution for modern organizations facing complex and persistent cyber threats.

Keywords— Next Generation Firewall , Zero Trust Architecture , Enterprise Firewall

ABSTRACT

The research aims to develop technological and procedural guidelines that foster autonomy, resilience, and creative growth among learners. Emphasizing the significance of efficient methodologies, training, and education, particularly within classroom environments, the study seeks to address creativity concerning coping strategies for autonomy resistance. It explores how resilience to autonomy influences creative processes, with the overarching goal of enhancing learning experiences and outcomes.

The findings suggest that the impact of individual autonomy on task creativity is influenced by task interdependence: it negatively affects team creativity when task interdependence is high but positively affects it when task interdependence is low. Through an investigation of coping mechanisms related to autonomy resistance, this research seeks to gain insights into how individuals navigate challenges and obstacles that may arise in autonomy-promoting environments. This examination encompasses the strategies individuals use to maintain their autonomy, overcome resistance, and sustain effective engagement in creative processes.

Keywords: Autonomy, Resilience, Creativity, Behavior, Gamification

8) **1570988065**: E-KYC-Based Privacy Preserving Model Using Smart Contract on Private Blockchain Network

Abstract— Nowadays, if Thai people want to transfer money more than 50,000 baht, they have to verify their face online for self-identification. Many banks in Thailand adopted e-KYC face authentication to verify their user identity; however, it causes many consequences and problems such as cyber threat and also privacy violations. A face image is personal data that is protected by PDPA; therefore, an e-KYC-based privacy preserving model was proposed for this reason. This research aims to preserve data privacy by implementing blockchain and smart contracts. The proposed model can preserve data privacy and also serve e-KYC identification on blockchain networks. This is a pioneer paper that can serve both purposes in the same model. The experiment shows outperforming results over existing system.

Keywords— *e-KYC, Blockchain, Smart Contract, Private blockchain*

9) **1570994005**: Data Visualization System to Examine the Market Price Trend of Agricultural Products

Abstract— This study aimed to evaluate user satisfaction with a data visualization system designed to analyze agricultural product price trends for China trade. The system was developed using public data and Microsoft Power BI, employing the Extract, Transform, Load (ETL) process. By incorporating China's economic data and agricultural product prices, the system supports entrepreneurs in making informed trading decisions. The research assessed the system's effectiveness and usability, gauging its potential impact on China's agricultural trading market. This comprehensive approach to developing and evaluating a data visualization system for agricultural product price trends ultimately seeks to enhance trading efficiency with China. The study's findings provide valuable insights into the system's potential to improve decision-making processes in the context of China-focused agricultural trade.

Keywords—*data visualization, agricultural product, Microsoft Power BI*

10) 1570985040: Guideline for data privacy protection in Thailand using differential privacy algorithm

Abstract— Attackers have been using reconstruction techniques to get some personal sensitive data. Data breach cases have occurred around the work by reconstruction attack and/or re-identification attack. therefore, both attacks become the most serious and difficult attack in a security violation. The best data privacy preservation technique is the differential privacy mechanism. This research aims to prevent both attacks by using the global differential privacy concept. In addition, there is no standard or guideline for Rangsit University; therefore, this research paper aims to construct a guideline for the university.

Keywords— *Data center, Privacy law, Differential privacy*

11) 1570984585: A Data Spoofing Encryption Algorithm for Securing the Official Database

Abstract— Data security and data privacy are two hot topics in the research world because they cause big damage and are against PDPA laws. Hacker always uses a sophisticated way to hack into the official database. The purpose of this research is to present a method to systematically modify the numerical data to create a mimic database used as a honeypot. An attacker is not aware that he/she is interacting with fabricated data. We proposed a novel algorithm named a “Data Spoofing Encryption (DSE) algorithm” in order to normalize data to avoid the attacker’s awareness and preserve data privacy. Experimental results indicated that the proposed technique is effective in producing normalized data and in preserving the confidentiality of original data.

Keywords— *Data center, Privacy law, Data spoofing*

12) 1570984586: Applying NIST Framework on Data Privacy Attacks Using K-Anonymity Algorithm

Abstract— With the escalating frequency and complexity of data privacy attacks, organizations confront unprecedented challenges in safeguarding sensitive information. While the National Institute of Standards and Technology (NIST) has crafted a comprehensive framework to bolster cybersecurity measures, its application in the context of data privacy attacks remains relatively unexplored. This research paper seeks to delve into the efficacy of employing the NIST framework to mitigate data privacy attacks, scrutinizing its strengths and limitations, and proposing potential enhancements for a more resilient defense strategy. The experiment assesses the performance of various classification models on an original dataset. Subsequently, it evaluates the performance of the same classification models on a dataset modified by K-anonymity algorithms. The results of these classification model evaluations indicate that K-anonymity algorithms neither compromise data utility nor impede effectiveness, yielding higher scores.

Keywords— *NIST framework, data privacy attack, PDPA, Re-identification attack*

13) **1570985012**: Smart Contract-Based Consent Management System for Data Privacy Protection

Abstract— The PDPA laws are the first data privacy laws to protect all Thai citizens since 2018. The consent management system (CMS) is a core module of Thailand's PDPA laws. It maintains complex and dynamic contents of user consent which are updated and changed all the time. The best network that can store a CMS's historical data is blockchain while the best tool for maintaining it is a smart contract which works on Ethereum-based blockchain. This paper aims to apply the Smart contract technique to enhance a consent management system to perform a better data privacy service. This research paper proposes a Smart Contract-Based Consent Management System (SCCMS) as an innovative solution to enhance data privacy protection. By leveraging blockchain technology and smart contracts, the SCCMS aims to provide a transparent, secure, and decentralized framework for managing user consent, thereby ensuring greater control and transparency in the handling of personal data. Our experiment result outperforms a regular CMS system

Keywords— **Smart Contracts, Blockchain, Consent Management System, Data Privacy, Decentralization, Security, Transparency.**

14) **1570985037**: Comparative Diagnosis Model for Risk Factors of Heart Disease Using Deep Learning

Abstract— Many sharing datasets about heart disease including Kaggle and UCI. Those statistics are crucial for human being to prepare themselves. This research has been conducted to create a diagnostic model for risk factors for developing heart disease. Five commonly used classification models are implemented in this paper including 1. Neural Network 2. Support Vector Machines (SVM) 3. Decision Tree Classification 4. Random Forest Classifier 5. Logistic Regression to compare the accuracy. The results of the experiment compared the performance of the models of all 5 algorithms, finding that the Neural Network model had the best performance. It has the highest accuracy and accuracy at 96.02%. It is the highest accuracy and suitable for use in diagnosing factors in heart disease.

Keywords- heart disease, diagnosis, machine learning, classifiers

15) **1570988692**: Social Media Privacy and Security in the Royal Thai Armed Forces

Abstract— This research paper delves into the critical issues surrounding social media privacy and security within the context of the Royal Thai Armed Forces. As social media platforms continue to play an increasingly significant role in military operations, communication, and personnel interactions, the need for robust privacy and security measures becomes paramount. As social media platforms continue to play an integral role in military operations worldwide, the protection of sensitive information is of paramount importance. The result of the recent survey show that the data breach is the most serious problems because it violent to both Thailand laws: cyber security acts and PDPA laws. We developed a simple guild line in an experiment. Some suggestions are proposed in these papers

Keywords— social media, Privacy, Security, Cybersecurity, Data breaches, Espionage, Insider threats.

16) 1570985622: The Adoption of Electronic know your customer (e-kyc) Technology for banking sector in Thailand

Abstract— The implementation of electronic Know Your Customer (e-KYC) technology has revolutionized the banking sector by enhancing the efficiency of customer identity verification processes, improving security, and ensuring regulatory compliance. This literature review will explore the adoption and impact of e-KYC in Thailand's banking sector, referencing studies from both global and local perspectives.

Factors influencing behavioral Intention to use the electronic Know Your Customer (e-KYC) for opening a bank account are as follows: 1. Technology Readiness, 2. Network Externalities, 3. Technical protection, 4. Transaction Procedures, 5. Perceived Security and 6. Perceived Trust. The purpose of this research is to create a conceptual framework for explaining the intention of using electronic Know Your Customer (e-KYC). The experiment showed that our framework is practical and useful for a bank in Thailand.

Keywords— *Electronic Know Your Customer, (e-KYC), Intention to use.*

17) **1570986242**: Blockchain-Based Auxiliary Systems for Password Management

Abstract— Authentication usually involves a combination of a username and password for the identity information process. Historically, users have had to find ways to manage them, typically by memorizing or noting them down separately. Blockchain-based Auxiliary System for Password Management (BAS-PM), which evolved from Distributed Ledger Technology (DLT) Frameworks, is designed to help users store their passwords securely and permanently. Passwords have been a simple yet effective means to protect systems from unauthorized access for years. They are also sensitive personal data that need to be protected by data privacy laws such as the GDPR. For cybersecurity and data privacy purposes, this research aims to propose a Blockchain-based Auxiliary System for Password Management (BAS-PM). The cost-effectiveness and robustness of blockchain technology make it an attractive solution for global password management. This article explores the use of blockchain in password management applications without relying on a centralized server. Experimental results indicate that blockchain-based methods have outperformed traditional methods.

Keywords— blockchain, password management, data privacy, GDPR

18) 1570988737: Data Anonymization for Thai SME E-Commerce on Social Media Using Generalization Technique

Abstract—Most Thai SME E-commences about 40% are on social media networks. Besides, all of them have to process a lot of personal data daily. In 2018, GDPR Laws as the first data privacy laws were announced. Since then, all personal data have been protected by each country's data privacy laws such as Thailand's PDPA laws. SME owners as data controllers have to take care of their users themselves or outsource to other logistic companies. Both cases are at risk for data breach. This research paper aims to propose a data breach protection model for membership data in a large-scale platform. A generalization concept is applied for data privacy protection in the experiment. Finally, full data anonymization is completely done for data privacy law compliance.

Keywords— *Data breach, Data privacy, Cyber security, Data anonymization*

- 19) 1571059919: AI-Driven Design Thinking: A Comparative Study of Human-Created and AI-Generated UI Prototypes for Mobile Applications

Abstract— The integration of Generative AI into the Design Thinking Process introduces new possibilities for UX/UI design, particularly in mobile app development. This study focuses on creating a fitness app prototype for next-generation users, with Generative AI acting as a co-creator across the Empathize, Define, Ideate, Prototype, and Test phases. Two sets of low-fidelity wireframes were developed: one by human UX/UI designers using Figma, and the other by AI using Visily.ai. These prototypes were evaluated through A/B testing, where users completed tasks on both designs, with their experiences measured using the System Usability Scale (SUS) and qualitative interviews. The findings compare human-designed and AI-generated prototypes, offering insights into their strengths and weaknesses. The study also introduces the AI-Driven User Experience (AID-UX) Framework, which outlines a structured method for integrating AI into UX/UI design, from data analysis to iterative testing. Results indicate that while AI-generated designs excel in creativity and efficiency, they lack the nuanced understanding required for human-centered design. This research highlights best practices for human-AI collaboration, emphasizing the balance between AI capabilities and human creativity. The study offers guidance for future AI-assisted design practices, promoting a collaborative approach that leverages both human and AI strengths.

Keywords—*Generative AI, Design Thinking, User Experience (UX), User Interface (UI) Design, System Usability Scale (SUS), AI-Generated Prototypes, Usability Testing*

20) 1571062866: ESP32Exten: Designing and Developing an ESP32 Microcontroller Expansion for IoT Applications with Motor Propulsion and AI Image Processing

Abstract—The Internet of Things (IoT) involves connecting devices to facilitate data sharing for collaborative work. This transformative technology holds high potential across various sectors. A key element in IoT systems is the microcontroller board, which must interface with sensors suited to specific tasks. The ESP32 is a popular choice for IoT applications due to its compact size, affordability, and excellent Bluetooth and Wi-Fi connectivity, all while consuming minimal power. However, the ESP32's limitation of supplying only 3.3V necessitates the use of expansion boards, particularly when dealing with high-power sensors or those requiring intensive processing.

To address these limitations, we developed the ESP32Exten expansion module to enhance the performance of the motor propulsion and AI processing capabilities for image processing. A library was created for ESP32Exten to improve its functionality. Performance tests were conducted to compare ESP32Exten with standard expansion boards across three key areas: 1. Motor performance, 2. AI image processing and data transmission via Bluetooth and Wi-Fi, and 3. Input-output sensor connectivity. The results demonstrated that ESP32Exten significantly improved DC motor control, image processing, rapid data transmission, and reduced voltage drop, effectively addressing the operational limitations of the ESP32.

Keywords—*Internet of Things, Microcontroller, ESP32 microcontroller*

21: 1570996285: A Prototype of a Rice Proteomics Data Consolidation and Visualization System

Abstract—As rice is one of the primary sources of energy that has been consumed by 50% of the world's population, there have been various rice research and development projects aiming to increase rice productivity, improve insect pest and disease resistance, support rice farming, etc. In this paper, we proposed a system prototype to enhance rice research and development processes, the study of proteins in rice. We viewed the integration of information retrieval and data visualization as an advocate for the research. In the research, one necessary task is to retrieve proteomic information from online databases. However, such a process heavily relies on human efforts to access and manually retrieve the information. Thousands of proteins are generally retrieved from proteomics research. This hinders the data analysis, interpretation, and visualization in the research task. To overcome such a problem, we proposed a prototype for a rice proteomic data consolidation and visualization system.

22) **1571000254**: Strategies for Cyber Risk Assessment and Mitigation in Small and Medium-Sized Enterprises in Thailand

Abstract

The significance of risk management has heightened across companies of all sizes from large corporations to small enterprises. The escalating cyber threat and financial impact, influenced by factors like Thailand's average profit margin, compel organizations to scrutinize emerging risks. Medium-sized, small, and micro-enterprises are notably affected due to limited resources and technological expertise, influencing investment decisions and risk mitigation strategies. A proof of concept was executed, simulating a medium-sized enterprise with diverse assets. The results highlight network device detection and evaluation within the framework, emphasizing the evolution of risks without proactive intervention. This accessible approach guide future cybersecurity enhancements for organizations. Keywords: Risk management, cyberattacks, financial impact, medium-sized enterprises, proof of concept, cybersecurity. Keywords— Strategies for Cyber Risk Assessment, Cyber security, NIST framework.

23) **1571000362**: Facial Expressions Pain Level Estimated by Weighting Method

Abstract—The process of understanding individuals through facial expressions via the analysis of emotions and sentiments is a crucial aspect in understanding the emotional states of individuals. This facilitates effective responsiveness during conversational exchanges, thereby enhancing communicative efficacy. However, in situations where it is challenging to articulate feelings, particularly the intensity of physical pain in addressing physical illnesses, the significance of understanding pain levels becomes crucial. This understanding directly influences decision-making regarding the selection of differing approaches to problem-solving in coping with pain.

Therefore, the researchers have proposed a method utilizing facial expression analysis to detect pain levels, aiming to address the issue of ambiguous pain expression. In our approach, Pain Level Expression (PLE), utilizing key points in six facial areas affecting emotional expression, was estimated by incorporating weights derived from emotional classification. This integration enhances the representation of pain levels through facial expressions. We applied our method to a sample group of 25 individuals, comprising a total of 4,084 images. The results underscore the effectiveness of our approach in providing a more accurate reflection of pain.

Keywords—*pain level, facial expressions, weighting method, action unit*

24) **1571020545**: Performance Evaluation Using Human Computer Interaction Models

Abstract—In today's digital age, the usability of mobile applications, particularly those developed by the government sector, plays a crucial role in ensuring efficient public service delivery. This study focuses on evaluating user performance in interacting with government mobile applications through the application of human-computer interaction models. Specifically, the GOMS-Touch-Level Model (GOMS-TLM) is employed as a testing methodology, complemented by the System Usability Scale (SUS) evaluation method for assessing application performance.

This research aims to provide in-depth insights into user behavior and performance through the application of both the System Usability Scale (SUS) and the GOMS-Touch-Level model (GOMS-TLM). By employing these methods, the study seeks to establish guidelines for assessing applications and emphasize the importance of utilizing both approaches. Additionally, it aims to compare the effectiveness of these methods to achieve more efficient outcomes.

Keywords: *Human-computer Interaction, SUS, GOMS-TLM, Evaluation, Performance, Mobile Application*

25) **1571071792**: Cybersecurity Threat Detection Analysis via Exploratory Data Analysis

Abstract In this research, where the landscape of cybersecurity is rapidly evolving, the necessity for efficient threat analysis and mitigation is of paramount importance. To this end, exploratory data analysis (EDA) plays a crucial role in understanding and visualizing various patterns that can enhance the ability to detect threats through firewalls. The focus is on a financial institution, utilizing data from events spanning two years (01/01/2022 - 31/12/2023), comprising a total of 2,884,103,138 events. After filtering, 53,273,203 events were selected to identify the top 20 most frequently occurring threats. These insights allow for the formulation of hypotheses in this context to help assess risk levels and detect anomalies. The model identifies outliers by comparing specific data points to others, and the distribution is examined using histograms. This approach ensures that the strategies employed are robust and adaptable to emerging threats. Together, these methodologies form a comprehensive framework for effectively safeguarding digital infrastructure against increasingly complex cyber threats.

Keywords Exploratory data analysis, Cybersecurity, In-depth analysis, Anomaly detection, Threat distribution, High-Risk Threats.

26) **1571068213**: AI-Enhanced Illustration: A Time and Cost-Efficient Solution for Indie Developers

Abstract—The escalating costs of game development pose significant challenges for indie developers, who often operate with limited budgets. Gamers accustomed to the quality of AAA games expect similar standards from indie games, despite their typically smaller budgets. This paper proposes a process that integrates generative AI into the creation of game illustrations to reduce time and costs, enhance productivity, and maintain full control over the final outcome. Through multiple case studies, We compares the cost, time, and quality of illustrations produced by professional freelance artists on Fiverr with those created using this AI-enhancing process, demonstrating significant savings while maintaining high quality.

Keywords—*generative ai, indie game developer, cost, time, budget, illustration*

27) 1571056173: “Sentiment Analysis of Thai Sentences for Monitoring Mental Health Issues Using Transformer Models”

Abstract— In recent years, mental health issues have become increasingly prevalent. Suicide and self-harm are consequences of severe mental illnesses. Though it can be challenging to identify those suffering from mental health issues, careful observation can help guarantee that those who are struggling with mental health issues receive treatment before their circumstance worsens. Several things, including social competition or familial problems, can lead to mental illness. Because people are using online communication channels more and more, this results in more private time and less social engagement, online technology for communication has additionally influenced social surroundings. This change significantly influences the onset of mental health problems. This research aims to present a sentiment analysis model for Thai sentences using the Transformer Model (ALBERT, RoBERTa, and BERT) to monitor mental health problems using 50,065 emotional sentences expressing negative and positive with web scraping techniques from X (Twitter) and YouTube. The experiments show that ALBERT has the highest processing efficiency when compared to RoBERTa and BERT models with an accuracy percentage of 90%, 85%, and 80%, respectively.

Keywords ----*Sentiment Analysis, Mental Health, Transformer Model, ALBERT, RoBERTa, BERT, web scraping, Twitter*

28) 1571056172: “Stress Detection Based on Facial Expressions Using a Combination of CNN and KNN”

Abstract—This study describes a method for facial expression-based stress detection that uses CNN and KNN to assess and detect stress based on facial expressions. Accurate identification of stress is essential because it has a major impact on both personal health and productivity. In particular, MediaPipe and the Facial Action Coding System (FACS) are used for feature extraction and stress level assessment in the suggested method's integration of AI and ML technologies. The study shows how well KNN and CNN models work together, obtaining a 95% accuracy rate in stress detection. A collection of 7,066 face photos representing seven different emotional states is used to assess the system's performance. The combined model performs better than the separate KNN and CNN models, according to the experimental data, indicating its potential for use in psychological testing and health monitoring.

Keywords ----*facial expressions, CNN, KNN, MediaPipe, FACS*

29) **1571068141**: Performance Comparison Between Moment Features and Using a Free Classification Service in Change-Robust Texture Recognition

Abstract— Texture is one of the important characteristics used to identify objects or target areas in images. One of the difficulties in texture recognition is to ensure robustness against movement, rotation, and scale changes. In the past, texture recognition has been based on features derived from wavelet transforms and classified by neural networks or other classifiers. However, it is difficult to classify textures of different scales and rotations using only these methods. We propose a texture recognition based on moment features. Wavelet coefficients corresponding to each signal band are used to compute moment features. For classification, each moment feature is fed to a neural network. The recognition results are compared with Google Teachable Machine, a free classification service, to verify the superiority of our proposed method. It is confirmed that our proposed method improves the recognition rate under certain conditions.

Keywords—*texture recognition, change-robust, wavelet transform, moment feature, Google Teachable Machine*

30) **1571046217**: Student-Centered Learning in HCI/UX/UI Framework: The Thai Experience

Abstract— The rapid expansion of Human-Computer Interaction (HCI), User Experience (UX), and User Interface (UI) design fields highlights the importance of specialized education to prepare future professionals. However, in Thailand, there is a significant gap in formal undergraduate programs dedicated to these disciplines. This study investigates the learning experiences, challenges, and motivations of Thai students and young professionals who pursue HCI/UX/UI knowledge through self-directed methods. Utilizing an online survey distributed to 41 participants of the UI Design-athon 2024, the research reveals a reliance on digital resources like YouTube tutorials and online courses, highlighting the need for structured educational pathways. Key challenges identified include UX/UI analysis and evaluation, as well as understanding basic concepts and using design tools. The findings suggest that while self-directed learning provides valuable skills, a more integrated and formal educational approach is necessary. Recommendations include enhancing curricula with practical applications, digital literacy, and community-based learning to better support the development of HCI/UX/UI expertise in Thailand. Comparisons with other developing countries in Southeast Asia reveal similar challenges but also unique aspects of the Thai context. This study contributes to the global discourse on HCI/UX education, particularly in developing countries, and proposes strategies for improving educational frameworks to meet the growing demand for skilled professionals in Thailand and beyond

Keywords—HCI/UX/UI education, Self-learning, Thailand HCI, Online resources, Skill development, Developing countries

31) **1571046641**: HCI/UX/UI Education Issues and Learning Challenges for Thai Undergraduate Students

Abstract— User Experience (UX) design has become crucial in developing digital products, leading to increased demand for skilled professionals. However, in Thailand, UX education faces significant challenges. This study investigates the learning obstacles encountered by Thai undergraduate students in Human-Computer Interaction (HCI), User Experience (UX), and User Interface (UI) design. A mixed-methods approach was employed, including a literature review and a survey of 41 Thai undergraduate students who participated in a UI Design-athon.

The study revealed that the primary challenges in HCI/UX/UI learning are lack of practice time (75.6%), lack of expert guidance (56.1%), and lack of real-world opportunities (53.7%). Students perceived varying levels of difficulty across UX design stages, with Empathy and Ideation being particularly challenging. In UI design, both mood board creation and visualization presented significant difficulties. Analyzing and evaluating UX/UI was identified as the most challenging aspect of learning (36.59%), followed by understanding basic concepts (21.95%).

Students strongly prefer online resources (48.78%) and structured training courses (34.15%) for developing UX/UI skills. These findings highlight the need for a multi-faceted approach to improve UX education in Thailand, including more flexible learning options, increased industry-academia collaboration, and targeted educational interventions. This study contributes to the understanding of UX education challenges in emerging markets and provides insights for enhancing UX/UI learning experiences for Thai undergraduate students.

Keywords— HCI/UX/UI education, HCI/UX/UI learning, UI design, Thai students, educational challenges

32) 1571024554: MAPS.ME Applications Guideline for Fiber Optic Network Maintenance: A Case Study of National Telecom Public Company Limited

Abstract— The study focuses on applying the MAPS.ME application for the maintenance of National Telecom Public Company Limited fiber optic network in region 1.4. It aims to create a guideline integrating MAPS.ME with preventive and corrective maintenance activities. For preventive maintenance, the guideline will help in network planning, identifying locations where cable quality needs to be improved which can reduce preparation time and costs. For corrective maintenance, the application expedites problem-solving and decision-making and enhances customer satisfaction. The evaluation of the application performance through in-depth interviews revealed that the application of MAPS.ME improved efficiency, reduced costs, responded quickly to disruptions, and increased user satisfaction in fiber optic network maintenance. Overall, the guideline proves to be a valuable tool for optimizing maintenance processes, contributing to organizational efficiency.

Keywords — *Fiber optic maintenance, preventive maintenance, corrective maintenance*

33) **1571029651**: Future Flood Risk Zones Using CMIP6 Climate Modeling and GeoInformatics in Phetchaburi Province Thailand

Abstract— An excess of water that submerges normally dry ground is called a flood. It occurs when there is an excessive amount of water in a river, lake, or other water bodies, leading to the inundation of nearby areas. Flood prediction using Geoinformatics combines technology, data analysis, and spatial understanding to enhance our ability to predict, prevent, and manage floods effectively. This study developed techniques for mapping flood extent and assessing flood damages that can be used as a guideline for Geoinformatics technique, Analytical Hierarchy Process modeling and climate modeling to improve the efficiency of future flood disaster monitoring and management in Phetchaburi province in the year of 2030, western Thailand. Climate change is significantly impacting flood risk worldwide. The CMIP6 HadGEM2-ES model plays a crucial role in advancing our understanding of climate dynamics and informing policy decisions related to climate change. In the results, it was found that the Bang Khrok subdistrict, Ban Laem district, is classified as a high-risk future flood zone with an area of 22.10 sq.km., which is 10.29% of the whole province in terms of affected future floods in the year of 2030. The field of Geoinformatics has significantly aided in the monitoring and assessment of flood damage, leading to major contributions from disaster management authorities.

Keywords—Geoinformatics, Future Flood Risk Zones, CMIP6 HadGEM2-ES, AHP model, Phetchaburi province

ABSTRACT

This research addresses challenges in agriculture arising from climate change and unpredictable environments, which significantly impact crop production. We propose a framework to tackle these challenges using machine learning for pest identification. The framework consists of three parts: i) Data Collection: we utilize Arduino and TensorFlow to capture images of insects in the field. TensorFlow processes the images using a trained machine learning algorithm to identify insect characteristics like type, species, and location. Additionally, TensorFlow is used to generate new pest images to enrich the training dataset. ii) Machine learning model development: a random forest model is used to identify existing insects. The model's performance is evaluated using precision, recall, and accuracy metrics. Results show high accuracy (93.33%) across different insect classes. And iii) web application development: the trained model is integrated into a web application to identify pests from user-uploaded images. This information can be used to automate a pesticide spraying system for targeted pest control. Additionally, this research contributes to precision agriculture by offering a framework for pest identification and supporting the development of automated spraying systems, potentially reducing pesticide overuse and environmental impact.

Keywords: Decision Support System, Machine Learning, Random Forest, Smart Farming, IOT

35) 1571051681: Yield Prediction for Lac Cultivation in Tropical Region Using Moving Average LSTM Reinforcement Algorithms

Abstract— Lac, a resin secreted by the lac insect, is a valuable agricultural product with applications in various industries, including food, pharmaceuticals, cosmetics, and varnishes. Efficient management and accurate prediction of lac production and export volumes are essential for optimizing supply chains, meeting market demands, and maximizing profits. This study investigates the application of machine learning algorithms to predict lac yield in tropical regions. Specifically, we compare the performance of Moving Average Long Short-Term Memory (MA-LSTM), Convolutional Neural Networks (CNN), and Random Forest (RF) models. The MA-LSTM model integrates Exponential Moving Average (EMA) to smooth short-term fluctuations and LSTM networks to capture long-term dependencies. Our findings demonstrate that the MA-LSTM model significantly outperforms traditional LSTM and other machine learning algorithms in terms of prediction accuracy, with lower Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) values. The enhanced predictive capability of the MA-LSTM model can greatly benefit stakeholders in the lac industry by improving production planning, inventory management, and strategic marketing decisions. This research highlights the potential of advanced machine learning techniques in enhancing agricultural productivity and sustainability through better predictive analytics.

Keywords— *Lac, Machine Learning, MA-LSTM, CNN, RF, Yield Prediction, Lac Agriculture*

36) 1571058973: Leveraging Blockchain Technology for Carbon Credit Management in Thailand

Abstract— The situation of the global warming problem in Thailand is worse than before. Higher daily temperatures and PM2.5 and also new kinds of disease are results of the global warming problem. The Thai government urges many stakeholders to take the problem seriously. The carbon credit is one of the key instruments of emission reduction. Traditional carbon credit systems, however, are often plagued by issues of transparency, accountability, and efficiency. Blockchain is a promising technology that is famous with its transparency environment characteristics. The research aims to underline principles of carbon credit management by implementing blockchain-based solutions. Additionally, we discuss key considerations such as scalability, interoperability, regulatory frameworks, and environmental impact.

Keywords: Carbon Credits, Blockchain Technology, Sustainable Development, Transparency, Accountability, Decentralization, Environmental Governance

37) 1571062146: Review on Zero Trust Architecture Apply in Enterprise Next Generation Firewall

Abstract— The modern cybersecurity threat landscape requires a paradigm change in network defense strategies. Zero Trust Architecture (ZTA), that significant difference from traditional security models, by limiting the total trust tacit within an organization's network. This paper presents a literature review on the comprehensive application of Zero Trust principles within Next Generation Firewall (NGFW) devices by integrating the improved ZTA and NGFW to provide durable security controls thorough and continuously updated. This is necessary to mitigate and prevent the complexity of cyber threats. The article will examine key elements of the ZTA, including user authentication. Subdivision and implementation of least privileged access within existing NGFW devices are also discussed. Case studies and current progress are discussed to demonstrate the practical benefits and challenges of this integration. The results show that integrating the ZTA architecture with NGFW devices not only strengthens security measures but also enhances security. It also provides a scalable and adaptable solution for modern organizations facing complex and persistent cyber threats.

Keywords— Next Generation Firewall , Zero Trust Architecture , Enterprise Firewall

Abstract—Stock investment often leads to uncertainty among investors due to market volatility and unpredictable factors. The lack of sufficient knowledge and analytical tools causes investors, especially novices, to rely on emotional decisions rather than systematic data-driven analysis. Thus, this research presents the development and evaluation of the Finsight Bot, an advanced investment recommendation for stock selections. The investigation of Thailand’s Market for Alternative Investment (MAI), particularly the TECH sector, is performed, and it consists of fundamental data (FD), Discounted Cash Flow (DCF), and technical analysis (TA). These components are applied to classify the recommendations between buying and avoiding. A procedure for recommendation classification was designed according to the changing data of FD, DCF, and TA. This dataset was applied to generate the proposed algorithm. This algorithm was used to classify the recommendation using a random forest model. The accuracy of this classification model between buying and avoiding recommendations was 100%. Thus, the proposed algorithm can assist novice investors and experienced investors.

Keywords—DCF, ROA, ROE, Receivable Turnover, ratio, advisor, machine learning, random forest

39) 1571035894: “Facial Authentication with Liveness Detection on Edge Computing”

Abstract— Robust facial authentication with liveness detection is vital for secure access control systems. Conventional methods using remote cloud servers suffer from latency, bandwidth constraints, and privacy risks. To address these issues, we propose an edge computing solution that performs on-device facial liveness detection using an optimized convolutional neural network on low-power hardware like the Raspberry Pi. This approach eliminates the need for remote servers, providing reliable authentication. Our system also manages user data intelligently by synchronizing and distributing facial encoding data and user profiles between the central server and edge devices as needed, proactively removing unused data to conserve storage. This minimizes transmission overhead while ensuring edge devices have the latest user information. By performing on-device liveness detection and intelligent data management, our architecture reduces latency, bandwidth usage, and privacy risks, enabling secure and privacy-preserving facial authentication for widespread IoT deployment.

Keywords— Facial authentication, Liveness detection, Edge computing, Deep learning, Raspberry Pi, IoT devices

40) 1571036103: “Improve Tire Pattern Imprint Image Recognition With YOLO”

Abstract—Many car accidents around the world cause damage to both life and property. The incidents occur where the perpetrators cannot be tracked. Although there are efforts to find evidence from the scene of the accident, especially tire pattern testing to find the perpetrator's car, this is considered important evidence to help find the perpetrator. In addition, the development of current automobiles that need to respond to driving efficiency has resulted in the development of tire production with a large number of different tire patterns. From the researcher's perspective, tire pattern analysis at the scene of the accident is still a challenging problem. In order to provide useful clues in the case of road accidents and improve the accuracy of tire pattern recognition by using Discrete Wavelet Transform and Local Binary Pattern, we propose that YOLO train tire pattern recognition for recognition by comparing it with SVM, YOLOv5, YOLOv8, and YOLOv9.

Keywords ----*tire patterns, pattern recognition, SVM, YOLO*

41) 1571037539: Lightweight Health Consultation Chatbot Systems Using LINE Application

Abstract— Artificial intelligence has offered a solution to the problem of consulting instead of using experts in many fields. Consulting about health is another aspect that saves patients time; they do not have to travel to the hospital unnecessarily, reduce the congestion of large groups of people, and also solve the concern about infectious diseases such as COVID-19. However, the development of Chatbot's at present is still complicated, requires a lot of resources, takes a long time, and is quite intensive to maintain. Therefore, the researchers have proposed a guideline for developing a lightweight health consultation Chatbot using the LINE application, along with Dialogflow for the Natural Language Processing (NLP) platform and BigQuery to store data to provide consultation on basic disease descriptions, symptoms of the disease, and information useful for initial treatment, which focuses on reliability and overall usability through measuring accuracy, recall, and F1 scores, indicating the potential reliability of using the LINE application to solve consultation problems in various fields.

Keywords—*Artificial Intelligence, Chatbot, lightweight, LINE Application, Dialogflow, NLP, BigQuery*

42) 1571054095: “Image Emotion Classification Leveraging a Fusion Technique Combining LBP and YOLO”

Abstract— Robust facial authentication with liveness detection is vital for secure access control systems. Conventional methods using remote cloud servers suffer from latency, bandwidth constraints, and privacy risks. To address these issues, we propose an edge computing solution that performs on-device facial liveness detection using an optimized convolutional neural network on low-power hardware like the Raspberry Pi. This approach eliminates the need for remote servers, providing reliable authentication. Our system also manages user data intelligently by synchronizing and distributing facial encoding data and user profiles between the central server and edge devices as needed, proactively removing unused data to conserve storage. This minimizes transmission overhead while ensuring edge devices have the latest user information. By performing on-device liveness detection and intelligent data management, our architecture reduces latency, bandwidth usage, and privacy risks, enabling secure and privacy-preserving facial authentication for widespread IoT deployment.

Keywords— Facial authentication, Liveness detection, Edge computing, Deep learning, Raspberry Pi, IoT devices

43) 1571054264: “Improving Durian Leaf Disease Detection Using LAB Color Space and CLAHE Technique with YOLOv8 Integration”

Abstract—Durian is considered a significant economic crop in Thailand, with an economic value of 110 billion baht. Leaf diseases in durian trees greatly impact the health of the trees and the quality of the durian fruit, especially its aroma and taste. Effective management of leaf diseases ensures that durian trees grow healthily and produce high-quality fruits. One way to diagnose and detect illnesses of durian leaves, such as algal leaf spot, leaf spot, and leaf blight, is through laboratory testing, which is quite costly. Visual inspection requires regular monitoring, which is time-consuming and labor-intensive for industrial-scale cultivation. Therefore, this issue has gained attention by using image processing methods to identify diseases in durian leaves that presents an enhanced approach by improving the preprocessing steps using image sharpening, contrast enhancement, and conversion to LAB color space, followed by applying Contrast Limited Adaptive Histogram Equalization (CLAHE) to improve feature visibility and utilizing the YOLOv8 model for disease detection and classification. The experimental results found that the YOLOv8 model achieved an accuracy of 99.74% in detecting durian leaf diseases.

Keywords—*leaf disease, leaf durian, LAB, CLAHE, YOLOv8*

44) 1571054298: “Coral Detection Using Image Enhancement and Discrete Wavelet Transform Techniques”

Abstract—Coral reefs provide vital environmental, economic, and medical benefits. They serve as breeding grounds for fish species, attract tourists, act as natural barriers against coastal erosion, and offer potential medical advancements. coral reefs are under threat from pollution, overfishing, and climate change, thus effective protection and monitoring are essential. Accurate classification of underwater coral photos is challenging due to color distortion and poor contrast. The research in this article was supported by the Earth Sea Foundation (Thailand) to study a method for detecting and classifying coral species using Image Enhancement and Discrete Wavelet Transform (DWT) techniques with YOLO deep learning models. (YOLOv8, YOLOv9, and YOLOv10). Techniques such as color correction and red channel adjustment significantly improve image quality. Our comparative analysis demonstrates that YOLOv9 achieves the highest classification accuracy with a mean average precision (mAP) of 98.98%, followed by YOLOv10 with 97.57%, and YOLOv8 with 97.12%. This indicates that the performance of the models is ranked as YOLOv9, YOLOv10, and YOLOv8, respectively, in terms of their effectiveness in coral classification.

Keywords ----*Deep learning, Coral classification, Image Enhancement, Discrete Wavelet Transform (DWT), YOLO*

45) 1571055853: “Enhanced Image Technique for Yoga Pose Recognition Based on MediaPipe and YOLOv8”

Abstract— Movement is the foundation of daily physical activities. Physical movement also includes exercise for health. Yoga is another method that people are more interested in nowadays, especially after the COVID-19 outbreak. Because it does not require much space, it can be exercised in the room without traveling. Although yoga is a slow exercise, yoga practitioners may still be affected and injured by incorrect body movements. Doing yoga in stretching or twisting poses that are different from standard yoga poses. Research on studying correct yoga pose recognition has been popular in recent years. Therefore, researchers propose enhance image technique to improve the performance of yoga pose recognition by comparing the MediaPipe and YOLOv8-Pose models through deep learning. YOLOv8 has many techniques to improve the performance of point detection, such as adjusting the image contrast with the Contrast Limited Adaptive Histogram Equalization (CLAHE) algorithm and improving the image color quality with the Multi-Scale Retinex with Color Restoration (MSRCR) algorithm. This research fuses the two algorithms to improve the efficiency of the MediaPipe and YOLOv8-Pose datasets. They have different numbers of keypoints, but they can accurately detect poses and identify keypoints at body joints. Our comparative analysis on yoga pose identification shows that MediaPipe has the highest accuracy in identifying yoga poses from body joint detection, with a mean accuracy (mAP) of 94.9% and YOLOv8-Pose of 92.0%, indicating that the MediaPipe model is more effective in identifying yoga poses in this research.

Keywords ---COVID-19, enhance image, CLAHE, MSRCR, YOLOv8, Yoga poses recognition

46) 1571056144: “A New Approach for Sentiment Analysis of Sexual Harassment in Thai Sentences Using Transformer Models”

Abstract— A major issue that can occur in a number of contexts, including public areas and workplaces, is sexual harassment. One type of sexual harassment that can affect someone's mental health and interfere with everyday living is verbal harassment. This kind of harassment includes using sexually suggestive language, disparaging remarks, or statements that unnerve others. The victim is put in an intimidating or hostile setting, which can cause worries, worry, and mental health issues. The prevalence of verbal sexual harassment has surged recently, mostly as a result of the expansion of online communities that provide rapid messaging or commenting among members. For academics, analyzing words that can be indicative of verbal sexual harassment is a difficult undertaking. This work aims to perform sentiment analysis of sexual harassment in Thai sentences using a transformer model from the social networking site X (Twitter) with web scraping techniques. The RoBERTa model was the main focus of this investigation, and it was contrasted with the BERT, mBERT, and BERT-th models. The percentages of accuracy were 91%, 95%, and 95%, in that order. RoBERTa outperformed the other two models in our analysis, with the greatest accuracy of 91%.

Keywords ---sexual harassment, sentiment analysis, Twitter, web scraping, RoBERTa, BERT, mBERT, BERT-th

47) **1571079327**: The Tomato Sorting Machine

Abstract— This article presents the controller of the tomato sorting machine. The controller can decide the tomato's quality from the color, size, and shape of the tomato. The controller uses the decision tree and Autoencoder to decide the color and shape and uses the rule based at the final stage to decide the quality of the tomato. The testing result shows that the controller has satisfying performance. It can decide with the right result of 90%.

Keywords—*tomato sorting, decision tree, autoencoder*

48) **1571078047**: Implementation of Whistleblowing System to Strengthen Internal Control and Risk Assessment

Abstract— The Whistleblowing System as a tool to create corporate transparency and anticipate fraud greatly supports the company's internal control. This study uses a sample of companies that go public in the Indonesian capital market. The sample of this study was 413 manufacturing companies listed on the Indonesian capital market. Data analysis was carried out using SPSS regression and the results of the study showed that the implementation of the Whistleblowing System would strengthen the internal control system and be able to prevent the possibility of fraud in the organization, the proportion of independent commissioners and risk committees had a positive effect on the strength of internal control, while risk disclosure had no effect on the strength of internal control.

Keywords— *independent commissaries, internal control, risk assessment, risk committee, whistleblowing system*

49) **1571077922**: Transforming Carbon Emission Trading Schemes in Thailand Using Non-Fungible Tokens

Abstract— With 1.92 million tons of carbon dioxide equivalent traded, the value of carbon credits under the T-VER project was estimated to be 146.7 million baht as of mid-2022. But compared to Thailand's total greenhouse gas emissions, which were 257.77 million tons of carbon dioxide equivalent in 2021, this trading volume is minuscule. Given this importance, the researchers see challenges in developing a mechanism for creating carbon credit assets in the form of NFTs and a support system to drive the carbon credit trading process. This article aims to apply a Non-Fungible Token (NFT) to enhance a credit carbon system. Existing systems often face challenges related to transparency, accountability, and traceability. This explores the potential integration of NFT into carbon credit systems to enhance transparency and traceability. A concept to address these challenges and optimize the functioning of carbon credit systems in Thailand. Including the theoretical framework, technical aspects, potential benefits, and challenges of integrating NFTs, a Blockchain base that is part of the cyber security framework for data protection in the digital world, into carbon credit systems. The researchers see challenges in developing a mechanism for creating carbon credit assets in the form of NFTs and a support system to drive the carbon credit trading process, with a primary focus on Cyber security standards.

Keywords: *Carbon Credit, Carbon Credit Asset, Non-Fungible Tokens (NFTs), Blockchain, Cyber Security*

50) 1571041420: Enhancing Personalized Financial Advisory Application With Generative AI and Chatbot: A Usability Study

Abstract— The dynamic nature of investment markets over recent decades has led to notable shifts in traditional saving methods due to a decline in saving interest rates. As a response to these transformations, there is a growing need for personalized investment products tailored to individual preferences such as pension funds, insurance, and mutual funds. With these circumstances, the financial advisory industry has emerged to assist individuals in making informed investment decisions, utilizing demographic variables and other characteristics to tailor recommendations. Recent trends also highlight a shift towards technology-driven advisory, leveraging FinTech tools such as machine learning and artificial intelligence for personalized solutions. Despite opportunities presented by these advancements, drawbacks persist in currently available systems. This paper explores the roles and limitations of emerging technologies in the field and tries to address the drawbacks by incorporating the conceptual design of financial advisory systems, conducting usability testing, and analyzing statistical results to enhance user experience.

Keywords—*Financial Advisory Application, Human-Machine Interaction, User Experience Design, Data Analysis*

Abstract—Image preprocessing is a crucial step in enhancing the quality of skin lesion images before segmentation, with the primary objective of removing noise and artifacts that could interfere with the segmentation process and reduce accuracy. This process involves various techniques designed to address artifacts such as hair, black frames, skin lines, and vignettes, which may arise due to variables in image acquisition, such as lighting conditions and skin characteristics. Several preprocessing techniques used include artifact removal using Gaussian filter, bottom hat filter, and median filter, as well as hair removal methods like DullRazor and short line detector. Image augmentation techniques, such as rotation and transformation, are also employed to ensure that key features in the image are well preserved and accurately reflected in the data, helping to prevent overfitting during the classification stage. Additionally, contrast enhancement through methods like Contrast-Limited Adaptive Histogram Equalization (CLAHE) and gamma correction is used to improve lesion visibility and enhance the accuracy of lesion boundary detection. Findings from various studies indicate that appropriate preprocessing can significantly improve image quality, leading to more accurate segmentation. Descriptive statistical testing can be employed to analyze the extent to which these preprocessing steps affect segmentation outcomes, focusing on accuracy improvements and the reduction of segmentation errors caused by artifacts and noise in the images. Thus, effective preprocessing not only enhances image quality but also provides a stronger foundation for more accurate segmentation and classification in skin lesion diagnosis

Keywords—*Statistical, Artifact Removal, Hair Removal, Contrast Enhancement, Skin Lesion Segmentation*

52) 1571068210: Development of a Smart Office System Through LINE Official Account: A Case Study of the Public Sector Development Group, Department of Medical Services

Abstract— To meet the increasing demand for digital transformation in government operations, this research focuses on developing and evaluating a smart office system for enhanced efficiency and service delivery. The PSD Smart Office system, implemented through a LINE Official Account for the Public Sector Development Group of the Department of Medical Services, is designed with two user levels: General users, who can access information and submit various requests, and Administrators, who manage data and oversee the LINE Official Account using CRUD operations in Google Sheets. A low-code approach was employed, utilizing Google Apps Script to develop a Webhook API, enabling seamless interactions and automated responses. The findings reveal that the PSD Smart Office system effectively supports the operational needs of both general users and administrators. The system's usability, assessed using the System Usability Scale (SUS), received a high score of 88.43, indicating that the system is both functional and highly efficient. These results highlight the system's potential to significantly enhance digital service capabilities within the Public Sector Development Group.

Keywords— *Smart office, LINE Official Account, chat bot, Digital Government.*

53) 1571042993: Comparative Evaluation of Resampling Techniques on Machine Learning for Predicting Customer Purchasing Behavior

Abstract— In the era of subscription-based services, customer purchasing behavior presents a significant challenge for organizations because customer retention is essential to long-term success. One of the main issues with datasets is the significant imbalance between majority and minority classes, which can lead to model bias in favor of the dominant class. This study presents a comparative evaluation of customer purchasing behavior with a focus in imbalance problem with several resampling techniques. We conducted a thorough analysis of various classification methods, including popular resampling strategies such as the Synthetic Minority Over-sampling Technique (SMOTE), Edited Nearest Neighbors, TomekLinks, and various hybrid sampling methods. Our research findings demonstrate the competitive effectiveness of using the Random Forest algorithm with undersampling methods such as TomekLinks and Edited Nearest Neighbors (ENN), which have shown the highest F1 scores. However, the hybridization of oversampling and undersampling yields unsatisfactory results, below our expectations. This suggests that the dataset used in this study exhibits a high degree of overlap between the two classes. Consequently, undersampling proves to be an effective method for mitigating the negative impact of class overlap. This research makes a substantial contribution to the field of predicting customer purchasing behavior.

Keywords—clickstream data, online consumer purchasing behavior, resampling technique, machine learning.

54) 1571069747: The Study of User Experience Interview Using Semantic Analysis and Short-Term Memory Chatbot

Abstract— There are many ways to study user experience, each with its own strengths and weaknesses. One popular method is questionnaires. However, questionnaires may not provide deep insights. Phanupong’s research proposed a chatbot using semantic analysis and short-term memory called SEBASS. This chatbot uses a customized semantic short-term memory with RDF as a knowledge representative for the chatbot’s memory. We applied SEBASS, a semantic short-term memory service chatbot, to query the user experience of the MICROSOFT® TEAMS application. Comparison with traditional chatbot and online interview, results show that SEBASS chatbot has high efficiency in information extraction. There is question answering efficiency score is significantly higher, close to online interview. User interface knowledge that can be responded to in depth is 91.6%, compared to 25% of traditional chatbot. The number of data nodes retrieved at level 3 is also significantly higher, at 1.67, compared to 0.33 of traditional chatbot.

Keywords— chatbot, user interface, user experience, short-term memory, interview

55) 1571066375: Designing a Reference for Smart Village: An Enterprise Architecture Approach

Abstract— The rapid development of information technology has influenced various aspects of life, one of which is the government aspect, through the application of e-Government to various government activities both internally and externally to achieve effective, efficient and transparent performance. One of the innovations in implementing e-Government is Smart Village concept which is an adaptation of Smart City adapted to the rural context. Buahbatu Village is one of the villages with "Independent" status that has adopted Smart Village concept to help improve the quality of life of its village community. Even so, this concept has not been implemented optimally because social inequality is still a major problem, which can be seen from the low value of the Sustainable Development Goals (SDGs) in Goals 10 (Villages Without Inequality), namely 61.65. In an effort to overcome this problem, it is necessary to design an Enterprise Architecture (EA) using the TOGAF 9.2 framework which consists of several Preliminary, Architecture Vision, Business Architecture, Information System Architecture, Technology Architecture, Opportunities and solutions, and Migration Planning. Through this research, it is hoped that it can help improve the welfare of village communities and maximize the achievement of SDGs in Buahbatu Village.

Keywords— *Enterprise Architecture, Smart Village, Smart Mobility, TOGAF 9.2, SDGs*

56) **1571070252**: Stock Selection by Machine Learning in Thailand Stock Market (SET)

Abstract— This research compares machine learning tools—K-means clustering, Hierarchical clustering, Affinity propagation clustering, and the Random Forest model—with the Low-Correlation Strategy for stock selection on the Stock Exchange of Thailand (SET). Each stock is equally weighted and evaluated by the Sharpe ratio.

Data for clustering and stock return prediction includes adjusted closing prices and financial ratios from January 1, 2020, to December 31, 2022 (in-sample period), and from January 1, 2023, to December 31, 2023 (in-sample forecast).

During the in-sample period, it was found that using Machine Learning to select stocks, both Unsupervised Learning and Supervised Learning created portfolios with higher Sharpe ratios than the Low-Correlation Strategy. On the other hand, when evaluating the Sharpe ratio for the in-sample forecast period using 2023 data, the Sharpe ratio of portfolios using Unsupervised Learning was negative for all portfolios. The Sharpe ratio of the Random Forest portfolio get rapidly decreased. In contrast, the Sharpe ratio of the Low-Correlation Strategy portfolio increased to 0.61.

In conclusion, using Machine Learning, both Supervised and Unsupervised Learning, led to higher Sharpe ratios than the Low-Correlation Strategy during the in-sample period. However, in the in-sample forecast period, the portfolios from both types of Machines Learning had lower Sharpe ratios than those from the Low-Correlation Strategy. However, the Random Forest Model of this study still has high errors due to data and economic factors.

Keywords—*Unsupervised learning, Supervised learning, Stock Selection*

57) **1571069617**: Reverse Engineering Neural Connectivity: Mapping Neural Activity Data to Artificial Neural Networks for Synaptic Strength Analysis

Abstract—We introduce a novel approach for reverse engineering the synaptic connectivity by mapping neural activity data from live, alert zebrafish larvae to continuous-valued artificial neural networks (ANNs). By utilizing high-performance calcium indicators and advanced imaging techniques, we record real-time neuronal signals at a cellular resolution. These signals are subsequently mapped to an all-to-all connected Hopfield network with rectified linear units (ReLU) as activation functions. This ANN model can then be trained via backpropagation and other optimization techniques to obtain the synaptic strengths between the individual neurons. This approach offers considerable potential for understanding complex neural networks and brain function, and contributing to the development of more advanced brain-inspired artificial intelligence.

Index Terms—bio-inspired algorithms, artificial neural networks, conversion, bioinformatics, nature inspired computing

58) **1571069552**: Sentiment Analysis of ESG Disclosures on Annual Report in Thailand

Abstract—The concept of ESG has been gaining popularity in recent years in Thailand. ESG disclosures can be studied through the annual report or Form 56-1 One Report. However, the content of the annual report contains a number of statements, which take a long time to analyze manually. To address these problems, this research therefore uses the Transformers model to process and deal with the large amount of text data within annual reports.

The purpose of this paper is to provide investors with knowledge on how to perform textual analysis of ESG disclosures, which is an analysis method that goes beyond analyzing financial numbers through the development of language models specifically focused on ESG within annual reports. Then evaluate the performance of models that specifically focus on ESG aspects compared to models that focus more generally. Models focused specifically on ESG were found to have higher prediction accuracy. The next step was to use this ESG-specific model to do a sentiment analysis of annual report between 2020 and 2022 for 27 companies in the resource group. The study found that most companies gave the most weight to disclosing social aspects, and the sentiment of ESG disclosures was revealed in the neutral polarity.

Keywords— *ESG, Transformers, Machine Learning, Sentiment Analysis, Textual Analysis, Annual Report*

59) **1571068996**: Enhanced Transactional Blockchain Data Access Control via Fog Computing and Multilevel Aggregation Encryption

Abstract— Despite the praise for blockchain technology's auditability, security, and decentralization, safeguarding Personally Identifiable Information (PII) continues to pose a challenge. Existing schemes often fail to effectively balance security with efficiency, fine-grained access control, and distributed processing. Many approaches either sacrifice performance for enhanced security or struggle with the complexity of managing fine-grained access in a decentralized manner. To address these shortcomings, a novel schema is proposed that integrates Ciphertext-Policy Attribute-Based Encryption (CP-ABE) with a lightweight fog layer to offload heavy cryptographic operations. This solution reduces policy tree complexity and mitigates side-channel attacks through a multi-layer encryption model. The approach enhances data confidentiality with minimal impact on transaction performance, offering a more secure, efficient, and distributed solution. This research validates the design with mathematical proofs and performance comparisons against existing implementations.

Keywords— Blockchain, Fog Computing, Access Control, Encryption

60) **1571068536**: Investigating the Impact of Developer Proficiency on Bug-Fixing Efficiency and Accuracy

Abstract—The efficiency and accuracy of bug-fixing are becoming increasingly crucial for timely issue resolution, software quality maintenance, and user satisfaction. At the same time, assigning a developer with a high proficiency level to fix a bug can highly affect the resolution times, bug-fixing accuracy, code complexity, team productivity, and user experience. In this paper, we aim to evaluate developer proficiency by analyzing bug repository data and subsequently explore its impact on bug-fixing efficiency and accuracy in greater detail. We first introduced an approach to measure developer proficiency (DP) utilizing the data available in the bug repository of a project. In our study, we identified six influencing factors from the bug repository that are related to developer proficiency, and industry practitioners validated these factors. Then we empirically studied three open-source bug repositories comprising 85,386 issues to investigate the impact of developer proficiency on bug-fixing efficiency and accuracy. We conducted multiple non-parametric tests to assess the statistical significance of our findings. Our analysis shows that proficient developers tend to be more efficient and accurate in bug-fixing. The outcomes of our study can significantly help project managers and team leads to understand the importance of assigning proficient developers to enhance bug-fixing efficiency and accuracy during the software maintenance phase.

Index Terms—Bug-fixing, Developer Proficiency, Efficiency and accuracy, Software maintenance

61) **1571068439**: Data Integration and Data Pipeline Model by Using Knime for Research Data

Abstract— Nowaday, we are in an era of data-driven decision-making that is challenging for universities to gather and analyze a large amount of data from various sources. Moreover, the data centralization in a single repository or data warehouse is required for a good quality data collection and integration along with a fast and easy data accession. This research work focuses on finding a solution to lessen the burden on personnel staff responsibility for summarizing the data of researchers linked to their research works at Mae Fah Luang University. The goal of this research is to improve a lack of research data collection and integration that meets the university's strategic plan criteria of the research publications in national and international databases while reducing data retrieval errors. The research will utilize data pipeline processes to generate the efficient research data collection and accurate mapping data including the researcher personal profiles from the personnel division relevant to the university faculties and departments, integrating with the research publications from public research databases. Finally, this work develops the business intelligence to visualize the summary of university research data. The proposed data pipeline and integration model including the business intelligence dashboard is useful for data-driven decision making for any faculties and departments in university that would be also applied to other academic institutions.

Keywords—*API, ETL process, Cleansing data, Data pipeline, Knime workflow, data integration, Data Management, Data Warehouse, Power BI*

62) **1571073921**: Improving Digital Literacy Skills of Teachers in Lao PDR:
Analyzing Key Contributing Factors

Abstract — Digital literacy has become a crucial skill for educators worldwide, particularly in developing countries striving to modernize their education systems. This study investigates the factors influencing the development of digital literacy skills among teachers in the Lao People's Democratic Republic (PDR). Using a quantitative approach, data were collected from 400 teachers across teacher training institutions in southern Lao PDR via a structured questionnaire. Multiple regression analysis identified five key factors significantly impacting digital literacy development: (1) evaluation of digital skills, (2) promotion of lifelong learning, (3) use of digital technology in teaching, (4) enhancement of cybersecurity skills, and (5) digital learning through online platforms. These factors collectively explained 82.4% of the variance in teachers' digital literacy development. The findings highlight the critical role of continuous assessment and lifelong learning in enhancing digital competencies. This study provides valuable insights for policymakers and educational institutions in Lao PDR and similar contexts, offering evidence-based strategies to improve teachers' digital literacy and, consequently, the quality of education in the digital age.

Keywords — Digital Skills, Teacher Development, Laos, 21st Century Education, Digital technology in education

63) **1571072258**: Analyzing Key Factors Influencing Digital Literacy Among Students in the Lao PDR: Implications for Educational Policy and Practice

Abstract — This research aims to analyze the factors influencing the digital literacy of students in the Lao People's Democratic Republic. The findings from this study contribute to understanding how various factors impact students' digital skills, which are crucial for meeting the demands of the digital-era labor market. A descriptive research design was employed, with data collected from a sample of 404 students across colleges, universities, and other educational institutions in Laos. The sample size was determined using W.G. Cochran's formula, ensuring a margin of error of $\pm 5\%$ at a 95% confidence level. Additionally, in-depth interviews were conducted with 30 individuals to complement the quantitative data. Statistical analyses, including Mean, Standard Deviation, and Stepwise Regression, were used to examine the relationships between variables. The study identified six significant factors influencing students' digital skills: family support, social influence, computer experience, teachers' digital competence, perceived ease of use, and perceived usefulness, all of which had a statistically significant impact at the 0.05 level.

The research findings revealed that family support (FS), social influence (SI), students' computer experience (CES), teachers' digital competence (TDC), perceived ease of use (PEU), and perceived usefulness (PU) significantly influence the digital skills of students in the Lao People's Democratic Republic. These results suggest that enhancing digital literacy among students requires targeted interventions at both the educational and familial levels, which can inform educational policy and curriculum development.

Keywords — Influential Factors, Digital Literacy, Digital Competence, Perceived Ease of Use, Perceived Usefulness, Students' Computer Experience

64) **1571072207**: Exploring User Satisfaction for Health Application Among Pregnant Women in Indonesia: A Case Study With Aspect Based Sentiment Analysis

Abstract— The development of information technology has brought significant changes in seeking and obtaining health information. Health is a major factor affecting the development and well-being of individuals and communities, especially for health monitoring applications for pregnant women and toddlers. In Indonesia, despite the high development of technology, the adoption of health apps is still relatively low. This research investigates user sentiment regarding health apps targeted at pregnant women, focusing on four main aspects - social, individual, technical and security. Through sentiment classification and Aspect Based Sentiment Analysis (ABSA) on thousands of user reviews from the Google Play Store, we identified critical areas of concern and appreciation. The results showed significant negative sentiment on social and individual aspects, with users experiencing dissatisfaction over insufficient community support, lack of personalization, and emotional relevance. Security aspects also showed negative sentiments due to concerns over privacy and data protection. In contrast, the technical aspects were the most positively received, with users appreciating the overall functionality and performance of the application.

Keywords— *health application, pregnant women, sentiment analysis, ABSA,*

65) **1571064450**: Analyzing End-User Acceptance of SaaS-Based ERP Systems in Hospitality in Bali: A UTAUT 3 Model Approach With SEM-PLS Using R Programming

Abstract— Information technology advancements have an impact on operational effectiveness across a range of industries, including the hospitality sector. Systems for enterprise resource planning, or ERPs, are integrated systems used to maximize resources and increase productivity. However, there are still barriers to widespread ERP adoption concerning application acceptance. It can be challenging for certain SaaS-based ERP system providers in the hospitality sector to ensure every client is accepted and implemented successfully. Using the Unified Theory of Adoption and Use of Technology 3 (UTAUT 3) model, this study assesses the SaaS ERP system's ultimate adoption in Bali, Indonesia's hotel sector, and pinpoint the variables influencing this acceptance. Questionnaires are distributed to hotel owners in Bali to gather data using quantitative approaches. SEM-PLS was used for data analysis and R programming to evaluate nine hypotheses. The findings demonstrated the considerable effects of Price Value, Hedonic Motivation, Social Influence, and Performance Expectancy on Behavioral Intention. Use Behavior was significantly impacted by both behavioral intention and habit simultaneously.

On the other hand, there was no discernible impact from Effort Expectancy, Facilitating Conditions, or Personal Innovativeness. To improve the design of more successful implementation strategies, this study emphasizes the critical elements that promote end-user motivation and behavioral intentions to utilize ERP systems. It also emphasizes the necessity of addressing obstacles that may impede successful adoption

Keywords— *SaaS-based ERP, SEM-PLS, Technology Adoption, UTAUT 3, R Programming*

66) 1571064445: Speech Lab VR: A Virtual Reality System for Improving Presentation Skills

Abstract— Presentation skills are considered as the essential communication skills for university students to be successful in their academic studies and future professional careers. Despite their importance, many university students encounter difficulties during the presentations, such as low confidence, unclear speech, wrong pronunciation, difficulty of managing nervousness, lack of eye contact, and ineffective time management. Moreover, delivering an effective presentation contributes to creating a credible and professional image, and facilitating future career advancement. Inspired by these challenges, this research aims to design and develop a virtual simulation environment named Speech Lab VR by applying the virtual reality technology. The Speech Lab VR system enables university students to self-practice their presentations in a controllable setting and provides them with constructive feedback for self-improvement. The goal of this research project is to enhance the university students' presentation skills which can lead to improve performance in their academic presentations and better prepare them for future career opportunities.

Keywords— *constructive feedback, presentation skills, self-improvement, university students, virtual reality*

67) 1571047835: Evaluation of the Multinomial Algorithm in Predicting Technostress on Indonesian Fintech Adoption Sentiment

Abstract— This paper evaluates the performance of a Multinomial Naïve Bayes algorithm for sentiment prediction using Term Frequency-Inverse Document Frequency (TF-IDF) and Bag of Words (BoW) text transformation methods. The evaluation focuses on measuring the model's quality across different train-test data splits (80:20, 75:25, 70:30) to understand the model's effectiveness in predicting sentiment with varying training and testing data ratios. The dataset comprises user reviews from financial technology (fintech) services in Indonesia. The results highlight the differences in model performance across various data splits and text transformation methods. Additionally, this study explores technostress among Indonesian fintech users, providing insights into the unique challenges faced by this demographic. The evaluation is conducted using a confusion matrix to provide a comprehensive analysis of model accuracy and reliability.

Keywords— Technostress, TF-IDF, Bag of Words, Sentiment Analysis, Fintech

68) **1571067304**: The Efficiency of ChatGPT Vs Google Against Self-Learning of Undergraduate Students

Abstract—ChatGPT has sparked excitement across various domains, especially in education. It has been applied in various contexts such as homework assignments and essay writing, igniting both excitement and curiosity, particularly regarding ChatGPT's effectiveness in self-learning methods. This study aims to compare the effectiveness of ChatGPT and Google Search in self-learning among undergraduate students. The sample groups consisted of 20 English language students and 20 physical education students, totaling 40 participants selected through Purposive Sampling and Randomized Controlled Trial (RCT). They were divided into two groups: Group A using ChatGPT and Group B using Google Search for self-learning on predetermined topics. The research instrument is a skill training sets for using ChatGPT and Google Search for self-learning on ethics and laws related to information use. The study found that overall, ChatGPT had an average score higher than the sample group using Google Search.

Keywords—*ChatGPT, Self-learning, Undergraduate students*

69) 1571046494: Real-Time Dual Traffic Signal System for Self- Driving

Abstract—Current traffic light recognition systems are primarily designed for human interpretation, making autonomous vehicles susceptible to lighting interference. This paper proposes the novel traffic signal system (NTSS) to address this issue. Comparative experiments between the traditional traffic signal (TTS) and NTSS using the resnet18 model were conducted across various scenarios, including normal, light interference, and dawn conditions. The results showed that NTSS outperformed TTS in all scenarios, particularly at dawn, where NTSS achieved an accuracy of 0.95 compared to TTS's 0.90. Under light interference, NTSS maintained higher accuracy (0.85) compared to TTS (0.60). Deploying NTSS on a model car confirmed its practical applicability and potential for real-world use. These findings suggest that NTSS significantly improves traffic signal recognition.

Keywords—*deep learning, model car, traffic light recognition*

70) 1571056986: How Consumer Interests Over Time Impact Product Performance: The Cases of Thai and Italian Box-Office Movies

Abstract—This work aims to explore movie factors together with consumer interests on the Web and YouTube platforms influencing movie performance. Five hundred and thirty movies, which were listed as the top five movies each week for one year in Thai and Italian box offices, were gathered. Two hundred and forty-eight distinct movies were extracted to examine the relationship between tentative influential factors and movie performance. Genre type, genre count, quarters on the box-office chart, and consumer interests impact movie performance differently. Gross-to-date (GTD) revenues affect future IMDb ratings. Country moderates the relationships between influential factors and GTD revenues. This paper contributes to using Google Trends as big data about searches to predict box-office performance, revealing factors influencing each market, and confirming the impact of search data on box-office performance.

Keywords— *Google Trends; box office; consumer interests; movie performance; comparative study; Thailand; Italy*

71) **1571059015**: Factors Affecting Long-Term Effectiveness of Community Based-Early Warning Systems (EWSs) in Rural Areas: A Systematic Review

Abstract— The rise in frequency and severity of climate-related natural disasters has severely impacted lives and economies, especially in rural areas. While Early Warning Systems (EWS) are vital for disaster risk reduction and community resilience, recent events in rural Indonesia show that existing systems often fall short. This paper, through a systematic review, identifies key factors for implementing effective EWS in rural areas, focusing on technical and socio-cultural aspects. Technically, elements like technological integration, training, communication strategies, and system coordination are crucial. Socio-culturally, community engagement, local knowledge, and institutional support play significant roles in the system's acceptance and effectiveness. Combining technological and scientific advancements with local knowledge and active community participation is essential for improving EWS and enhancing disaster resilience in rural communities.

Keywords- *early warning system, community resilience, disaster risk reduction, rural development, long-term effectiveness.*

72) 1571064509: Thai Mango Varieties Web Application: An Evaluation Using the System Usability Scale

Abstract—Thailand is a major global producer of mangoes but lacks a dedicated online database for its diverse mango varieties. This study developed and evaluated a Thai mango varieties database web application to provide valuable information to farmers, researchers, and businesses for informed decision-making in cultivation and marketing strategies. The application was evaluated using the System Usability Scale (SUS), which assessed the five key attributes: learnability, efficiency, memorability, error management, and satisfaction. The application achieved a high score of 88.57 for satisfaction, demonstrating its effectiveness in meeting user needs and expectations.

Keywords—Mango Database, Mango Varieties, User-friendly, SUS Test, Usability Test

73) 1571062233: EEG Age Prediction via Elastic Net Linear Regression

Abstract— Accurate prediction of human age based on EEG signals presents a significant challenge due to the complex changes in brain function associated with aging. This study addresses these issues by proposing an advanced Elastic Net Linear Regression model to enhance prediction accuracy and model reliability. The proposed approach was evaluated on a EEG dataset of 109 samples, each representing 1000 milliseconds of brain activity. Comprehensive preprocessing techniques, including missing value imputation, feature scaling, and feature selection, were employed to prepare the data for the Elastic Net Regression model. The experimental results demonstrate the effectiveness of the Elastic Net Regression model, achieving a mean absolute error of 4.73 years and an R-squared score of 0.7626 on the test set. On the training set, the model's performance was exceptional, with an MAE of 2.42 years and an R-squared of 0.9404, showcasing its ability to capture the complex relationship between brain activity and age. The model's predictions were well-calibrated, with a mean of 45.49 years and a standard deviation of 15.80 years, indicating its reliability in representing the age distribution of the samples. The results contribute valuable insights into brain aging mechanisms and offer potential avenues for enhancing cognitive health interventions to support healthy cognitive aging and early intervention in age-related neurological disorders.

Keywords— *Brain, EEG Signals, Age Prediction, Linear Regression, Elastic Net Regularization*

74) **1571077066**: A Framework Utilizing Genetic Algorithm Wrapped Neural Network Model in Discovering Effective Technical Indicators for the Cryptocurrency Market

Abstract—A main challenge of cryptocurrency trading is selecting technical indicators which fits the dynamic nature of the cryptocurrency market. This research proposes a framework that integrates a genetic algorithm with a neural network to effectively explore the efficacy of traditional technical indicators in cryptocurrency. It optimizes both the selection of technical indicators and neural network parameters through tailored genetic operations such as mutation and crossover, allowing for enhanced exploration of the solution space. Through rigorous testing on historical cryptocurrency market data in two distinct periods, the proposed model demonstrates superior predictive accuracy and improved trading performance compared to traditional methods, generating a 19.33% profit in the first period and 7.13% in the second period, outperforming the buy-and-hold benchmark. The results highlight the robustness of the model, which consistently delivered positive returns across varying market conditions, including both bullish and bearish phases.

Keywords— *Cryptocurrency Market, Technical Indicators, Genetic Algorithm, Neural Network, Trading Strategies*

75) **1571064669**: Leveraging Ingredient Profiles in Content-Based Skincare Product Recommendation

Abstract—The fast expansion of the skincare sector has resulted in a bewildering assortment of skincare products available to users, making the choosing process challenging. This research describes the construction of an ingredient-based skincare product recommendation that helps users choose products that best fit their needs by using content-based filtering techniques with Term Frequency-Inverse Document Frequency (TF-IDF), cosine similarity, and Jaccard similarity. The research utilizes a dataset comprising various skincare products, including features such as “Product type”, “Ingredients”, and “Skin type”. By applying content-based filtering techniques, this recommendation evaluates the similarity between products based on their ingredients, producing a ranked list of recommendations. Unlike common recommendations, which rely mostly on user reviews and ratings, this technique focuses on the specific ingredients included in skincare products. The proposed method obtained the highest accuracy of 80% for serum and sunscreen, and average accuracy for all categories was 66% using cosine similarity and 61% using Jaccard similarity. The proposed method is particularly useful for individuals looking for products with specific active components, as it emphasizes ingredient compatibility and efficacy over popular opinion.

Keywords—*Skincare recommendation, Ingredients based recommendations, Content-based filtering, Natural Language Processing (NLP), Cosine similarity, Jaccard similarity*

76) 1571064344: The Predictive Models for Customer Classification Based on Customer Personality

Abstract— Personalized marketing is an important component of the marketing mix since it entails personalizing marketing techniques to meet the specific needs of each individual consumer in order to build strong relationships and remain competitive in the competitive marketplace. In this research, we provide a prediction model for classifying chocolate consumers using consumer personality data from two theories: the Big Five model; NEO-PI-R and human life values. Experiments were carried out to classify groups of chocolate lovers using well-known algorithms such as decision trees, random forest trees, and deep learning. Subsequently, we have compared the effectiveness of these techniques and found out which one produces the maximum accuracy for the existing data set. Finally, we recommend personalizing offerings to certain groups of chocolate customers from both a marketing and branding perspective.

Keywords—chocolate industry, decision tree, random forest trees, deep learning, personalized marketing

77) **1571066821**: Transferring Labels Based on Text Similarity: An Application for e-Portfolio Sentiment Analysis

Abstract— This paper proposes a method for transferring labels during sentiment analysis based on text similarity. The data is sourced from the e-Portfolio system, which contains employees' feedback. Challenging, the data lacks labels, making sentiment analysis initially impossible. Thus, various similarity algorithms for labeling were examined, including Cosine Similarity, Jaccard Similarity, Jaro-Winkler Similarity, and Pearson Correlation Coefficient. Also, an upscaling technique was employed to ensure balanced labels. Natural Language Processing was used for word tokenization and feature engineering. Sentiment analysis was conducted using several classification algorithms such as Logistic Regression, Decision Tree Classifier, and Support Vector Machines to categorize sentiment (positive or negative). The results showed that the Cosine Similarity algorithm, along with the Bag of Words (BoW) feature through Logistic Regression, achieved a promising accuracy of 0.892 and an F1-Score of 0.883.

Keywords— Data Labeling, Sentiment Analysis, Text Similarity, Classification, NLP, e-Portfolio

78) **1571062712**: Improving Sentiment Analysis Performance on Imbalanced Dataset Using Data Resampling and Statistical Feature Selection

Abstract—Imbalanced dataset is one of major challenges in developing machine learning model. This imbalance problem leads to bias in the classification model that ends in low classification performance. In many cases of sentiment analysis, the imbalance problem often arises in the class distribution, where opinions tend to be either ‘positive’ or ‘negative’ depending on the concerning topic. Besides, the presence of high-class overlap within the imbalanced dataset also has a negative impact on the classification performance. Furthermore, the raw text data is usually transformed using the well-known TF-IDF feature extraction. This transformation generates a set of high-dimensional features containing the statistical value of terms extracted from the raw text data that makes it very complex to classify. Therefore, this work proposes the use of data resampling and statistical feature selection to improve the classification performance of sentiment analysis on high-dimensional datasets and imbalanced class distribution. As a result, statistical feature selection combined with data resampling methods successfully improves the classification performance of five different machine learning algorithms on two imbalanced datasets. The proposed approach achieves better accuracy while reducing the dataset dimensionality by up to 73% and 89% of the original features on two different datasets.

Keywords—sentiment analysis, feature selection, smote, data resampling, machine learning

79) **1571057653**: Expediting Project Timelines with State-Of-The-Art Dashboard Management Systems to Improving Efficiency and Minimizing Delays

Abstract— A program is a collection of interrelated projects, programs, and other related activities that cannot be managed individually. One Higher Education Institution (HEI) was awarded a program worth over USD 3 million to build an education-integrated application that will serve academic and non-academic processes. The program had severe challenges since it required tight monitoring and control due to its enormous project value. This study aims to design a dashboard to reduce delays and enhance efficiency. The solution was achieved by integrating a Dashboard Management System using the waterfall method. It was developed using Google Spreadsheet due to its familiarity and usability aspect compared to other project management systems that require huge investment and knowledge to use. The study shows that the program management dashboard significantly improved overall program efficiency. The program has reached 37.29% schedule acceleration of work completion. It indicates that the simple information system and adopting the formal standard of program management will increase the success of program completion.

Keywords—Project Baseline, Google Spreadsheet, Program Management, Information System Dashboard, Project Management

80) **1571066453**: Machine Learning-Driven Classification of Thai Mango Groups Using Clustering and Random Forest

Abstract—Classifying Thai mango varieties based on physical traits such as leaf shape and fruit size is challenging. This issue was addressed using K-means clustering of mango varieties followed by the Elbow, Silhouette, and Calinski-Harabasz methods to determine the optimal number of clusters. The clusters were validated and classified using a Random Forest model which achieved an accuracy of 91.26%. Results demonstrated significant improvements in the precision and efficiency of mango classification, benefiting both producers and consumers.

Keywords—Mango Groups, Mango Physical Characteristics, K-Means, Silhouette Method, Hyperparameter

81) **1571032735**: Developing the NaiMor Rangsit Game: Enhancing Cultural Appreciation and Place Awareness Through Location-Based Technology

Abstract—This paper aims to develop and evaluate NaiMor Rangsit game, a location-based tool designed to enhance cultural appreciation and place awareness among students at Rangsit University. The game integrates critical landmarks within the university campus using GPS and gyroscope sensors, offering an interactive and immersive learning experience. The study of 58 participants ages 18-30 was conducted. It assessed the game's effectiveness across three main criteria: Place Awareness Level (PAL), Cultural Appreciation Enhancement (CAE), and Game Design Satisfaction (GDS). The results indicate a near-neutral sentiment overall, with significant differences in game design satisfaction based on the participants' game experience. This study identifies needed improvements in mission design, menu response speed, and cultural content engagement to better meet player expectations and enhance satisfaction. These findings emphasize the importance of inclusive, accessible game design in education, emphasizing the potential of location-based games to deepen cultural and historical connections.

Keywords—NaiMor Rangsit; location-based game; GPS; Open Street Map; GeoGames; gyroscope sensor

82) **1571066373**: An Intersection Point Detection Method in Direct Binary-Scale Amniotic Fluid Bag Chromosome Images Using Hit-Or-Miss Transformation for Automatic Chromosome Number Determination

Abstract—*The problem of amniotic chromosome counting errors is caused by chromosomal ambiguity. For example, chromosomal overlap results in misidentification of the overlap point in chromosomal skeleton images. The overlapping points of the chromosomal skeleton images are important features used in counting the amniotic sac chromosomes. Therefore, this research presents a method (Crosspoint Detection in Overlap Chromosomal Structures: A Directional Binary Approach: CDOCS-DBA). This method is developed based on Direct Binary-Scale and Hit-or-Miss Transformation. This method improves the efficiency of identifying overlapping points in amniotic chromosome images. The proposed method can improve the efficiency of amniotic chromosome counting with a yield of 81.48 % for ambiguous amniotic chromosomes.*

Keywords—*chromosome counting, amniotic sac chromosome image, chromosome skeleton intersection, ambiguous chromosome, chromosome skeleton image, hit-or-miss transformation*

83) 1571065867: Virtual Fire Survival Learning Simulation: A Case Study of School Students in Chiang Rai Province

Abstract—Fire emergencies can occur unexpectedly, making it crucial to be prepared and knowledgeable about how to respond effectively. Proper preparation can significantly reduce the risk of injury and loss of life. Utilizing a virtual reality simulation system for learning about fire and fire survival is a highly effective method for enhancing safety and minimizing risks during actual fire events in daily life.

This research focuses on developing a fire simulation system designed to facilitate learning and practice in fire survival, with the goal of increasing knowledge and understanding of fire-related emergencies. The research team conducted a feasibility study on developing an application aimed at improving learning and instruction through a virtual reality platform. This platform allows learners to experience realistic scenarios. The system was tested with children in Chiang Rai Province, Thailand, and the results were collected and analyzed to inform further development.

Keywords— *Fire emergency simulation, virtual reality learning, fire survival simulation, virtual reality, simulation system*

84) 1571065755: Analysis of Feature Selection Methods on Clove Quality Classification

Abstract— Proper feature selection is becoming increasingly important in the context of clove quality classification in Indonesia; effective feature selection can identify the most relevant attributes of clove quality. This study investigates 3 famous feature selection methods, namely mutual information, recursive feature selection, and lasso regression, for classifying clove quality using various models, i.e. Naïve Bayes, K-NN, and Decision Tree. The study results showed that the mutual information feature selection method impacted the K-NN method by 1.05%; for naïve Bayes and decision trees, the accuracy did not increase. For the recursive feature elimination (RFE) feature selection method, the accuracy of K-NN increased by 2.16%, the decision tree by 0.37%, and naïve Bayes accuracy did not increase. In addition, using Lasso Regression feature selection, the accuracy of naïve Bayes increased by 2.97%, K-NN by 2.28%, and decision tree accuracy decreased.

Keywords—Clove Quality, Decision Tree, feature selection, K-NN, Naïve Bayes

85) **1571065667**: A Comparative Study of Face Recognition Algorithms for Investigating Watchlist

Abstract—There are several reasons why the passenger is overwhelmed in front of the immigration checkpoint. Firstly, the overwhelmed passengers returned to a new normal after the COVID-19 crisis. Secondly, the data is not up to date or lag of external sources. Lastly, they have numerous procedures to consider, leading to a large gathering of passengers in front of the checkpoint. If a passenger misses a board or cannot identify a suspect promptly, a compensation lawsuit will be filed. Due to the possibility of being by time, attempts have been made in the past to adjust strategies and add measures during the inspection process to make it faster and more concise. In this paper, we approach early identifying the watchlist before coming to the checkpoint and study facial recognition based on facial features and deep learning methods. The performance of the two algorithms in the development of a facial feature is compared and a suitable model is obtained, which has good facial feature recognition performance in accuracy and speed. Through the research of this paper, we hope that it will help simplify the workflow before checking the passage and improve the accuracy of judgment.

Index Terms—Deepface, LBPH, Face recognition, Immigration, Border Control

86) **1571079084**: Addressing Sociolinguistic Challenges in Machine Translation: An LLM-Based Approach for Politeness and Formality

Abstract—Machine translation has advanced significantly in recent years, but critical nuances, such as politeness, formality, and humbleness, often get lost due to fundamental differences in language structures, cultures, and social norms. This challenge becomes particularly pronounced when translating between languages like English and Japanese, where sociolinguistic systems are deeply ingrained in communication. In this paper, we propose a novel approach that integrates an LLM into the translation pipeline, specifically designed to preserve these nuanced aspects of communication. Our method includes engineered GPT prompts that allow for greater control over the levels of politeness and formality, addressing the gaps left by traditional Neural Machine Translation (NMT) systems. We provide a conceptual framework for this approach and present initial evaluations, showing that GPT-4 performs slightly better than NMT in maintaining politeness and formality. However, humbleness, particularly in Japanese-to-English translations, remains challenging due to the inherent limitations of the English language.

Index Terms—human-computer interaction, machine translation, politeness preservation, large language models(LLMs) application

87) **1571079170**: An Evolutionary Multi-Objective Optimization of Vision Transformer

Abstract— This paper presents an evolutionary multi-objective optimization of vision transformer architecture and the effect of two genetic crossover operators, two-point and uniform crossover, on the quality of the solutions. The proposed method employs the multi-objective genetic algorithm (NSGA-II) and uses a block-based encoding for visual transformer models. By adopting configurable blocks, the encoding method allows the search for various ViT architectures. The paper comprehensively analyzes the effect of genetic operators on the quality of the solution, providing practical insights for future research. The experimental results, which are reported on the Cifar-10 dataset, demonstrate a trade-off between model size and accuracy and are compared to the state-of-the-art models, providing solid evidence of the findings.

Keywords—*Vision Transformer, Multiobjective optimization, Genetic algorithm, Crossover*

88) **1571068981**: Contamination Measurement Techniques in Hydraulic Fluid Based on Hall Effect Sensor

Abstract—This paper proposed two methods to examine metal particles in fluid using Hall Effect Sensor under the condition of nondestructive testing based on two conditions: test of particles in oil samples, and test of particles in industrial machinery simulation. Hall Effect Sensor had ability to detect magnetic fields in objects, so it was applied to measure the density of metal in liquid. Hereby, hydraulic liquid was selected to examine because it was one of the most use in industrial machines. After operating the experiments found that Hall Effect Sensor was able to measure particles in oil samples if the amount of contaminants were greater than or equal to 10 milligram that equivalented to NAS 15 standard. In the same way, to measure particle in simulation process when using electromagnet as magnetic field source showed that temperature had an influence on accuracy of the metal particle evaluation. Therefore, to get the most accurate value, system temperature had to employed in calculation process when alternating current was input to the system. While, the result of the simulation when permanent magnet was used to generate magnetic field showed that the relationship between output voltage and amount of metal particles were probably in linear form. To apply this method in industrial applications could be a way to extend service time of hydraulic liquid properly.

Keywords—*hall effect sensor, metal particle, contamination measurement*

89) “**1571078985**: SafeCultural: A Dataset for Evaluating Safety and Cultural Sensitivity in Large Language Model

Abstract—The increasing use of Large Language Models (LLMs) in daily life raises important questions about ensuring their trustworthiness. While existing datasets are widely used to evaluate issues like safety and hallucinations, they often overlook important factors like social norms and cultural sensitivity. This paper introduces a dataset that incorporates regional cultural aspects, allowing LLMs to be more adaptable across diverse contexts. This dataset covers both safety and cultural sensitivity aspects. The safety component includes seven dimensions: Unlawful Conduct, Toxicity, Violence, Privacy Violations, Harms to Minors, Adult Content, and Mental Health Issues. Cultural sensitivity is divided into three categories: Beliefs, Behaviors, and Safety. We tested across seven LLMs, the dataset aims to help models overcome cultural barriers, fostering user-friendly and culturally aware development. Furthermore, we provide guidelines for creating and evaluating culturally sensitive prompts to ensure they meet safety and cultural standards. The finding of this paper may help the development of more adaptable, culturally aware, and trustworthy LLMs for daily use.

Index Terms—Trustworthiness, Safety, Cultural, LLMS

90) **1571079145**: Comparative Analysis of Deep Learning and Statistical Algorithms for Forecasting Inbound Foreign Tourism in Thailand

Abstract—Accurate prediction of tourist arrivals and revenue is crucial for establishing effective tourism development strategies in Thailand. This paper aims to predict the number of foreign tourists visiting Thailand and the revenue generated from them using the Long Short-Term Memory (LSTM) algorithm in comparison with the popular statistical method in economics, the Autoregressive Integrated Moving Average (ARIMA). We utilized real regional and country tourist data sets, collected by the Ministry of Tourism and Sports, and performance metrics, normalized root mean square error (NRMSE) and normalized mean absolute error (NMAE). Results reveal that LSTM yielded NRMSE values better than ARIMA ranging from 1.18 times to 19.33 times, and NMAE values better than ARIMA ranging from 1.40 times to 21.70 times across all data sets, except for the revenue forecast using the central region data set where ARIMA outperformed LSTM. This suggests that economists should consider adopting LSTM alongside traditional statistical techniques.

Keywords—*Deep Learning, Long Short-Term Memory, LSTM, Autoregressive Integrated Moving Average, ARIMA, Forecasting, Time Series Data, Foreign Tourism, Inbound Tourism*

91) **1571079242**: Building a Facilitator Agent to Promote Understanding in Multilingual Communication

Abstract—To cultivate an attitude of respect for diversity from childhood, machine translation has been used to mediate intercultural communication among children. In this situation, it has been reported that the number of utterances by speakers of low-resource languages is low. Low-resource languages are characterized by limited linguistic resources and lower translation accuracy. Therefore, speakers of these languages often struggle to follow the discussion making it difficult for them to participate in the conversation. This study focuses on the summary of discussions, and two different facilitator agents were developed and validated to improve the understanding of discussions by speakers of low-resource languages. As a result, quantitative analysis using statistical methods did not reveal the effects of the agents. However, qualitative analysis examined the impact of the facilitator agents on ensuring the full participation of low-resource language speakers in the discussion.

Index Terms—Intercultural Collaboration, Facilitator Agent, Machine Translation

92) **1571078537**: A Reliable Protocol for Wireless Sensor Network to Support Large-Scale Smart Farm System

Abstract— This research presents a newly proposed design for a reliable protocol for wireless sensor networks, supporting large-scale smart farms. The protocol was tested and compared with previous methods. The results demonstrated a significantly higher data transmission success rate and approximately three times faster transmission speed. Additionally, when the proposed reliable protocol was implemented in ten smart farms in Sukhothai province, it achieved a data transmission success rate of 99.07% and an average transmission time of 16.64 seconds which is approximately 3 times faster than the previous method. These experimental outcomes confirm that the proposed reliable protocol meets the communication objectives outlined in its design, ensuring reliable, consistent, and timely data transmission.

Keywords—*protocol, wireless sensor network, smart farm, large-scale smart farm*

93) **1571078320**: EORL: Energy Optimization via Reinforcement Learning in Software-Defined Wireless Sensor Networks

Abstract—A wireless sensor network is a collection of sensors placed in a particular area to collect and transmit data to the base station or sink. They usually have batteries as the primary power sources. If they work for a long time, their energy will be exhausted. Replacing the battery may not be cost-effective compared to developing an algorithm that optimizes energy efficiency to extend the network lifetime. This work optimizes the energy consumption of wireless sensor networks by adaptively selecting an optimal routing path in a Software-defined Wireless Sensor Networks (SDWSN) environment. A concept of the energy balance among nodes according to the current network status by the SDWSN controller using Reinforcement Learning (RL) is introduced. We propose energy optimization via reinforcement learning (EORL) for SDWSN using a minimum energy reward function and state design that considers energy consumption. The EORL algorithm then identifies the node that requires attention and selects the most energy-efficient path for that node. The performance of the EORL shows that it has a more extended network lifetime compared with other RL solutions.

94) **1571076976**: Clustering of Pre-Service Teachers by Stress Levels Using Machine Learning Techniques

Abstract— Teacher professional experience training is crucial in developing professional educators. Consequently, universities nationwide that offer education degrees include teacher professional experience training in their programs. This study aims to clustering of pre-service teachers by stress levels from teacher professional experience training. The dataset includes 208 samples from the Faculty of Education at Nakhon Ratchasima Rajabhat University, Thailand, during the 2022 academic year. This work presents a clustering of pre-service teachers using three machine learning algorithms: K-means Clustering, Hierarchical Clustering, and Spectral Clustering. A comparison of clustering efficiency revealed that Spectral Clustering achieved the highest Silhouette Coefficient at 0.3741. Two clusters were identified: one comprising 171 members with low-to-moderate stress levels and another with 37 members experiencing high stress levels. These findings suggest the need for targeted interventions and personalized support to address the varying stress levels among pre-service teachers. Future research should incorporate longitudinal studies to monitor changes in stress levels over time and evaluate the long-term impact of stress management interventions.

Keywords— *machine learning, pre-service teachers, teacher professional experience training*

- 95) **1571075012**: Bridging the Gap: Preparing Teachers for Web 2.0 Integration in a Thai University

Abstract— This paper explores the integration of Web 2.0 tools into teaching and learning at a Thai university, focusing on the alignment of these tools with specific pedagogical approaches to enhance engagement and learning outcomes. The study, conducted within the context of a blended learning environment influenced by the COVID-19 pandemic, employed problem-tree analysis and semi-structured interviews with faculty, IT support staff, and students. Findings reveal challenges related to tool complexity, the need for comprehensive teacher training, and the importance of aligning technology with pedagogical strategies. The research highlights the need for a more streamlined approach to Web 2.0 tool integration, emphasizing careful selection, effective teacher training, and a thoughtful blending of online and on-site learning experiences to improve student engagement and learning. The study contributes to the ongoing conversation surrounding effective technology integration in higher education by offering practical insights for improving teaching and learning in diverse contexts.

Keywords— *teleconference tools; online class; class engagement; web2.0; pedagogy2.0*

96) **1571078696**: Customer Query Classification Based on DistilBERT and TextCNN

Abstract—Customer service representatives are tasked with handling customer inquiries and resolving issues. However, due to the high volume of inquiries, it is challenging for customer service representatives to provide timely services. To address this, natural language processing (NLP) and deep learning techniques can be applied to analyze customer queries and develop chatbots. This research presents a customer question classification case study of a Thai company using various deep learning techniques. Initially, the text is preprocessed through tokenization and text vectorization using techniques such as Word2Vec, Universal Sentence Encoder (USE), and RoBERTa and DistilBERT. Question classification is performed using machine learning and deep learning techniques including CNN, Bi-LSTM, SVM, TextCNN and Fine-tuning RoBERTa/DistilBERT. The experimental results show that the DistilBERT encoding technique and TextCNN classifier yield the best performance, achieving an accuracy of 91.59%, recall of 91.59%, and F1-score of 91.61%.

Keywords—*Text Classification, DistilBERT, TextCNN, BERT*

97) **1571078461**: Data Integrity and Cost-Effectiveness in the Blockchain-Based Whistleblowing Systems Implementation

Abstract— The implementation of Whistleblowing Systems aims to promote trust, security, and transparency in reporting alleged violations or unethical behavior, while ensuring the anonymity of the whistleblower to protect them from potential threats or revenge. Anonymity serves as a protection for the whistleblower's identity, while generating of tokens for report tracking, without requiring account creation, ensures that each report is properly followed up. Furthermore, the system must ensure that reports remain unchanged to preserve their integrity. Blockchain technology represents one method to address this requirement. The utilization of hashes that reference previous entries in an off-chain table or data stored on the blockchain (on-chain) might facilitate the verification of reports, maintaining their integrity in Whistleblowing Systems. If any information in the report is modified, the changed hash will no longer correspond with the hash recorded on the blockchain. Verifying the consistency of hashes between both of them ensures data integrity. However, the integration of blockchain in Whistleblowing Systems must also account for the expenses related to the storage of report hashes. The storage expenses are relied on smart contracts that minimize complex operations and high gas fees. The smart contract must be engineered to be cost-effective while adequately fulfilling the system's requirements.

Keywords—*blockchain, data integrity, gas usage, smart contract, whistleblower, whistleblowing systems*

98) **1571078169**: Leveraging Graph-RAG for Enhanced Diagnostic and Treatment Strategies in Dentistry

Abstract— The implementation of Whistleblowing Systems aims to promote trust, security, and transparency in reporting alleged violations or unethical behavior, while ensuring the anonymity of the whistleblower to protect them from potential threats or revenge. Anonymity serves as a protection for the whistleblower's identity, while generating of tokens for report tracking, without requiring account creation, ensures that each report is properly followed up. Furthermore, the system must ensure that reports remain unchanged to preserve their integrity. Blockchain technology represents one method to address this requirement. The utilization of hashes that reference previous entries in an off-chain table or data stored on the blockchain (on-chain) might facilitate the verification of reports, maintaining their integrity in Whistleblowing Systems. If any information in the report is modified, the changed hash will no longer correspond with the hash recorded on the blockchain. Verifying the consistency of hashes between both of them ensures data integrity. However, the integration of blockchain in Whistleblowing Systems must also account for the expenses related to the storage of report hashes. The storage expenses are relied on smart contracts that minimize complex operations and high gas fees. The smart contract must be engineered to be cost-effective while adequately fulfilling the system's requirements.

Keywords—*blockchain, data integrity, gas usage, smart contract, whistleblower, whistleblowing systems*

99) 1571079539: Revolutionizing Meteorological Forecasting with Cloud Image Analysis Using Edge Flow and YOLO

Abstract— This paper focuses on the development of a Meteorological Service for Air Navigation system, which classifies clouds into five categories: BKN, CAVOK, FEW, OVER, and SCT. The classification is based on the cloud patterns captured in images, which are interpreted as the sky coverage measured in oktas, dividing each image into eight parts. The main contribution of the proposed method lies in the use of the Edge Flow algorithm to convert images into vector data, which are then analyzed and modeled for forecasting using the YOLO algorithm. The images, collected continuously both day and night, are processed to provide weather forecasts, which in turn facilitate weather alerts. The methodology of the study consists of three main steps. The first step involves using the Edge Flow algorithm to transform the images into vector form. The second step focuses on feature extraction and training the model using cloud images categorized into the five defined types. Finally, the third step is the evaluation of the model's accuracy through the testing of weights generated during training. In this study, over 10,000 images were used for the experiments, yielding average mAP, precision and recall scores of 84.52%, 77.46%, and 86.84%, respectively.

Keywords— YOLO, Meteorological, Deep Learning

100) 1571078728: Temporal Collage Prompting: A Cost-Effective Simulator-Based Driving Accident Video Recognition With GPT-4o

Abstract—This paper presents temporal collage prompting, a novel approach for detecting and classifying simulator-based driving accident videos using GPT-4o. While recognizing accident videos is crucial for assessing drivers' abilities and safety, this task traditionally relies on human labor. In addition, it is time-consuming and inefficient, especially when dealing with numerous videos. Large multi-modal models (LMMs) offer a promising solution to reduce processing time but face a challenge with context window limitation when handling video data. We address this by developing a method that optimizes input efficiency while preserving temporal information. Our approach combines multiple video frames into a collage, significantly reducing input tokens. Testing with custom scenarios generated from CARLA, a driving simulator, we achieve 93% accuracy in accident recognition using a 2x2 collage at 1 frame per second (FPS), outperforming a uniform frames baseline method. This configuration reduces token usage by 91% compared to uniform frames at 3 FPS, while improving accuracy from 72% to 93%. Through ablation studies with various collage layouts and sampling rates, we found that lower frame rates, particularly 1 FPS, are more effective for this task. Our results demonstrate that optimized frame sampling and collage creation can enhance both efficiency and accuracy of video recognition using LMMs, offering a promising solution for simulator-based driving video recognition in driving assessment, with potential applications in other domains requiring temporal visual recognition. We provide our data and source code for public use¹.

Index Terms—GPT-4o, Large multi-modal models, Prompt Engineering, CARLA

101) 1571078457: Development of Load Break Tool Training Simulation

Abstract— High-voltage electrical systems pose significant risks, making proper training crucial. This paper presents the development of a Load Break Tool (LBT) training simulation designed to enhance safety and operational proficiency by using data from real tools, documents, and video materials to create a digital version of the LBT and environment. The simulation allows trainees to safely practice tasks like positioning, attaching the anchor, hooking the pull-ring, and disconnecting circuits in an interactive 3D environment, accessible via web browsers on desktop and mobile devices. User feedback supports its ease of access and value for pre-hands-on training, with future research suggested into AR/VR/MR technology.

Keywords—simulation, interactive learning, high-voltage-electrical learning, game engine, load break tool

Abstract— This article aims to present the design concept of a 3-phase induction motor speed controller via a web server system. This design uses the NodeMCU ESP 8266 microcontroller set to process by receiving commands from a web browser (Web Browser) and sending commands to the Relay Board, which will act as a controller for the relay output set (Control Relay output). Which is to order the inverter set to work by starting to work only when there is a command from the microcontroller NodeMCU ESP 8266 and there is a display set to control the speed of the 3-phase motor with a function to control the rotation reversal (Reverse Forward) and control the motor speed level 3 speeds: low, medium and high.

The test results of the operation of the 3-level speed controller of the 3-phase induction motor via the web server system found that: motor command to work according to the command, on/off via smartphone and the operation of the 3-phase motor speed control set via the web server system, is 100 percent, which is considered to have very good accuracy in the command. The NodeMCU ESP8266 microcontroller has a built-in Wi-Fi module (Wi-Fi Built-in), making it easy to connect to the internet. It also has a general-purpose input/output (GPIO) port that can connect to sensors and other devices, making it suitable for industrial control and can be used in IoT (IoT), but it depends on the stability of the internet signal.

Keywords— Motor speed control, Web server, Node MCU ESP8266, Industrial plant

103) **1571078622**: A Verification of Digital Certificate Forgery Using Blockchain Technology and Smart Contract

Abstract—Digital certificate forgery is becoming increasingly common and impacting information security. This research develops a framework and system for verifying digital document signing certificates by applying blockchain technology and smart contracts. Smart contracts are created on the Ethereum network to define various conditions in developing information systems that support adding digital certificates to the blockchain, verifying digital certificates, and accessing digital certificates. The research tested the security of smart contracts using the Slither tool and analyzed the shortcomings of smart contract development using the Solhint tool. The research results indicate that smart contracts can function correctly, without security risks, and can be used to verify digital certificate forgery. Additionally, smart contracts can be utilized in developing information systems and further developed with other related research in the future.

Keywords—*Digital Certificate Forgery, Blockchain, Smart Contract*

104) 1571079197: Sentiment Analysis of P2P Lending Fintech Service User Comments Using CNN-ROS-NCL on Imbalanced Data

Abstract— Fintech P2P lending services have grown rapidly and thousands of comments from Fintech P2P application users appear every day, which is important to note as material for improving the system and its services. The purpose of this study is to explore machine learning and deep learning models to classify Fintech P2P Lending user comments based on sentiment. Classifying user comments efficiently is increasingly important to improve user experience and operational effectiveness. Data imbalance poses a challenge, which often hinders the performance of classification models. This paper uses Lexicon to determine sentiment polarity, CNN algorithm to perform classification, and ROS-NCL algorithm to handle imbalanced data. The ROS-NCL preprocessing strategy is able to balance the dataset and improve the quality of training data, so that CNN can effectively learn more general and representative features. We also compare the imbalanced data handling algorithms SMOTE, SMOTEENN and ADASYN. The experimental results show a significant improvement in classification performance with an accuracy of 99.10% and a misclassification rate of only 0.90%. This level of accuracy can be used to build applications based on the classification of P2P lending user comments that are currently trending so that users can make good use of Fintech P2P lending.

Keywords—CNN, imbalance, data, ROS-NCL, P2P-Lending

105) 1571079304: Analyzing LQ45 Prices Using Indonesia's Inflation Rate
With a Hybrid ARIMA-LSTM Model

Abstract— This study explores the relationship between inflation and LQ45 stock price fluctuations from 2003 to 2024, focusing on how macroeconomic factors influence stock market performance. The LQ45 stock index, known for its high liquidity and market capitalization, is used as a representative of Indonesia's economic conditions. By applying Spearman's Rank Correlation, the study measures the correlation between inflation rates and LQ45 stock prices, aiming to determine how inflation impacts stock price changes. Furthermore, the study employs a hybrid prediction model combining ARIMA (Autoregressive Integrated Moving Average) and LSTM (Long Short-Term Memory) to enhance the accuracy of stock price forecasts. ARIMA is effective at capturing long-term linear trends, while LSTM excels at identifying short-term nonlinear patterns. By integrating these two methods, the hybrid ARIMA-LSTM model takes advantage of ARIMA's ability to analyze long-term data and LSTM's strength in managing short-term fluctuations, ultimately producing more accurate stock price predictions in volatile conditions.

Keywords— *LQ45 Stocks, inflation, stock analysis, ARIMA, LSTM, ARIMA-LSTM*

106) **1571079067**: Exploring IDX Composite Growth Using LSTM Model with US Economic Indicators

Abstract— This study aims to analyze the growth, trends, and fluctuations of the IDX Composite using a machine learning approach with the Long Short Term Memory (LSTM) model, which is then compared with VAR and SARIMA models to assess their accuracy. LSTM was chosen in this research due to its functions and advantages in capturing complex and recurring stock movement patterns. However, aside from utilizing the LSTM analysis model, this study also considers US economic indicators, including the interest rate, unemployment rate, and inflation rate, as external factors influencing the IDX Composite movement. The data used includes historical series of the IDX Composite from 1990 to 2024, as well as data on US economic indicators over the same period, to create a comprehensive approach to the analysis. The results of the study indicate that LSTM effectively captures market trends and stock price fluctuations in the IDX Composite and provides more accurate results compared to other models. Thus, the use of LSTM in this research proves that LSTM demonstrates its potential to be a reliable analytical tool in modeling stock price movements in the IDX Composite amid the influence of economic changes in other countries.

Keywords—*IDX composite, stock analysis, US economic, LSTM, SARIMA, VAR*

107) **1571071906**: The Reputation Model Assesses Node Validators Consensus on the Federated Byzantine Agreement Blockchain Using Eigen Trust

Abstract—The method for validating blockchain consensus has progressed from the initial Proof of Work (PoW) system implemented by Bitcoin to the Byzantine Fault Tolerance (BFT) family. At present, the Federated Byzantine Agreement (FBA) is under development due to its superior speed, higher throughput, and greater openness in comparison to PoW and Practical Byzantine Fault Tolerance (PBFT).

FBA primarily relies on the Quorum Slice, or a cluster of validator nodes. The trust among the validator nodes forms the basis for this group's formation. A validator node's degree of reputation directly correlates with its level of trust among the public. Stellarbeat.io provides an index that serves as a benchmark for evaluating the reputation level. This index is generated by computing the mathematical mean of six factors. One problem with this reputation index is that its findings lack fairness due to the presence of validator nodes that lack a quorum set but still achieve a high index score. Furthermore, the lack of diversity in the index values poses challenges in establishing rankings.

The objective of this paper is to create a reputation evaluation model for FBA validator nodes by EigenTrust as a viable option for calculating the reputation index and addressing the index problems at stellarbeat.io. The methodology in this paper entails gathering data from the stellarbeat.io API over a period of three months, mapping the validator nodes according to the quorum set, and executing the EigenTrust procedure. The result is a reputation evaluation model for FBA validator nodes using EigenTrust, which provides a more equitable and straightforward ranking of reputation assessment outcomes compared to the stellarbeat.io index.

Keywords—*EigenTrust, FBA, Indeks kepercayaan, Algoritma Konsensus*

108) **1571067515**: Examining the Influence of Social Values on Purchase Intentions in Virtual Item Stores for Mobile Games

Abstract— In the contemporary mobile game industry, virtual item stores have become an important component of freemium-based business models. The purpose of this study is to examine how social values influence purchase intentions in mobile game virtual item stores. The study was conducted using an online survey of active mobile game players. Data collection was carried out using a questionnaire designed to measure perceptions of social value and purchase intentions. Data analysis was carried out using descriptive statistical methods and multiple regression analysis. The results show that social values such as participation and prestige significantly influence purchase intentions in virtual item stores. These findings have practical implications for game developers, who must consider social values when planning marketing and sales methods for virtual items in order to maximize player experience and profitability. Hopefully, this study contributes to understanding customer behavior in the context of purchasing virtual items in mobile games and provides important insights for the gaming industry in refining their monetization tactics.

Keywords—*freemium, mobile game, participation, prestige, purchase intention, virtual items*

109) **1571071832**: Compact Design of an S-Band Rat Race Hybrid Coupler
With Enhanced Phase Balance Using Parallel Coupled-Lines

Abstract—This paper presents the design and implementation of an S-band Rat Race Hybrid Coupler operating at 2.2-2.3 GHz, integrated with parallel coupled-line phase shifters to reduce circuit size for satellite communication systems. The proposed design improves critical performance parameters, including phase balance, insertion loss, isolation, and bandwidth. By incorporating the coupled-line phase shifter into the traditional rat-race structure, the design achieves enhanced isolation and bandwidth, making it suitable for applications in signal processing, antenna feeding networks, and radar systems. Simulations using a $70.7\text{-}\Omega$ microstrip line at 2.25 GHz demonstrate significant improvements in phase shift accuracy and return loss. Measurement results validate the simulations, confirming the compact and efficient nature of the design, which offers promising potential for modern microwave communication technologies.

Index Terms—S-Band, Rat Race Hybrid Coupler, Phase Balance, Parallel Coupled-Lines

110) 1571078102: Pneumothorax Segmentation Using Low-Cost Computing Method

Abstract— Pneumothorax, a life-threatening condition characterized by air leakage in the pleural space, presents a significant diagnostic challenge in chest X-rays (CXR). Deep learning methods have shown promise in medical image segmentation, but they face limitations due to data scarcity and computational demands. This study investigates the applicability of traditional segmentation techniques, including Uniform Local Binary Patterns (ULBP), filtering, clustering, and manual pattern selection, for pneumothorax segmentation in CXR images. Our results demonstrate that these traditional methods yield significantly lower Dice coefficient scores (below 0.20) compared to the desired threshold, indicating their limitations in accurately segmenting pneumothorax. These findings highlight the challenges associated with traditional approaches for pneumothorax segmentation and emphasize the need for more advanced techniques, such as deep learning, to address the complexities of this medical imaging task.

Keywords— *Pneumothorax, chest X-ray, segmentation, deep learning, traditional methods, ULBP, filtering, clustering, Dice coefficient*

111) 1571079241: User-Centered Approach of Interactive HMI on PLCnext for Smart Factory Applications

Abstract— This study explores the integration of a custom-designed Human-Machine Interface (HMI) with the PLCnext platform to improve industrial automation. PLCnext offers advantages over traditional PLCs, including real-time control, Internet of Things (IoT) connectivity, and flexible programming. This custom-designed HMI features seven specially designed screens that allow remote monitoring and control through a web server, enhancing plant operations. Performance tests showed positive results, with an average of First Contentful Paint (FCP) of 0.4 seconds and a performance score of 89.1. This combination of PLCnext and HMI significantly improves efficiency, safety, and scalability in manufacturing processes, supporting Industry 4.0 advancements. The research proposes a user-centered approach to interface design within the PLCnext system, potentially speeding up the adoption of advanced automation solutions across various industries. By leveraging PLCnext's open architecture and the intuitive HMI design, this integration addresses key challenges in modern manufacturing, such as real-time data visualization, predictive maintenance, and adaptive control systems. The findings contribute to the ongoing evolution of smart factories and offer insights for future developments in industrial automation technologies.

Keywords—HMI, PLCnext, User-centered Design, Smart Factory, Interactive Interface

112) 1571078610: Human Joint Coordinate Sequencing in Video-Based Thai Finger Spelling Recognition

Abstract—This article presents a video-based Thai finger spelling recognition system that utilizes human joint coordinate sequencing combined with deep learning models. The system processes video frames to extract key joint coordinates using MediaPipe, focusing on both hand and body poses. These skeletal points are fed into four deep learning models: LSTM, GRU, Bi-LSTM, and Transformer, which capture temporal dependencies in gesture sequences. For one-stroke poses with 10 letters, the Transformer model achieved the highest performance with an in-sample accuracy of 98.4% and an out-of-sample accuracy of 86.5%. Similarly, for two-stroke poses with 14 letters, the Transformer reached an in-sample accuracy of 94.2% and out-of-sample accuracy of 82.4%, outperforming the other models in precision, recall, and F1-score. These results demonstrate the effectiveness of the Transformer model in recognizing dynamic and complex Thai finger spelling gestures, offering a robust solution for improving communication accessibility for the deaf community.

Index Terms—Thai Finger Spelling, Joint Coordinates, Sign Language Recognition, Video-Based System.

113) **1571072935**: Development of Microwave Sensor Using Coupled Lines for Pickled Fish Assessment

Abstract—This research explores the development and analysis of a microwave sensor using a microstrip band stop filter to assess pickled fish quality (Pla Som). The sensor is designed using coupled lines in the microstrip structure, operating at a frequency of 2.45 GHz on an FR4 substrate. Measurements were conducted using a KEYSIGHT model E5063A network analyzer across a frequency range of 0.1 GHz to 3.5 GHz. The study focuses on the frequency response of the insertion loss (S_{21}) and its relationship to the quality of the pickled fish samples. The results demonstrate a clear correlation between the sensor's response and the quality of the fish samples, highlighting the potential of microwave sensors in food quality assessment.

Index Terms—Microwave Sensor, coupled lines, pickled fish, microstrip

114) **1571078534**: A Lightweight Deep Residual Network for Motorcyclist Behavior Recognition Using Inertial Sensors

Abstract—Motorcyclist behavior recognition (MBR) is a significant factor in improving road safety and preventing accidents. Inertial sensors, such as accelerometers, gyroscopes, and magnetometers, have shown promising potential for capturing the dynamic behavior of motorcyclists. However, existing approaches often require complex models and significant computational resources, limiting their deployment in real-world scenarios. This study presents a MotoNeXt architecture, which is a light deep residual network for correctly identifying the behavior of motorcyclists using data from inertial sensors. Our approach leverages the power of deep learning while maintaining a compact model size, making it suitable for resource-constrained environments. The proposed network incorporates multi-kernel residual blocks to facilitate the learning of hierarchical features and improve gradient flow during training. We evaluate our method on a publicly available benchmark dataset, MB-IMU, collected from multiple riders under various riding conditions. Experimentation has shown that our lightweight model achieves cutting-edge performance, outperforming a variety of existing techniques. In Scenario I, using accelerometer, gyroscope, and magnetometer data, MotoNeXt achieved an accuracy result of 78.90088% along with an F1-score of 81.56738%. According to Scenario II, which included additional sensor data such as Vellnc, OriInc, and Euler angles, MotoNeXt further improved its performance, achieving an accuracy result of 83.29735% along with an F1-score of 84.95352%. The proposed approach offers a practical solution for real-time MBR, enabling the development of intelligent transportation systems and rider assistance technologies. Our experiments highlight the effectiveness of lightweight deep learning models in extracting meaningful patterns from inertial sensor data. This opens up opportunities for further investigation in this field.

Keywords—*motorcyclist behavior recognition, human activity recognition, inertial sensors, lightweight deep learning, residual networks, intelligent transportation systems*

- 115) **1571062142**: Data Center and IT Equipment Installation in an Old Building: A Case Study of a Government Office in Thailand“

Abstract — Building a data center presents many obstacles and requires meticulous planning with expertise in civil engineering, electrical systems, ventilation, air conditioning design, network configuration, and system administration with limited time and cost. Three types of data center installation exist: newly installed data centers in old buildings, newly constructed data centers inside newly constructed buildings, and renovated old data centers in old buildings. There are unique challenges in a different type of data center. This work focuses on building data centers in old buildings and analyzing problems in each stage to present a novel guideline called "Pre-Stage." By systematically addressing problems in each stage together with the experience of managing a data center project in an old government office building in Thailand, this article designs a guideline for IT project management for a data center project to ensure that it is built to meet data center standards, cost, and time management efficiently. After implementing this guideline, the project timeline is reduced by 10% and the project can be finished earlier than expected.

Keywords— *Data Center, IT project management, Data Center management, Electrical systems, Air conditioning*

116) 1571066437: Pixel Art and Its Influence on User Interface Creativity: A Design Perspective

Abstract— This research explores the impact of Pixel Art games on the creativity and User Interface (UI) design skills of college students, assessing whether exposure to this gaming format can enhance design performance. Pixel Art games, known for their minimalist graphical style, are recognized for stimulating creativity, but their direct influence on UI design is less understood.

The study involved two groups: one that played Pixel Art games before engaging in UI design tasks and a control group that did not. The research assessed their performance across five key UI design criteria: Layout, Color Scheme, Button and Font Clarity, Usability, and Creativity. Statistical analysis revealed that the Pixel Art group scored significantly higher in Layout (8.19 vs. 6.12), Usability (8.43 vs. 6.26), and Creativity (8.36 vs. 6.53). This study used Group Difference Testing t-tests to evaluate the impact of playing a pixel art game on students' UI design skills.

These findings suggest that integrating Pixel Art games into design education could foster creativity and improve key design skills, contributing to more engaging learning experiences in art and design.

Keywords— *pixel art, user interface, creativity, game-based learning, design education*

117) 1571079122: Adaptive CI/CD: A Flexible Architecture for Software Development“

Abstract—Currently, the development of Continuous Integration/Continuous Deployment is considered essential and indispensable in the software development industry. However, there are some individuals who face challenges related to CI/CD development, particularly concerning software security, the maintenance of complex software, and the challenges of scalability. Therefore, we have proposed a new layered architecture design based on CI/CD for software development, titled Adaptive CI/CD, based on to the recommendations and best practices for CI/CD development from the Cloud Native Computing Foundation (CNCF). Adaptive CI/CD will be a guideline for developers to implement tools in their work by designing tools based on the fundamental layers we have established. This will assist in various aspects during the design and development process. It breaks down software development into smaller, more manageable parts, making the development process easier. It will help improve software quality from the coding stage through deployment to production, with security checks in place. It can also help monitor your software's scaling. Therefore, our layered CI/CD design will serve as a guideline, adapting to future technology trends to enhance the quality of the software development process and assist developers in developing software in a rapid and efficient manner.

Keywords—*Adaptive CI/CD, Cloud Native Computing Foundation (CNCF), Continuous Deployment (CD), Continuous Integration (CI), Software Development, Web-based application*

118) **1571079203**: Mathematical Model Development for AI Gesture Classification in Industrial Motion and Time Study

Abstract— This study presents the development of an artificial intelligence (AI) algorithm designed to classify work motions in a production process, utilizing Python and OpenCV. A comprehensive literature review on the role of AI in Industry 4.0 is also included. The proposed AI algorithm comprises three key components: motion detection, motion classification, and work cycle separation. To validate its accuracy, the algorithm was tested in a controlled experiment, comparing AI-based motion assessments with those conducted by human appraisers. Statistical analysis of the results demonstrated a high level of agreement between the AI system, established standards, and human assessments. Motion and time studies are essential for waste elimination in process improvement initiatives. Advancing automated methods for conducting these studies significantly reduces the resources traditionally required when performed manually. Furthermore, this technology offers small and medium-sized enterprises (SMEs) a cost- and time-effective solution for achieving process improvement goals.

Keywords— artificial intelligence, machine vision, process improvement, industrial work study

119) 1571078779: The Development of the Application for Public Health Support for the Elderly

Abstract—This research aims to develop a public health care support application for the elderly. The sampling is a group of 30 elderly in Khlong Lad Phrao community, Bangkok by purposive sampling and a group of 15 public health care volunteers and 3 information technology experts. The instruments used in this research are questionnaires and interviews. The development tools of the applications were as follows 1. ASP.NET 2. PHP Apache 3. Java 4. SQL Server. The data analysis statistics are frequency, percentage mean, and standard deviation. The result shows that from the trial of the application for public health support for the elderly, the performance and satisfaction assessment form shows overall assessment results of a mean of 4.57 and a standard deviation of 0.54, implying that the application is the most satisfied. This developed application can be downloaded on Android apps on Google Play named “PHS Application”.

Keywords—*elderly, application, public health support, TAM model.*

120) 1571078563: Optimal AI Models for Process Data Analysis in Industry 4.0 Regarding Digital Twin Implementation

Abstract— This study compares YOLOv8 and Mask R-CNN object detection algorithms for defect detection in digital twin applications for smart manufacturing. With the ongoing transformation of manufacturing processes in Industry 4.0 and 5.0, integrating digital twin technology and advanced visual inspection techniques has become crucial for improving quality control and process optimization. Using the expanded MVTec Metal Nut Dataset, we evaluated performance based on mean average precision (mAP), precision, recall, F1-score, and inference time. Results show YOLOv8 consistently outperformed Mask R-CNN in accuracy and computational efficiency, achieving higher scores across all metrics and quicker inference times. This suggests YOLOv8 is more suitable for real-time industrial applications, particularly in digital twin implementations. However, the study emphasizes the importance of considering specific manufacturing contexts when selecting an object detection model. The integration of AI-powered visual inspection with digital twin technology has significant potential to enhance product quality, reduce downtime, and optimize production processes, contributing valuable empirical evidence to guide the implementation of advanced defect detection systems in industry.

Keywords—*Digital Twin, YOLO, Industry 4.0, Object Detection, Visual Inspection*

121) **1571073275**: Compact S-Band Low-Pass Filter With Enhanced Suppression Using Inductive Compensated Resonators and BSF Feed Line“

Abstract—This paper presents an innovative technique for designing a compact L-band and S-band microstrip low-pass filter (LPF) utilizing cascaded resonators with doubly inductive compensated coupled lines. The proposed design significantly enhances signal suppression in the transition and stopbands compared to conventional stub-based LPFs. A closed-form design equation is provided for ease of implementation. Simulation and experimental results for a 2.75 GHz cut-off frequency LPF demonstrate an insertion loss of less than 0.1 dB, return loss exceeding 24 dB, and suppression performance over 52 dB at 5.5 GHz. The compact size and superior suppression performance make this filter ideal for modern microwave systems.

Index Terms—S-Band, Low-Pass Filter, Enhanced Suppression, Inductive Compensated, BSF Feed Line

122) **1571078834**: Machine Learning-Based Business Trend Analysis for Informed SME Investment Decisions

Abstract— The success of a business hinges on effective planning and management. Business planning, which must be meticulously studied and analyzed, forms the foundation for this success. In this research, Machine Learning and data mining techniques such as Multilayer Perceptron and Linear Regression were employed to analyze trends in three service sectors: Accommodation, Food and Beverage Services, and Travel businesses from 2016 to 2021, using data from the Office of Small and Medium Enterprises Promotion (OSMEP). The results of the three-year forecast reveal compelling insights. Businesses with total assets up to 1 million baht show promising prospects in the guest house sector (67%). For businesses with assets ranging from 1 to 10 million baht, student room services lead with an 81% rating. Non-alcoholic beverage businesses with assets exceeding 10 million baht demonstrate strong potential at 83%. In the medium-sized category, hotels and resorts perform well at 71%, while large-scale food restaurants lead with a 75% rating.

Keywords— *Business Plan, Data Mining, Machine Learning, Linear Regression, Multilayer Perceptron, Time Series Analysis*

123) 1571078672: Lumen Estimation in IVUS Image Using Polar-Space Falling-Ball Algorithms

Abstract— Accurate lumen contour detection in Intravascular Ultrasound (IVUS) images is critical for diagnosing cardiovascular diseases and guiding interventions. However, traditional methods often struggle with the noise, low contrast, and artifacts present in IVUS images. This paper proposes a novel method for lumen estimation using a Polar-Space Falling-Ball Algorithm, combined with deep learning and computational geometry techniques. The method begins with lumen and media-adventitia border detection using the YOLOv8 deep learning model, which is fine-tuned for IVUS images. Power-Law Gamma Transformation is applied to enhance image contrast, and the IVUS image is transformed into polar coordinates for easier border analysis. The Falling-Ball Algorithm is employed to refine the detected borders, followed by high-order polynomial regression to estimate the lumen contour. The final contours are then converted back to Cartesian coordinates for visualization. Experimental results on a dataset of 203 IVUS images show that the proposed method achieves a significantly improving accuracy over traditional approaches. This method offers a robust, accurate, and computationally efficient solution for IVUS lumen estimation, with the potential for real-time clinical application.

Keywords—*component, formatting, style, styling, insert (key words)*

124) **1571075382**: Usability Heuristics for VR-Based Education: A Case Study of Science Experiment Laboratory Simulator

Abstract—Usability analysis is essential in VR-based education as it ensures that virtual learning environments are intuitive, accessible, and effective for all users. This study focuses on evaluating the usability of a VR-based science experiment lab prototype, applying Nielsen’s Usability Heuristics throughout its design, implementation, and assessment. By identifying and addressing user experience challenges, the research highlights the impact of usability heuristics on enhancing user engagement. The study contributes valuable data on how usability improvements can optimize the effectiveness of VR in education, promoting a more immersive and efficient learning experience.

Index Terms—VR game design, heuristic evaluation, lab simulation, usability heuristics, educational technology, future of VR in education

125) 1571073632: Gamifying Python: Enhancing Learning Outcomes and Motivation Through a Game-Based Approach

Abstract—This work aimed to enhance Python programming education by developing a learning game that utilizes gamification techniques. The study focused on Mathayom Suksa 1 (7th grade in the U.S. education system) students who often face challenges in understanding complex programming concepts due to traditional teaching methods. The developed game incorporated gamification elements like points, rewards, leaderboards, and time constraints to create an engaging and interactive learning environment. The study compared students' learning achievements before and after using the game and assessed their satisfaction levels. The findings indicated that the gamified learning game significantly improved students' learning outcomes, with post-test scores ($M = 12.90$, $SD = 4.27$) being notably higher than pre-test scores ($M = 7.28$, $SD = 1.60$), $t(39) = 11.82$, $p < .05$. Furthermore, students expressed high levels of satisfaction with the gamified learning experience ($M = 3.88$, $SD = 0.69$) on a 5-point Likert scale, indicating its potential to foster positive attitudes towards learning Python. The study highlights the potential of gamification in addressing the challenges of teaching programming to novice learners and promoting effective and enjoyable learning experiences.

Keywords— *Python, Gamification, Learning Outcomes, Game-Based Learning, Technology Education*

126) 1571078388: Digital Forensic Analysis of Lockbit Ransomware Attack on Operational Technology

Abstract—In recent years, the prevalence and sophistication of ransomware attacks have highlighted a significant cybersecurity threat to Operational Technology (OT) and Industrial Control Systems (ICS) systems. These systems are important for energy, manufacturing, and transportation sectors. Among these threats, the LockBit ransomware has become the main adversary. It is known for its advanced strategies, techniques, and procedures (TTP). LockBit’s capabilities have infiltrated and attempted to disrupt critical functionality. This group of threats causes system outages and data security. This article analyzes LockBit attack methods, impacts, and strategies, supported by case studies and detailed analysis of the attack framework. This study aims to identify attack methods and procedures to recommend strategies to strengthen the prevention of such attacks further. With a large number of OT-targeted attacks from January to June 2024, there is an urgent need to improve security in the industrial sector.

Keywords—Operational Technology (OT), Industrial Control Systems (ICS), Ransomware, LockBit, Attack Matrix.

127) **1571078471**: Integrating Machine Learning and OBIA for Vegetation Classification in Archived Grayscale Aerial Imagery

Abstract – This study explores the use of machine learning models to classify water, vegetation, and non-vegetation land cover types in archived grayscale aerial imagery. Input images are segmented using a superpixel algorithm, and the resulting segments are mapped to expert-provided reference data. The region-based and patch-based approaches are evaluated using ANN and CNN models, respectively. The region-based method achieves an average accuracy of 0.83, while the patch-based method reaches 0.79. Although the patch-based method shows slightly lower overall accuracy, it significantly improves recall rates, particularly for the water and non-vegetation classes.

Keywords – *land use/land cover classification, object-based image analysis, gray-level co-occurrence matrix.*

128) **1571078904**: 1B6S Smart Factory Model Implementation in an Animal Food Factory

Abstract— This paper proposes a smart factory framework called 1B6S. The framework, developed in collaboration with Betsukawa Corporation Japan and Thai partners, aims to enhance the maturity level of the industry in the southern part of Thailand. A survey and information gathering about the industry led to the implementation of the framework in an animal food factory. A preliminary study of premium animal food factory is reported to provide insight into the benefits of applying the framework for fostering the industry's value chains.

Keywords—*1B6S framework, smart factory, animal food*

129) 1571077013: A Classification Model for Prediction of the Cafe Prospective Customer

Abstract—The café business faces declining customer numbers and sales due to increased competition serving diverse customer preferences. Understanding target customers and defining key characteristics that attract them is essential. This research investigates the factors influencing customer decisions to choose a café in Chiangrai, Thailand particularly focusing on preferences for cafes that offer a calm, natural, outdoor, or chillout nightlife environment. Through surveys and data analytics, we identified key factors influencing café choices and predicted the likelihood of customers selecting a café based on their preferences. We surveyed local residents, dividing them into two groups: those who frequented this type of café and those who frequented other types. This paper proposes a machine learning classification model to predict whether a customer is likely to choose this café style or not. The model aims to accurately classify potential customers based on their likelihood to choose a particular coffee shop. Machine learning models, including Random Forest, Decision Tree, and Naïve Bayes, were compared for predicting target customer choices. To improve their performance, hyperparameter tuning was applied. Experimental results showed that Random Forest achieved the best overall performance with an accuracy of 94.38%, outperforming both Decision Tree (91.90%) and Naïve Bayes (84.51%). These findings provide valuable insights for cafes to improve services, attract the right customers, and create effective marketing campaigns by customizing their offerings and marketing to specific customer groups.

Index Terms—customer behavior, customer preferences, machine learning classification, decision tree, naive bayes, random forest

130) **1571071068**: Efficient and Non-Invasive Rice Moisture Quantification
Using Coupled Lines Microwave Sensor Design

Abstract—This research presents the design, simulation, and experimental validation of a novel microwave sensor for non-invasive moisture measurement in rice. The sensor employs coupled microstrip lines fabricated on an FR4 substrate, designed to operate at a center frequency of 900 MHz with a quarter-wavelength configuration. The Advanced Design System software was utilized for the simulation, where key parameters such as S_{21} and phase response were analyzed across a frequency range of 0.1 to 3 GHz. The sensor was fabricated and tested using a Vector Network Analyzer, where the moisture content in rice samples was varied incrementally, and the sensor's performance was evaluated based on the changes in transmission characteristics. The results demonstrated the sensor's potential for accurate moisture detection in rice, showcasing its feasibility as a non-invasive measurement technique in agricultural applications. This study contributes to the development of efficient, real-time moisture measurement technologies in the food processing industry.

Index Terms—Microwave Sensor, Moisture Measurement, Rice, Non-Invasive, Coupled lines

131) **1571079058**: Comparing the Effectiveness of Generative AI for Learning and Developing Flutter Applications

Abstract— The rapid growth of business demands modern technological advancements, leading to an increased need for accelerated learning and development of tools. Generative AI has become a key player in enhancing these areas by aiding in code generation for application development. Specifically, Generative AI can produce functional code for various programming languages, aiding in the setup of UI components, navigation, and complex state management. This study evaluates the effectiveness of three widely-used Generative AI tools—ChatGPT, Copilot, and Codeium—chosen for their popularity and diverse approaches to code generation. Standardized prompts were used to generate Flutter code for beginner, intermediate, and advanced tasks. The results show that ChatGPT outperformed other tools, consistently generating runnable and comprehensive code, while Copilot and Codeium exhibited some limitations in handling complex tasks. These findings suggest that integrating Generative AI into Flutter development can significantly accelerate the coding process and enhance application quality.

Keywords—*Generative AI, Code generation, Flutter, Prompt engineering, Cross-platform*

132) **1571078410**: Data-Driven Design for Educational Game: Leveraging Insights from Educational Game Reviews by the k-Means Clustering

Abstract—This study proposes a data-driven approach to educational game design, utilizing user feedback and reviews to identify key factors contributing to the success or failure of educational games. By analyzing reviews of popular educational games from Common Sense Media, we employed k-means clustering to group similar reviews and extract meaningful insights. The clustering process, validated through Silhouette Scores and Davies-Bouldin Index metrics, revealed distinct themes in user feedback, highlighting areas for potential enhancement in educational game design. Our results demonstrate that clustering reviews can effectively differentiate between positive and mixed feedback, providing actionable guidance for game developers. This study underscores the value of incorporating systematic user feedback analysis into the educational game design process, offering a pathway to creating more engaging and educationally effective games. The findings contribute to a more structured and evidence-based approach to educational game development, ultimately enhancing learning outcomes and user satisfaction

Keywords— *Data-Driven Design, Educational Game, Educational Game Reviews, k-means Clustering*

133) **1571078541**: Remote Expert AI System for Industrial Maintenance: A Technical Approach

Abstract— Industrial maintenance has become increasingly important in industrial settings for maintaining operational efficiency and reducing downtime. This study evaluates YOLO object detection algorithms versions 5, 8, and 9 in combination with Microsoft's HoloLens 2 for detecting anomalies in PLCnext equipment. The research compares model performance using accuracy metrics and explores on-device and API-based implementation approaches. Results show YOLOv9 and YOLOv8 outperforming YOLOv5 in accuracy, with YOLOv9 demonstrating slightly higher performance. However, both YOLOv8 and YOLOv9 exhibited high CPU usage (51.75% and 61.32% respectively) during testing. Given the limited computational resources of HoloLens 2, an API-based approach is recommended to offload processing to server-side infrastructure. This research contributes to the advancement of augmented reality-assisted predictive maintenance in industrial settings by identifying effective methods for deploying object detection models. The findings suggest potential improvements in operational efficiency and reduced downtime in manufacturing environments through optimized implementation strategies.

Keywords—YOLO, object detection, Hololens, Industrial Maintenance, PLCnext

134) 1571058385: A Dual Methodology for Evaluating Medical Tourism Websites

Abstract— Hospital websites serve as crucial entry points for medical tourists seeking health information and services. This study introduces a comprehensive method for evaluating the quality of hospital websites by combining WebMedQual and Ad-hoc Codebook models. Based on a case study, the WebMedQual measurement results indicate a need to improve the quality of information on websites of both commercial and public hospitals. The Ad-hoc Codebook results, on the other hand, show that private hospitals are better equipped for medical tourism than their public counterparts. These findings highlight the disparity in online information quality and the different levels of medical tourism readiness among different hospital types. Healthcare providers, policymakers, and related stakeholders can use this evaluation method to improve their online profiles and better cater to medical tourists.

Keywords— *medical tourism, hospital website, WEBMEDQUAL, website quality, web assessment*

133) 1571077702: AI-Driven Market Demand Prediction: An Artificial Neural Network Model for Horticultural Commodities

Abstract—The annual increase in population drives a corresponding rise in demand for goods and services, which in turn directly impacts agricultural needs at both regional and national levels. In Sikka Regency, the demand for horticultural commodities has grown alongside population expansion and increasing prosperity. However, the lack of proper planting distance management has disrupted efficient distribution, leading to logistical inefficiencies. As a result, it is crucial to develop an optimal market demand plan for horticultural commodities to prevent surplus accumulation. To address this challenge, this study proposes a predictive model for monthly market demand in 2024, focusing on 12 types of horticultural commodities in Sikka Regency. The model is based on time series data of food consumption from 2019 to 2023. An Artificial Neural Network (ANN) with a back-propagation algorithm is employed for this prediction. The model's performance was evaluated, yielding an average training accuracy with a Root Mean Square Error (RMSE) of 0.201 and Mean Absolute Error (MAE) of 0.166, while the average testing accuracy produced an RMSE of 0.338 and MAE of 0.303. The experimental results demonstrate that the proposed method provides valuable insights into market behavior and can serve as a useful tool for stakeholders in the horticultural commodity market.

Keywords—ANN, back-propagation algorithm, market demand, horticultural commodities, time series prediction.

- 134) **1571072585**: Empowering Circular Economy in Thailand's Plastic Waste Management Through a Digital Platform

Abstract—The proliferation of single-use plastics in Thailand has led to a mounting waste management crisis. Despite the government initiatives to promote recycling and a circular economy, the majority of plastic waste still ends up in landfills or the natural environment, causing severe ecological damage. This paper explores the development of a digital platform as a mechanism to connect diverse stakeholders (i.e. households, local governments and a university) via a LINE Front-end Framework application (LIFF app) and two web applications, respectively, to facilitate seamless data sharing and analysis. By fostering collaboration and transparency, the platform aims to drive innovative solutions, enhance production efficiency and reduce waste management costs. The paper details the platform's design, development and pilot deployment in Nong Bua Sala subdistrict, Mueang Nakhon Ratchasima district, Nakhon Ratchasima province, highlighting its potential to promote a circular economy and contribute to a sustainable future for Thailand.

Keywords—circular economy ecosystem, community engagement, digital platform, single-use plastics, sustainable waste management

135) 1571076212: Sea Turtles Species Classification with a Modified ResNet-50 Deep Learning Model

Abstract— Sea turtles often undergo classification into distinct groups based on their species for conservation purposes. By classifying sea turtles in this way, conservationists can prioritize efforts and allocate resources effectively to protect these endangered and vulnerable species worldwide. Identifying sea turtle species is a major challenge when human visual inspection of the shells is required to determine the differences between species, which can lead to inaccuracies and errors in classification. Furthermore, such methods may disturb sea turtles in their natural environment. In this paper, we use images of sea turtle shells (carapace) of 7 species and preprocess them using the Sobel operator to improve edge detection and feature detection in images with different levels of noise and detail and a Color Histogram to find the distinctive features from the color distribution in the image from the pixel intensity distribution in the image to be complete and suitable for learning by using ResNet-50, a deep convolution neural network architecture, to identify sea turtle species accurately. The experimental results of this marine species classification achieved an accuracy with an average of 90.4%, proving that it is an effective and feasible tool for marine conservation applications. Monitor and protect endangered sea turtle populations without disturbing or harming their natural habitats.

Keywords—*Sea turtle, Species classification, Sobel, Color Histogram, ResNet-50*

136) 1571060509: The Blockchain and Business Applications: Edge Computing

Abstract— Edge computing is necessary due to data overload with AI and 5G and latency issues with distant cloud servers not near data sources for clients and vendors. Data prioritization via RSs (recommender systems) for integration and creating precise smart contract terms becomes key for efficiency and to avoid platform differences and insularity. The blockchain presents a potentially new way forward for edge computing with both data integration (to avoid government and corporate control points) and to create efficiency (smart contracts). A conceptual POC (proof of concept) is put forward for demonstration with both SME's and large conglomerates leveraging edge computing.

Keywords—Edge computing, blockchain, smart contracts, RSs, latency, IoT.

136) 1571078684: Spondylolisthesis Identification in Lumabr Spine Using Centroid Distance Error“

Abstract— Spondylolisthesis is a spinal disorder characterized by the anterior displacement of one vertebra over the one beneath it, predominantly affecting the lumbar region. Accurate and timely diagnosis is crucial for effective treatment and patient care. This study proposes an automated method for identifying spondylolisthesis by employing a deep learning approach using SSD for lumbar vertebrae detection. After detecting the vertebrae, the centroids of each vertebra are calculated from their respective bounding boxes, and a linear model is fitted through these centroids to assess vertebral alignment. The centroid distance error, defined as the deviation of each centroid from the fitted line, is utilized to evaluate misalignment indicative of spondylolisthesis. The proposed method was evaluated on a dataset of lumbar spine images, in diagnosing spondylolisthesis based on centroid distance errors. This automated framework demonstrates significant advantages over traditional diagnostic methods, including increased efficiency, consistency, and scalability. The findings highlight the potential of integrating advanced image processing techniques and machine learning models into clinical practice, paving the way for improved diagnostic accuracy and patient outcomes in spinal disorders. Future work will focus on expanding the dataset and exploring the integration of clinical parameters to enhance the model's predictive capabilities. +

Keywords—*component, formatting, style, styling*

137) **1571072258**: Analyzing Key Factors Influencing Digital Literacy Among Students in the Lao PDR: Implications for Educational Policy and Practice

Abstract — This research aims to analyze the factors influencing the digital literacy of students in the Lao People's Democratic Republic. The findings from this study contribute to understanding how various factors impact students' digital skills, which are crucial for meeting the demands of the digital-era labor market. A descriptive research design was employed, with data collected from a sample of 404 students across colleges, universities, and other educational institutions in Laos. The sample size was determined using W.G. Cochran's formula, ensuring a margin of error of $\pm 5\%$ at a 95% confidence level. Additionally, in-depth interviews were conducted with 30 individuals to complement the quantitative data. Statistical analyses, including Mean, Standard Deviation, and Stepwise Regression, were used to examine the relationships between variables. The study identified six significant factors influencing students' digital skills: family support, social influence, computer experience, teachers' digital competence, perceived ease of use, and perceived usefulness, all of which had a statistically significant impact at the 0.05 level.

The research findings revealed that family support (FS), social influence (SI), students' computer experience (CES), teachers' digital competence (TDC), perceived ease of use (PEU), and perceived usefulness (PU) significantly influence the digital skills of students in the Lao People's Democratic Republic. These results suggest that enhancing digital literacy among students requires targeted interventions at both the educational and familial levels, which can inform educational policy and curriculum development.

Keywords — Influential Factors, Digital Literacy, Digital Competence, Perceived Ease of Use, Perceived Usefulness, Students' Computer Experience

138) **1571044681**: Automatic Fire Detection and Positioning System for Outdoor Lac Cultivation

Abstract— This research explores the use of Kalman and Mahalanobis techniques in the development of a fire detection system tailored for outdoor lac cultivation by leveraging data from environmental sensors measuring temperature, humidity, and PM2.5 levels the study aims to identify anomalies indicative of wildfires. Traditional methods using Euclidean distance are compared with Mahalanobis distance to improve detection accuracy. The findings indicate that Mahalanobis distance significantly enhances the ability to detect complex anomalies offering a more reliable and efficient approach to fire detection in environments with diverse data distributions. This system aims to provide timely alerts to farmers thereby mitigating the risks and impacts of wildfires.

Keywords— fire detection, fire alarm algorithm, IoT, Laccifer lacca, agriculture, smart farming, data analysis, Mahalanobis distance, environmental sensors, wildfire prevention

139) 1571067660: Evaluating Deep Learning and Traditional Approaches in Recommender Systems

Abstract— Currently, recommendation systems have a major role in the selection and presentation of content related to the needs and interests of users. Because of this, we have benchmarked five models: Bayesian Personalized Ranking (BPR), Item-based k-Nearest Neighbors (ItemKNN), Item Popularity (ItemPop), Neural Collaborative Filtering (NCF), and TensorFlow Recommenders (TFRS). Using the Hit Ratio (HR) and Normalized Discounted Cumulative Gain (NDCG) metrics, our benchmark experiment finds the TFRS model very good in terms of accuracy and efficiency. While the Deep Learning models capture better modeling of the user-item interaction—BPR, NCF, and TFRS— their counterparts, non-deep learning models—ItemKNN, ItemPop—are faster but less effective in personalization. These insights guide the selection of the most suitable system for enhancing user engagement.

Keywords— *Deep Learning, Recommender Systems, BPR, NCF, TFRS, ItemPop, ItemKNN*

140) 1571056400: Managing Geographic Information Systems for Chachoengsao Province Administration

Abstract— The purposes of the research were to study and develop the state and problems of Info-Geometrics Technology of Chachoengsao Province Administration (CPA). The model of the Geographic Information System (GIS) for CPA developed according to management system theory including input factors consisting of person, hardware, software, database, and budgets. Administration can choose to operate all four systems at once or select some systems. Output and outcome consisted of GIS for administration, needs information for individual users, and the person's assessment. 96.67 % of the experts approved the appropriateness and the practicality of the proposed model.

Keywords — Info-Geometrics Technology, Managing Geographic Information System, GIS model

141) 1571044145: Enhancing Educational Quality Assurance in Thai Vocational Education: Intelligent Chatbot

Abstract— This study addresses the challenge of limited advisory services for educational quality assurance in Thailand's vocational institutions. We developed an Intelligent Chatbot for Self-Assessment Report (IC-SAR) system to provide 24/7 support and evaluated its efficacy using machine learning algorithms on the LINE platform. The Decision Tree algorithm demonstrated superior performance with 97.44% accuracy, outperforming Naïve Bayesian and K-Nearest Neighbor methods. Usability tests showed 92.00% accuracy in answering queries. The IC-SAR effectively supports educational institutions by providing timely and accurate responses, potentially reducing delays in advisory services and enhancing the efficiency of the self-assessment process.

Keywords— Self-Assessment Report, SAR, Chatbot, Decision Tree, K-Nearest Neighbor, Naïve Bayesian, Educational Quality Assurance

142) **1571062147**: Denial of Service Attack Detection in Digital Information Exchange by Using ML Techniques

Abstract— Denial of Service attack detection plays a significant role in the field of digital information exchange security, and log messages recording detailed system runtime information has become an important data analysis object accordingly. To improve traditional detection technology, several anomaly detection mechanisms, particularly the machine learning method, have been presented in recent years. This research proposes a technique for detecting anomalies in web log files that uses two machine learning algorithms. Isolation Forest is used to generate a set of features targeting traditional, while XGBoost is a tree-based model used for classification. The experimental data comes from the real web server for digital information exchange environment where log files have been collected, which contain many true intrusion messages. After comparing with two types of machine learning algorithms used in anomaly detection, testing results for this data set indicate that this system has a greater detection accuracy and can detect unknown anomaly data.

Keywords—denial of service, xgboost, isolation forest, digital information exchange

143) 1571067528: Particle Weight Redistribution in Particle Filtering to Improve Nonlinear State Estimation

Abstract—Particle filters are used to estimate hidden state parameters from the noisy signals. They are based on sequential Monte Carlo theory, where they randomly draw samples from all possible hidden states and then use the previous information of estimation to proceed to the next step. Particle filters are also known for their degeneracy issues where the particles are separated into high probability and low probability regions. Therefore, resampling is incorporated into particle filters. However, resampling brings up another issue of particle impoverishment and consequently reduce particle diversity.

This paper proposes an improved resampling process for a standard particle filters to address particle impoverishment in standard sampling importance resampling particle filters (SIR-PF). By introducing a weight redistribution of particles before resampling, the algorithm expects to mitigate error values across varying signal-to-noise ratios, potentially outperforming conventional SIR-PF. The experiment is validated using a simulated signal, resulting in overall lower RMSE and MAE at various noise levels. The proposed method is a computationally efficient and straight forward process compared to more complex alternatives.

Index Terms—Resampling, Sequential Importance Resampling, Particle filter, State estimation, Signal processing.

144) **1571078861**: An Extension of Drawing Exactness Assessment Method to Hair Evaluation in Portrait Drawing Learning Assistant System

Abstract—Portrait drawing learning is important for developing painting skills and humanistic sensibilities to a lot of people. However, it is challenging for novices to start learning portrait drawing, because it is often difficult to master facial proportions and structures without professional guidance. To solve this issue, we have developed a *Portrait Drawing Learning Assist System (PDLAS)* to help novices draw portraits by providing *auxiliary lines* for facial features that are generated using *OpenPose* and *OpenCV* from the face photo. Besides, we have implemented the *exactness assessment method* to evaluate drawing accuracy using the *Local Normalized Cross-Correlation (NCC)* algorithm. It calculates the similarity score between the original face photo and the drawing result. However, the current one is limited to evaluate the eyes, nose, mouth, and eyebrows in a face. In this paper, we present an extension of the *drawing exactness assessment method* to cover the hair for comprehensive feedback to users in *PDLAS*. For evaluations, we applied the proposal to drawing results by six students at Okayama University, Japan, using *PDLAS* and confirmed the validity.

Index Terms—portrait drawing, auxiliary lines, OpenPose, OpenCV, Normalized Cross-Correlation (NCC)

145) **1571078466**: Optimization of Factory Energy Costs Through Solar Energy Forecasting and Machine Scheduling Using Mixed-Integer Linear Programming

Abstract— This study utilizes machine learning and optimization techniques to lower energy costs in factory operations. By incorporating weather forecast data and machine learning techniques, we aim to accurately predict solar energy production. Various machine learning models, including XGBoost, Random Forest, Support Vector Regression (SVR), Ridge Regression, and Long Short-Term Memory (LSTM) networks, were employed. Among these, XGBoost emerged as the most effective model for solar energy forecasting.

Utilizing the solar energy production predicted by the models, a Mixed-Integer Linear Programming (MILP) optimization algorithm is used to determine the optimal scheduling for Sand Milling Machines. The model strategically schedules machine operations during intervals when solar energy is underutilized and during off-peak periods to minimize energy costs. This approach also ensures that the sand milling process meets critical constraints by maintaining sand levels within desired minimum and maximum thresholds.

The results underscore the potential for significant cost savings and enhanced energy efficiency in factory operations through the integration of machine learning predictions and optimization techniques.

บทคัดย่อ (NCIT2024)

การประชุมวิชาการระดับประเทศ
ทางด้านเทคโนโลยีสารสนเทศ

NCIT 2024 วันที่ 14 - 15 กันยายน 2567 คณะวิทยาการสารสนเทศ มหาวิทยาลัยบูรพา



NCIT2024_01: A Comparative Performance of Web Server on Windows

Abstract

This research aims to compare the performance of web servers on the Windows operating system. The web servers used are IIS, Apache, and NGINX. The performance was compared under the same number of users at each time interval. Various types of websites were used as test cases, including static websites and dynamic websites (WordPress and Moodle). The Apache JMeter was used to simulate website access through the HTTP and HTTPS protocols to test the performance of the web servers and record various data for comparison. The results showed that for static websites, IIS performed well with no errors through the HTTP protocol and supported good throughput (Transactions/s). Apache performed well with the HTTPS protocol. For dynamic websites, NGINX used fewer resources and performed well with both WordPress and Moodle through the HTTP protocol. Apache performed well with website access through the HTTPS protocol. Although IIS had a slower response time for both WordPress and Moodle through the HTTPS protocol, it had fewer errors and supported good throughput (Transactions/s) at high concurrent requests.

Keywords: web server, web server performance, iis apache, nginx

NCIT2024_02: Factors Affecting Cyber Threat Awareness Of Employees National Science Museum Thailand

Abstract

"The objectives of this research study are 1) to study demographic factors that affect the awareness of cyber threats among staff at the National Science Museum (NSM) 2) to study factors regarding experiences with cyber threats that affect the awareness of cyber threats among the staff of the NSM. 3) To study the factors of knowledge about cyber threats that affect the awareness of cyber threats among the staff of the NSM. The factors affect awareness of cyber threats. The sample group used in the research was 181 employees of the NSM by purposive selection. The tool used was a cyber threat awareness questionnaire. Statistics used in the analysis include frequency, percentage, mean, standard deviation, Independent Samples t-test, One-Way ANOVA, and pairwise comparison of differences (LSD). The research results found that the majority of respondents were female, aged 31 - 40 years, and had a bachelor's degree. They hold operational positions with 16-20 years of experience. The results of the demographic hypothesis test found that different genders, ages, educational levels, and length of service have an effect on cyber awareness. Hypothesis testing section Experience and knowledge factors regarding cyber threats have different effects on cyber threat awareness.

Keywords: Awareness Perceptual, experience, Cyber threats

NCIT2024_03: การพัฒนาระบบแจ้งซ่อมอุปกรณ์ไอที ในบริษัทรับเหมาก่อสร้าง แบบไร้กระดาษ

Abstract

IT department information management system for a construction company subsidiary. This system is designed to solve the problem of excessive paper use and increase efficiency in solving problems for users. Previously, the company used approximately 180 paper repair reports per month for approximately 700 employees. Common problems were paper wastage and wasted time waiting in line to fix problems caused by User Error. The new system supports repair notifications via The system is online and manages IT equipment information and notebook owner information. The results of the 5-month trial of the new system found that paper use decreased on average by 30-40% per month and employees resolved user errors 3-5 minutes faster.

Keywords: Paperless, Inventory system, IT support

NCIT2024_04: Fuel Usage Monitoring System for Expressway Service Vehicles

Abstract

Currently, Operating the expressway service business enhances efficiency in various types of businesses, such as parcel delivery services and public transportation. Using electronic devices on expressways, for example, optical barriers to detect objects passing through toll collection lanes or automatic vehicle classification which is used to classify a type of vehicle that enter through toll collection lane in order to calculate toll fees. However, the electronic equipment on the expressway has a limited lifespan and requires regular maintenance. When equipment breaks down, employees must drive to fix the problem, which requires constant use of fuel. Each time they refuel, employees must record the fill-up in the vehicle book and submit to the department at the end of the month to report expense to management This project was created to replace the manual recording of fuel fill-ups in the vehicle registration book with a web application, aiming to reduce paper usage within the organization.

Keywords: Fuel Usage Monitoring System, Cloud Computing, Infrastructure as Code

NCIT2024_05: The Impact of Bakery Website Design on the Purchase Decisions of Generation Z Consumers

Abstract

This research aims to study the design of bakery product websites that influence the purchasing decisions of Generation Z consumers in Thailand. A survey of 100 respondents found that Generation Z buys bakery products 1-3 times per month, with cakes and bread being the most popular choices. The key factors influencing their purchases are preferred taste and reasonable pricing. Additionally, this consumer group places importance on website design and information, particularly warm color tones like beige, orange, and red, easy-to-navigate layouts, and website credibility. They also prioritize prominent product details or promotions on the homepage. The study further revealed that website design should focus on simplicity, using medium-sized images arranged in a grid, displaying information on a single page, and ensuring that the website is responsive to different screen sizes, which is essential for Generation Z.

Keywords: Website Design, Bakery Purchase, Decision Generation Z, Consumer Behavior

NCIT2024_06: WEB APPLICATION FOR ARTWORK SELLING AND HIRING ONLINE: ARTNORK

Abstract

Nowadays, people tend to use traditional Thai medicine to maintain good health by using local wisdom and herbs. However, the process of collecting and storing these information are difficult to access and retrieve with smart phones. So, researchers have developed a health care application with traditional Thai medicine to accommodate today's people needs which is convenience, quick, and easy to access. The objective of this research is to develop a health care mobile application that able to search and retrieve medical treatment of each symptom. These symptoms are classify based on 1.) head, ears, eyes, neck, nose, and mouth 2.) body 3.) lower part of body. This application can show how to use herbs for each symptom and how to do the first aid. Moreover, this application also can save a user symptom log file and forward this log file to a doctor in future. Nowadays, the benefits of buying and selling products on the internet are significant. Researchers have developed a web application to allow users to showcase their artistic works and sell their products. Additionally, this application also supports a queue system for hiring. The application applies the principles of Human Computer Interaction (HCI) to ensure that users are satisfied. It includes an online store system for buying and selling products between users and artists. Moreover, it also utilizes a Kanban board to solve any issues related to the queue system, allowing users to see the queue of the artists immediately without the need for direct communication.

Keywords: art, web application, human computer interaction, Kanban board

NCIT2024_07: พฤติกรรมและปัจจัยที่มีอิทธิพลต่อการใช้งาน ChatGPT และสื่อสังคมออนไลน์ในการเรียน นักศึกษาคณะวิทยาการคอมพิวเตอร์ มหาวิทยาลัยราชภัฏอุบลราชธานี

Abstract

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) ศึกษาพฤติกรรมการใช้งาน ChatGPT และสื่อสังคมออนไลน์ในการเรียน นักศึกษาคณะวิทยาการคอมพิวเตอร์ มหาวิทยาลัยราชภัฏอุบลราชธานี และ 2) ศึกษาปัจจัยที่มีส่งผลกระทบต่อการใช้งาน ChatGPT และสื่อสังคมออนไลน์ในการเรียน นักศึกษาคณะวิทยาการคอมพิวเตอร์ มหาวิทยาลัยราชภัฏอุบลราชธานี ประชากรกลุ่มตัวอย่าง 247 คน ผลการวิจัยพบว่า นักศึกษาส่วนใหญ่ใช้คอมพิวเตอร์หรือโน้ตบุ๊ก ในการเข้าถึง ChatGPT และ นักศึกษาส่วนใหญ่ใช้สมาร์ทโฟน ในการเข้าถึงสื่อสังคมออนไลน์ เวลาที่นักศึกษาส่วนมากใช้งาน ChatGPT และสื่อสังคมออนไลน์ คือ ช่วงค่ำ ปัจจัยหลักที่มีอิทธิพลให้นักศึกษาใช้งาน ChatGPT คือ ความรวดเร็วในการตอบสนองต่อความต้องการ และ ปัจจัยหลักที่มีอิทธิพลให้นักศึกษาใช้งานสื่อสังคมออนไลน์ คือ อินเทอร์เน็ตที่ใช้งานง่าย วัตถุประสงค์หลักในการใช้งาน ChatGPT คือ เรียนรู้เพิ่มเติมนอกเหนือหาที่อาจารย์สอน และวัตถุประสงค์หลักในการใช้งานสื่อสังคมออนไลน์เพื่อติดต่อกับบุคคลที่รู้จัก สื่อสาร/แชท

Keywords: แชนเจีพีที, สื่อสังคมออนไลน์, พฤติกรรม

NCIT2024_08: A Cactus Classification System Based on Convolutional Neural Network

Abstract

In the past decade, the popularity of cultivating Cactus has significantly increased in Thailand. Cactus possesses uniquely beautiful and peculiar shapes, and there has been continuous breeding to develop various strains. Currently, they are widely grown for ornamental purposes in residential and commercial spaces. However, due to the vast diversity of cactus species, accurate classification is crucial for proper care. This ensures sustainable, aesthetically pleasing, and commercially valuable cactus. To address such a challenge, we developed a web-based system that can classify cactus varieties from images. It employs machine learning models based on Convolutional Neural Networks (CNNs). In addition, the proposed system supports functions providing information about different cactus varieties, their care methods, and how to adjust environmental conditions for optimal growth. The experimental evaluation guarantee that our system can be practically used in real-world settings with an overall accuracy of 80.56% for classification.

Keywords: Cactus classification, Machine Learning, Convolution Neural Network

NCIT2024_09: A Comparison of the Generative AI Performance in Application Design for the Elderly Thawinee Lohawatcharanon, Tanaporn Ngamjit and Papangkorn Pidchayathanakorn

Abstract

"Currently, generative artificial intelligence (Generative AI) plays a significant role in developing applications that meet user needs, especially in elderly communities that face physical limitations and challenges in using technology. Therefore, designing applications for the elderly must prioritize efficiency and usability. By incorporating generative AI technology and prompt engineering, we can enhance user experience (UX/UI) to better cater to elderly users. This research focuses on creating a set of prompts for AI to query four tools: ChatGPT, Gemini, Claude, and Microsoft Copilot, for designing applications aimed at the elderly using the same set of instructions. The goal is to analyze their capabilities in design, content creation, and user experience that address the needs of older adults, thereby identifying the most suitable tools for developing applications that meet their requirements. The findings indicate that generative AI can effectively support content development and improve user experience, with each model showcasing distinct strengths. It was found that Gemini and Claude excelled in graphic output, emphasizing clarity, simplicity, large icons, and vibrant colors suitable for the elderly, while ChatGPT and Microsoft Copilot provided good text-based guidance but lacked clarity in graphic presentation."

Keywords: Generative AI, Prompt Engineering, Application Design, Elderly Users

NCIT2024_10: ระบบต้นแบบติดตามและเฝ้าระวังข้อมูลด้านสุขภาพของผู้สูงอายุผ่านแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ด้วยเทคโนโลยี IoT

Abstract

ประเทศไทยได้เข้าสู่สถานการณ์ “สังคมสูงอายุ” ตั้งแต่ พ.ศ.2548 โดย 1 ใน 10 ของประชากรไทยเป็นประชากรที่มีอายุตั้งแต่ 60 ปีขึ้นไป หนึ่งในความพยายามของนักวิจัยเกี่ยวกับผู้สูงอายุคือ การนำเอานวัตกรรมเพื่อการดูแลสุขภาพของผู้สูงอายุเข้ามามีบทบาทและใช้งานอย่างมีประสิทธิภาพมากขึ้น ปัจจุบันมีการนำเอาเทคโนโลยี Internet of Things (IoT) มาใช้กับการดูแลสุขภาพผู้สูงอายุแล้ว ผู้วิจัยจึงเห็นประโยชน์ของการนำเอาเทคโนโลยี IoT มาประยุกต์เพื่ออำนวยความสะดวกในการดูแลสุขภาพผู้สูงอายุในการพัฒนาระบบต้นแบบติดตามและเฝ้าระวังข้อมูลด้านสุขภาพของผู้สูงอายุผ่านแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ด้วยเทคโนโลยี IoT ซึ่งเป็นการทำงานร่วมกับอุปกรณ์พกพาที่สามารถสวมใส่ติดตัวผู้สูงอายุได้ (wrist wearable devices) เช่น Smart watch สามารถตรวจวัดการเต้นของหัวใจ ข้อมูลสุขภาพ และสามารถแจ้งเตือนไปยังผู้ดูแลเมื่อภาวะผิดปกติได้ โดยระบบสามารถทำงานได้ทั้งบนเว็บแอปพลิเคชัน และแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ ผู้วิจัยได้นำระบบไปประเมินโดยผู้เชี่ยวชาญแล้ว พบว่า ผลของการประเมินประสิทธิภาพของระบบทั้ง 4 ด้าน คือ 1) ด้านความสามารถทำงานตามความต้องการของผู้ใช้ 2) ด้านการใช้งานของระบบ 3) ด้านหน้าที่ของระบบ 4) ด้านความปลอดภัย โดยผู้เชี่ยวชาญและผู้ใช้งานอยู่ในระดับดี

Keywords: เฝ้าระวังข้อมูลด้านสุขภาพ สังคมสูงอายุ Internet of Things (IoT)

NCIT2024_11: ระบบบริหารจัดการสารสนเทศการตรวจสอบคุณภาพน้ำดื่ม

Abstract

ด้วยในปัจจุบันเทคโนโลยีสารสนเทศและการสื่อสารได้เข้ามามีบทบาทสำคัญต่อการดำรงชีวิต ในชีวิตประจำวันของมนุษย์อยู่ตลอดเวลา ไม่ว่าจะเป็นการติดต่อสื่อสาร การทำงาน การเดินทาง การศึกษา เห็นได้จากจำนวนผู้ใช้อินเทอร์เน็ตและอุปกรณ์เคลื่อนที่เพิ่มขึ้นอย่างต่อเนื่อง เพื่อเป็นการนำเอาความสามารถของเทคโนโลยีสารสนเทศและการสื่อสารเข้ามาสนับสนุนการตรวจสอบคุณภาพน้ำดื่มในท้องถิ่น เพื่อให้ได้น้ำสะอาดไว้ใช้ในการอุปโภค-บริโภคในชุมชน งานวิจัยนี้ผู้วิจัยจึงได้ทำการพัฒนาระบบบริหารจัดการสารสนเทศการตรวจสอบคุณภาพน้ำดื่มตามมาตรฐานคุณภาพน้ำบาดาลที่ใช้บริโภค ซึ่งมีความสามารถในการวิเคราะห์และประเมินความแตกต่างของคุณภาพแหล่งน้ำ และรายงานผลคุณภาพแหล่งน้ำได้ โดยสามารถทำงานได้ทั้งบนเว็บแอปพลิเคชัน และแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ ระบบทั้งสองได้ถูกประเมินโดยผู้เชี่ยวชาญแล้ว พบว่า ผลของการประเมินประสิทธิภาพของระบบทั้ง 4 ด้าน คือ 1) ด้านความสามารถทำงานตามความต้องการของผู้ใช้ 2) ด้านการใช้งานของระบบ 3) ด้านหน้าที่ของระบบ 4) ด้านความปลอดภัย โดยผู้เชี่ยวชาญ อยู่ในระดับดี

Keywords: การตรวจสอบคุณภาพน้ำดื่มระบบบริหารจัดการสารสนเทศแอปพลิเคชัน

NCIT2024_12: Purchasing Products Through Online Applications
Study: Comparing Use Cases Shopee, Lazada, Facebook of
Consumers
in Bangkok Metropolitan Region

Abstract

This research aims to study online shopping behavior through applications such as Shopee, Lazada, and Facebook among consumers in Bangkok and its surrounding areas. The study examines demographic factors, including age, gender, education level, occupation, and average monthly income, as well as marketing factors that influence consumers' online shopping behavior. Additionally, it explores how technology acceptance and personalized services affect consumers' decisions to purchase products through online applications in Bangkok and its surrounding areas. Data was collected through online questionnaires from a sample of 400 participants and analyzed using statistical software according to the research objectives. The hypothesis testing results indicate that consumers in Bangkok and its surrounding areas who differ in age, occupation, and interests make different purchasing decisions through online channels and applications. However, differences in gender, education level, interests, and average monthly income do not significantly affect online purchasing decisions through applications. Marketing mix factors and service quality, on the other hand, do influence the decision to purchase products through applications among consumers in both Bangkok and its surrounding areas.

Keywords: Online Applications Marketing Mix and Service Quality
Online Consumer Behavior

NCIT2024_13: Generative Artificial Intelligence: A Case Study of Application in Highway Engineering

Abstract

This research aimed to evaluate the application of Generative artificial intelligence (AI) systems in Highway engineering and their utility as tools for engineers in design calculations based on engineering principles. The study employed a true experimental research method. The tools selected for the experiment included: (1) A set of instructions related to Highway engineering, developed through a review of relevant literature and research, to test the performance of a large language model, and (2) ChatGPT, which was chosen as the large language model for testing its responses to the created instructions. The experimental results were as follows: (1) The creation of instructions for testing the large language model, based on literature review and relevant research, included commands for designing horizontal curves using circular curves and superelevation design; (2) ChatGPT's responses to the created instructions aligned with the research objectives, demonstrating its potential as a tool in the field of Highway engineering.

Keywords: Generative AI Application, Highway Engineering

NCIT2024_14: Study Guidelines for Adjusting the Roles of Bank Employees During the Period of Transition into Digital Transaction

Abstract

Digital Disruption Digital Transactions e-Payment Internet & Mobile Banking Upskill & Reskill" "Digital disruption has transformed the banking industry, driving a shift from traditional services to online platforms and reducing physical bank branches. This research examines which banking transactions cannot be fully automated and explores how bank employees' roles should adapt during and after this transition. Through in-depth interviews with bank executives, IT personnel, and service providers, as well as document analysis, the study found that tech-savvy customers can manage simple transactions on their own. However, complex transactions still require direct interaction with bank employees for additional information or guidance. Bank employees continue to be vital in all transactions for customers without access to technology. Bank employees must undergo upskilling and reskilling to effectively manage this digital shift. In the digital banking era, they need both technical (hard skills) and interpersonal (soft skills) to meet the evolving needs of the industry.

Keywords: Digital Disruption, Digital Transactions, e-Payment, Internet & Mobile Banking
Upskill & Reskill

NCIT2024_16: Digital forensic of Ransomware Attacks by 2S Matrix Framework for Energy Sector

Abstract

"After the 2020 COVID-19 pandemic, which had a massive impact on work processes, there was a shift to working from home. Consequently, this transition has led to an increasing number of cyberattacks. In the beginning, malware constituted the main mode of cyberattacks; however, ransomware has now become common. A study conducted in 2023 established that ransomware attacks in the energy sector doubled compared to the previous year hence making it imperative to carry out research on this area focusing on ransomware as a threat and using 2S matrixes for analysis. This is documentary research that gathers information from research articles and documents from foreign security agencies. The collected information is analyzed by using the 2S Matrix Framework to make it easy and understandable"

Keywords: Ransomware, Malware, 2S Matrix, Cyberattack, Ransomware Gangs, Energy Sector

NCIT2024_17: Systematic Literature Review on AI Literacy in workplace

Abstract

Artificial Intelligence (AI) plays a crucial role in current work practices, making AI literacy an essential skill for applying this technology. This study aims to analyze the components of AI literacy for work by conducting a systematic literature review from Scopus and Google Scholar databases between 2019-2023. Out of 682 related articles, 9 were found suitable for analysis based on the selection criteria. The content analysis results synthesized 8 key components of AI literacy for work: Understanding Intelligence, Critically Interpreting Data, Imagine Future AI, Human Role in AI, AI ethics, Decision-Making, Data Literacy, and Programmability. These components are vital for preparing personnel to cope with technological changes. The findings of this study can be used to design training courses for organizational personnel.

Keywords: AI literacy, AI literacy competencies, Systematic literature review

NCIT2024_18: การพัฒนาแอปพลิเคชันนิตยสารดุลพาห สำนักงานศาลยุติธรรม (Development of Dunlaphaha Journal of the Court of Justice Application)

Abstract

“นิตยสารดุลพาห” เป็นงานทางวิชาการของสำนักงานศาลยุติธรรม จัดทำเพื่อ 1) เผยแพร่ผลงานวิชาการ ผลการศึกษาวิจัย รวมทั้งความรู้ด้านกฎหมาย กระบวนการยุติธรรม และด้านอื่น ๆ แก่ผู้พิพากษา บุคลากร ของศาลยุติธรรม นักวิชาการ ผู้ปฏิบัติงาน รวมถึงประชาชนผู้สนใจ 2) เพื่อเป็นสื่อกลางในการแลกเปลี่ยน ผลงานวิชาการ ปัญหา และแนวทางแก้ไขในทางปฏิบัติระหว่างผู้พิพากษา บุคลากรของศาลยุติธรรม นักวิชาการ ใช้วิธีเผยแพร่โดยการตีพิมพ์เป็นเล่ม จากการศึกษาพบปัญหาคือวิธีเผยแพร่นิตยสารที่เป็นการ ตีพิมพ์ที่จำกัดจำนวนไม่เพียงพอต่อความต้องการ การค้นหาข้อมูลใช้เวลานาน งานวิจัยนี้จึงได้นำเสนอ การ วิเคราะห์ ออกแบบ และการพัฒนาแอปพลิเคชันนิตยสารดุลพาห สำนักงานศาลยุติธรรม บนอุปกรณ์ สมาร์ทโฟน เนื่องจากสมาร์ทโฟนเป็นอุปกรณ์ที่ใช้งานสะดวก พกพาไปได้ทุกที่ทำให้การเข้าอ่านนิตยสาร ง่าย และสะดวก นิตยสารดุลพาหที่ตีพิมพ์จะถูกนำมารวบรวมไว้ในแอปพลิเคชันนี้ เป็นการลดข้อจำกัดของ การเผยแพร่นิตยสาร ลดเวลาในการค้นหาข้อมูลจากนิตยสาร เป็นการเพิ่มความพึงพอใจของผู้ใช้งาน และ นำความรู้จากนิตยสารไปเป็นแนวทางแก้ปัญหาต่าง ๆ ได้

Keywords: นิตยสารดุลพาห, สำนักงานศาลยุติธรรม, แอปพลิเคชัน

NCIT2024_19: Influence of Photo Genres Affecting the Purchase Decision Through NFTs Fundraising in Non-Profit Organizations

Abstract

This research is a qualitative study aimed at examining the influence of photography genres affecting the purchase decision through NFTs fundraising in non-profit organizations. The selection criteria for the types of photographs were based on international photography contests and institutions, totaling 20 categories from 5 different sources. These were compared with the types of NFT photographs purchased through the fundraising project of one international non-profit organization. Additionally, the researcher collaborated with a domestic non-profit organization to organize another NFT photography fundraising project. According to the research results, during the 3-month fundraising period, a total of 53 items were purchased, accounting for 27.75%. Lifestyle Photo Genre had the highest number of purchases, with 11 items sold, accounting for 20.75%. This was followed by Environment Photo Genre, with 8 items purchased, representing 15.09%. The Animal and Portrait Photo Genres both recorded 5 purchases each, accounting for 9.43% respectively.

Keywords: Photo Genre, Non-Fungible Token, Fundraising, Non-Profit Organizations

NCIT2024_20: การวิเคราะห์พฤติกรรมความผิดปกติของผู้ขับขี่ จากทิศทางการมองและการ
กะพริบตา

Abstract

สถิติอุบัติเหตุทางรถยนต์ทั่วโลกส่วนใหญ่เกิดจากพฤติกรรมการขับขี่ที่ผิดปกติ เช่น การขับรดโดยเสียสมาธิ ขาดสมาธิ การใช้โทรศัพท์มือถือ การปรับวิทยุในรถยนต์หรือระบบอื่นๆ การขับรดด้วยความเหนื่อยล้าหรือง่วงนอนอาจนำไปสู่การเกิดอุบัติเหตุโดยตรงอันเนื่องมาจากพฤติกรรมการขับขี่ที่ผิดปกติ นอกจากนี้ยังส่งผลให้เกิดความเสียหายต่อทรัพย์สินและอาจทำให้เกิดอันตรายต่อตนเองและผู้อื่น ส่งผลให้ได้รับบาดเจ็บหรือเสียชีวิต การขับขี่ที่ผิดปกติสามารถระบุได้จากการแสดงออกทางสีหน้า การหาว การกะพริบตา หรือการมองไปทางอื่น ความเหนื่อยล้าแสดงออกโดยการกะพริบตามากเกินไป เพื่อวิเคราะห์ปัจจัยที่ส่งผลต่อการเกิดอุบัติเหตุทางรถยนต์ นักวิจัยได้เสนอ อัลกอริทึม **Unified Driver Attention and Fatigue Detection (UDAF)** เพื่อการปรับปรุงประสิทธิภาพในการตรวจจับพฤติกรรมการขับขี่ที่ผิดปกติโดยการตรวจจับทิศทางการมองและการกะพริบตาโดยใช้ **Virtual Geometry Group (VGG16)** และ **Long Short-Term Memory (LSTM)** ในการวิจัยนี้ ได้ทำการทดลองกับภาพและวิดีโอจากกล้องด้านหน้า โดยวิจัยนี้จากการตรวจจับทิศทางการมองและการกะพริบตาผ่าน อัลกอริทึม **UDAF** มีอัตราความแม่นยำโดยเฉลี่ย **93.12%**

Keywords: ทิศทางการมอง, การกะพริบตา, UDAF, VGG16, LSTM

NCIT2024_21: Application of Artificial Intelligence in Digital Media Production

Abstract

The purpose of this research were to 1) Study the effectiveness index of artificial intelligence application in digital media production, 2) Study the creativity of students from the application of artificial intelligence in digital media production, 3) To study learner satisfaction from the application of artificial intelligence in digital media production. The sample group used in this research were Undergraduate students who are enrolled in the courses Digital Media Production Visual Effect, first semester of the academic year 2024 at Faculty of Computer Science, Ubon Ratchathani Rajabhat University which consist of 30 students. The research instruments were lesson plans, learning achievement test, creative thinking test and satisfaction survey form. The statistics used in data analysis were mean, percentage, standard deviation and efficiency index. The results of the research found that 1) The results of the application of artificial intelligence found that the effectiveness index was equal to 0.6025, or 60.25 percent, respectively, 2) The Creative thinking of students: 75 percent, which is higher than the specified threshold of 60 percent, 3) The results of student satisfaction were found to be the highest level.

Keywords: Artificial Intelligence, Digital Media, Creative Thinking

NCIT2024_22: การวิเคราะห์ส่วนประสานกับผู้ใช้ของตลาดออนไลน์ด้วยแผนที่ความร้อนแบบกริด (Aujchariyapol Suriya, Suphawit Kankam, Benchaporn, Jantarakongkul and Prajaks Jitngernmadan)

Abstract

การศึกษานี้มุ่งวิเคราะห์ส่วนประสานกับผู้ใช้ (UI) ของตลาดออนไลน์จำนวน 4 แห่ง โดยใช้วิธีการวางกริดขนาด 12x12 ช่องลงบนหน้าเว็บไซต์ เพื่อระบุตำแหน่งของอิลิเมนต์สำคัญ เช่น โลโก้ ช่องค้นหา และตะกร้าสินค้า วัตถุประสงค์คือเพื่อค้นหาความคล้ายคลึงในการจัดวางองค์ประกอบและประเมินความสอดคล้องกับหลักการออกแบบที่มีผู้ใช้เป็นศูนย์กลาง ผลการวิจัยแสดงให้เห็นว่าเว็บไซต์ส่วนใหญ่มีการจัดวางอิลิเมนต์สำคัญในตำแหน่งที่คล้ายคลึงกัน โดยมีกลุ่มอยู่บริเวณกึ่งกลางด้านบนของหน้าเว็บ และมีการจัดเรียงจากซ้ายไปขวาและบนลงล่าง สอดคล้องกับรูปแบบการอ่านภาษาไทย การวิเคราะห์นี้ให้ข้อมูลเชิงลึกที่มีคุณค่าสำหรับการปรับปรุงการออกแบบเว็บไซต์ตลาดออนไลน์ โดยมุ่งเน้นการสร้าง เลย์เอาต์ที่เป็นมิตรต่อผู้ใช้งานมากขึ้น การศึกษานี้ใช้แผนที่ความร้อน (heat map) เพื่อแสดงความถี่ของการวางอิลิเมนต์สำคัญ ซึ่งช่วยให้เห็นภาพรวมของการออกแบบที่เป็นที่นิยมได้อย่างชัดเจน นอกจากนี้ ยังพบว่าการจัดวางองค์ประกอบที่สอดคล้องกับพฤติกรรมการอ่านของผู้ใช้ช่วยเพิ่มประสิทธิภาพในการทำงานและความพึงพอใจของผู้ใช้ ผลการวิจัยนี้มีนัยสำคัญต่อนักออกแบบ UI/UX และผู้พัฒนาเว็บไซต์ตลาดออนไลน์ โดยสามารถนำไปประยุกต์ใช้ในการออกแบบเว็บไซต์ให้มีความเป็นสากลมากขึ้น และตอบสนองความต้องการของผู้ใช้งานได้ดียิ่งขึ้น ซึ่งจะส่งผลต่อประสบการณ์ผู้ใช้โดยรวมและอาจนำไปสู่การเพิ่มประสิทธิภาพทางธุรกิจในระยะยาว

Keywords: Artificial Intelligence, Digital Media, Creative Thinking

Abstract

การศึกษานี้มุ่งวิเคราะห์ส่วนประสานกับผู้ใช้ (UI) ของตลาดออนไลน์จำนวน 4 แห่ง โดยใช้วิธีการวางกริดขนาด 12x12 ช่องลงบนหน้าเว็บไซต์ เพื่อระบุตำแหน่งของอิลิเมนต์สำคัญ เช่น โลโก้ ช่องค้นหา และตะกร้าสินค้า วัตถุประสงค์คือเพื่อค้นหาความคล้ายคลึงในการจัดวางองค์ประกอบและประเมินความสอดคล้องกับหลักการออกแบบที่มีผู้ใช้เป็นศูนย์กลาง ผลการวิจัยแสดงให้เห็นว่าเว็บไซต์ส่วนใหญ่มีการจัดวางอิลิเมนต์สำคัญในตำแหน่งที่คล้ายคลึงกัน โดยมีก้อยู่บริเวณกึ่งกลางด้านบนของหน้าเว็บ และมีการจัดเรียงจากซ้ายไปขวาและบนลงล่าง สอดคล้องกับรูปแบบการอ่านภาษาไทย การวิเคราะห์นี้ให้ข้อมูลเชิงลึกที่มีคุณค่าสำหรับการปรับปรุงการออกแบบเว็บไซต์ตลาดออนไลน์ โดยมุ่งเน้นการสร้าง เลย์เอาต์ที่เป็นมิตรต่อผู้ใช้งานมากขึ้น การศึกษานี้ใช้แผนที่ความร้อน (heat map) เพื่อแสดงความถี่ของการวางอิลิเมนต์สำคัญ ซึ่งช่วยให้เห็นภาพรวมของการออกแบบที่เป็นที่นิยมได้อย่างชัดเจน นอกจากนี้ ยังพบว่าการจัดวางองค์ประกอบที่สอดคล้องกับพฤติกรรมการอ่านของผู้ใช้ช่วยเพิ่มประสิทธิภาพในการใช้งานและความพึงพอใจของผู้ใช้ ผลการวิจัยนี้มีนัยสำคัญต่อนักออกแบบ UI/UX และผู้พัฒนาเว็บไซต์ตลาดออนไลน์ โดยสามารถนำไปประยุกต์ใช้ในการออกแบบเว็บไซต์ให้มีความเป็นสากลมากขึ้น และตอบสนองความต้องการของผู้ใช้งานได้ดียิ่งขึ้น ซึ่งจะส่งผลต่อประสบการณ์ผู้ใช้โดยรวมและอาจนำไปสู่การเพิ่มประสิทธิภาพทางธุรกิจในระยะยาว

Keywords: ส่วนประสานกับผู้ใช้, วิเคราะห์, แผนที่ความร้อน, กริด, ตลาดออนไลน์

NCIT2024_22: ระบบจัดการร้านอาหารเลิศรสหมูกระทะ Restaurant Management System: Lert-Ros Thai BBQ Pork Virasinee Thaweessri, Korawit Chorasat and Theerada Chotipant

Abstract

การศึกษานี้มุ่งวิเคราะห์ส่วนประสานกับผู้ใช้ (UI) ของตลาดออนไลน์จำนวน 4 แห่ง โดยใช้วิธีการวางกริดขนาด 12x12 ช่องลงบนหน้าเว็บไซต์ เพื่อระบุตำแหน่งของอิลิเมนต์สำคัญ เช่น โลโก้ ช่องค้นหา และตะกร้าสินค้า วัตถุประสงค์คือเพื่อค้นหาความคล้ายคลึงในการจัดวางองค์ประกอบและประเมินความสอดคล้องกับหลักการออกแบบที่มีผู้ใช้เป็นศูนย์กลาง ผลการวิจัยแสดงให้เห็นว่าเว็บไซต์ส่วนใหญ่มีการจัดวางอิลิเมนต์สำคัญในตำแหน่งที่คล้ายคลึงกัน โดยมีก้อยู่บริเวณกึ่งกลางด้านบนของหน้าเว็บ และมีการจัดเรียงจากซ้ายไปขวาและบนลงล่าง สอดคล้องกับรูปแบบการอ่านภาษาไทย การวิเคราะห์นี้ให้ข้อมูลเชิงลึกที่มีคุณค่าสำหรับการปรับปรุงการออกแบบเว็บไซต์ตลาดออนไลน์ โดยมุ่งเน้นการสร้าง เลย์เอาต์ที่เป็นมิตรต่อผู้ใช้งานมากขึ้น การศึกษานี้ใช้แผนที่ความร้อน (heat map) เพื่อแสดงความถี่ของการวางอิลิเมนต์สำคัญ ซึ่งช่วยให้เห็นภาพรวมของการออกแบบที่เป็นที่นิยมได้อย่างชัดเจน นอกจากนี้ ยังพบว่าการจัดวางองค์ประกอบที่สอดคล้องกับพฤติกรรมการอ่านของผู้ใช้ช่วยเพิ่มประสิทธิภาพในการทำงานและความพึงพอใจของผู้ใช้ ผลการวิจัยนี้มีนัยสำคัญต่อนักออกแบบ UI/UX และผู้พัฒนาเว็บไซต์ตลาดออนไลน์ โดยสามารถนำไปประยุกต์ใช้ในการออกแบบเว็บไซต์ให้มีความเป็นสากลมากขึ้น และตอบสนองความต้องการของผู้ใช้งานได้ดียิ่งขึ้น ซึ่งจะส่งผลต่อประสบการณ์ผู้ใช้โดยรวมและอาจนำไปสู่การเพิ่มประสิทธิภาพทางธุรกิจในระยะยาว

Keywords: ระบบร้านอาหาร, อาหารบุฟเฟต์, ร้านเนื้อย่าง

NCIT2024_23: CONSUMER BEHAVIOR ANALYSIS IN DOCTOR DRUG PHARMACY

Abstract

This research aims to analyze the behavior of consumers using services at Dr. Drugstore. In studying and analyzing the data of consumer vitamin product purchases to obtain the best relationship rules, the researcher collected the purchase data from January 2020 to December 2021, totaling 39,859 items, by using data mining techniques and preparing, adjusting, and filtering data for only 15 sample vitamin product purchases, including vitamin C, vitamin B, vitamin A, multivitamins, zinc, glutathione, collagen, L-carnitine, astaxanthin, evening primrose, coenzyme Q10, vitamin E, fish oil, calcium, and biotin, totaling 2,000 items. The data group was written as a data set using the relationship rules using the Apriori algorithm. The data was processed and analyzed using the WEKA program. The research results tested 30 relationship rules, which showed that every time consumers bought vitamin supplements, they mostly bought vitamin C. The results of the study analyzing consumer behavior in Dr. Drug stores can be used for marketing purposes in organizing sales promotion activities, introducing vitamin products for body care, and preparing sufficient stock for sales.

Keywords: Data mining, association rules, apriori algorithm, WEKA program, vitamins

NCIT2024_24: การวิเคราะห์ความสัมพันธ์ระหว่างการปล่อยก๊าซมีเทนและการใช้ที่ดิน
ของพื้นที่นาข้าวโดยใช้ภาพถ่ายจากดาวเทียม Sentinel-2 และ Sentinel-5P

Abstract

งานวิจัยนี้วิเคราะห์ความสัมพันธ์ระหว่างการปล่อยก๊าซมีเทนและการใช้ที่ดินในพื้นที่นาข้าว โดยใช้ข้อมูลจากภาพถ่ายดาวเทียม Sentinel-2 และ Sentinel-5P ในจังหวัดสุพรรณบุรี ผลการศึกษาพบว่าไม่มีความสัมพันธ์ชัดเจนระหว่างก๊าซมีเทนกับค่า NDVI อย่างไรก็ตาม พบว่าประเภทนาข้าวที่ 3 (นาข้าวที่เก็บเกี่ยวแล้ว) มีค่า NDVI ในช่วง 0.00 ถึง 0.50 และค่ามีเทนในช่วง 1930 ถึง 1960 ซึ่งต่ำกว่าประเภทอื่น นอกจากนี้ ยังพบความสัมพันธ์ระหว่าง NDVI กับพื้นที่นาข้าว และการกระจายตัวของก๊าซมีเทนใน Band 4 ที่ต่ำสุดในนาข้าวประเภท 3

Keywords: ก๊าซมีเทน, นาข้าว, Sentinel-2, Sentinel-5P, NDVI

Abstract

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา ออกแบบ และทดลองใช้โครงข่ายประสาทเทียมในการส่งข้อมูลรูปภาพของค่าแรงดันเลือดจากฐานงานรับสัญญาณดาวเทียมไวแซท ไปยังอาคารปฏิบัติการดาวเทียมธีออสทุก ๆ 1 ชั่วโมง เพื่อลดระยะเวลาในการติดตามและเพิ่มประสิทธิภาพในการตรวจสอบค่าแรงดัน ระบบที่พัฒนาขึ้นมีการแสดงข้อมูลในรูปแบบของรูปภาพและตัวเลขดิจิทัล ซึ่งช่วยในการตรวจสอบและป้องกันความเสียหายที่อาจเกิดขึ้นกับอุปกรณ์ การใช้โครงข่ายประสาทเทียมในการสื่อสารระยะไกลเป็นวิธีที่มีประสิทธิภาพในการใช้พลังงานต่ำและลดความล่าช้าในการติดตามผล นอกจากนี้ ข้อมูลที่ได้รับยังสามารถนำไปต่อยอดในการประมวลผล เช่น การใช้ปัญญาประดิษฐ์เพื่อทำนายปัญหาที่อาจเกิดขึ้นในอนาคต

Keywords: โรคหัวใจโต, ภาพเอกซเรย์, CLAHE, Color Histogram, Otsu Thresholding, ResNet-50

NCIT2024_26: การออกแบบและพัฒนาระบบส่งภาพค่าแรงดันเสิร์จผ่านโพรโทคอลลอร่า เพื่อตรวจสอบสถานีฐานงานรับสัญญาณดาวเทียมไวแซท

Abstract

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา ออกแบบ และทดลองใช้โพรโทคอลลอร่าในการส่งข้อมูลรูปภาพของค่าแรงดันเสิร์จจากสถานีฐานงานรับสัญญาณดาวเทียมไวแซท ไปยังอาคารปฏิบัติการดาวเทียมหรือออสทุก ๆ 1 ชั่วโมง เพื่อลดระยะเวลาในการติดตามและเพิ่มประสิทธิภาพในการตรวจสอบค่าแรงดัน ระบบที่พัฒนาขึ้นมีการแสดงข้อมูลในรูปแบบของรูปภาพและตัวเลขดิจิทัล ซึ่งช่วยในการตรวจสอบและป้องกันความเสียหายที่อาจเกิดขึ้นกับอุปกรณ์ การใช้โพรโทคอลลอร่าในการสื่อสารระยะไกลเป็นวิธีที่มีประสิทธิภาพในการใช้พลังงานต่ำและลดความล่าช้าในการติดตามผล นอกจากนี้ ข้อมูลที่ได้รับยังสามารถนำไปต่อยอดในการประมวลผล เช่น การใช้ปัญญาประดิษฐ์เพื่อทำนายปัญหาที่อาจเกิดขึ้นในอนาคต

Keywords: การส่งข้อมูลภาพ, โพรโทคอลลอร่า, ค่าแรงดันเสิร์จ, การสื่อสารระยะไกล, ปัญญาประดิษฐ์

NCIT2024_27: Guidelines for Developing 'Mor Prom' Application to Handle Future Emerging Diseases

Abstract

This research aims to develop guidelines to enhance the 'Mor Prom' application to handle future emerging diseases. The focus is improving user experience, optimizing vaccine and healthcare service booking, and integrating with national health databases. The study will draw from user feedback and lessons learned from the use of 'Mor Prom' during the COVID-19 pandemic to propose a design that can rapidly adapt to changing health scenarios. The application should be user-friendly, secure, and scalable to meet users' needs. The research highlights the importance of real-time notification systems, telemedicine integration, digital health record management, and interoperability with international health applications, ensuring the app is ready to support global health crises. The findings will present design guidelines that enhance the app's efficiency in managing public health and increase its flexibility in responding to future emerging diseases.

Keywords: MorProm application, emerging diseases, Technology Acceptance Model (TAM), App development

NCIT2024_28: Satisfaction and Reliability of Use the ECU Remap Program System for 4-6 Wheel in Bangkok and Metropolitan Region

Abstract

The objectives of this research are (1) To study the factors affecting satisfaction of ECU service recipients remap program system for 4-6 wheel in Bangkok and Metropolitan Region (2) To study the factors affecting Reliability of users ECU remap program system for 4-6-wheel in Bangkok and Metropolitan Region. Analytical approach using quantitative research methods by conducting empirical research, the population is using remap program system of the 4–6-wheel cars in Bangkok and Metropolitan Region using a questionnaire as a tool to collect data from a sample of 400 sets of statistics. Percentage Average finding Determination of standard and non-standard bias Multiple regression analysis.

Keywords: Satisfaction, Reliability, ECU remap program system

NCIT2024_29: A STUDY ON THE APPROACH TO ADJUSTING THE PRODUCTION MODEL AND THE DEVELOPMENT OF A CLEAN CASSAVA DRYER BY USING SOLAR CELL TECHNOLOGY.

Abstract

The purpose of this research is to study data on the installation of a Solar cell for cassava dryers. Information of entrepreneurs for cassava production and investment information of the project to analyze Technical and economic possibilities by installing solar panels. To change the original using the courtyard for drying. The method of the dried courtyard has disadvantages in terms of uncontrollable environment, thus resulting in unstable image quality, humidity control and sand content when exported to the market. Has carried out research into Step 1 Study of the design and installation of solar panels for the cassava dryer. Step 2 Study the break-even point of the project. The study found that the average solar energy was 4.46 kWh per day. The system produces an average of 978.64 kWh per month. The specific energy value that the system produces is 1,467.95 kWh / kW maximum. There is an area for installing the system in X MW, with a 25-year project life, that will generate 16,837,549 kWh of electricity. From analysis of financial feasibility by using the project investment equal to X baht, the investment period is 5-6 years at a discount rate of 8.4%. The financial index can be calculated as follows: The net present value is 89,125.64 baht, the internal rate of return of the project is 15.15 percent per year. The adjusted project internal rate of return is 10.44% per year, the benefit to cost ratio is 1.04, the net return on investment ratio is 1.59, and the project payback period is 3 years and 6 months if the system is in use. Until 25 years, the resulting savings is 35.49, 31.25 and 36.78 million baht, respectively, and will be able to reduce the carbon emissions by 9,531.73 tons.

Keywords: Solar Cell project, Feasibility study of project investment, A clean cassava dryer

NCIT2024_30: A Systematic Literature Review on Developing Integrated Reporting Platforms for Corporate Sustainability of Thai Listed Companies using AI technology

Abstract

This research aims to study a sustainability reporting platform for Thai listed companies integrated with artificial intelligence (AI) technology through a systematic literature review. The study is categorized into four main groups: (1) ESG prediction and evaluation using machine learning techniques, (2) ESG-based investment modeling, (3) natural language processing and sentiment analysis, and (4) development of decision support systems. The results indicate that applying AI can enhance accuracy, transparency, and efficiency in ESG assessment for sustainable investment. It also provides a guideline for developing platforms that can adapt to changing environmental factors in the future.

Keywords: ESG Assessment, Sustainability, Artificial Intelligence (AI), Systematic Literature Review.

NCIT2024_31: การจำแนกโรคในใบพืชด้วยวิชันทรานฟอร์มเมอร์

Abstract

การเพาะปลูกพืชทางการเกษตรต้องการการดูแลรักษาที่ดีเพื่อลดความเสี่ยงจากการเกิดโรคพืชที่อาจส่งผลกระทบต่อผลผลิตอย่างรุนแรง. งานวิจัยนี้มีเป้าหมายในการตรวจจับและจำแนกโรคในใบพืชโดยการสกัดคุณลักษณะเฉพาะจากภาพถ่ายของใบพืช ผู้วิจัยได้ใช้ชุดข้อมูลที่ประกอบด้วยภาพของใบพืช 7 สายพันธุ์ โดยที่พืชแต่ละสายพันธุ์ประกอบไปด้วยโรค 3 ชนิด รวมทั้งหมด 21,733 ภาพ ขั้นตอนสำคัญเริ่มจากการปรับขนาดและคุณภาพของภาพด้วยการปรับความสว่างและความคมชัด จากนั้นทำการแปลงค่าสีภาพเป็นระบบสี (CIE Lab color space) และใช้การจัดกลุ่มข้อมูลด้วยอัลกอริทึม K-means เพื่อเน้นลักษณะสำคัญของภาพ เมื่อได้ข้อมูลที่ผ่านการประมวลผลแล้วจึงนำเข้าสู่กระบวนการเรียนรู้ของเครื่อง งานวิจัยนี้ใช้แบบจำลอง Vision Transformer (ViT) ที่สามารถตรวจจับและจำแนกลักษณะของโรคในใบพืชได้อย่างมีประสิทธิภาพ เทคโนโลยีนี้จะช่วยให้การตรวจพบโรคในใบพืชตั้งแต่ระยะแรกเริ่มเป็นไปได้อย่างแม่นยำ เพิ่มโอกาสในการป้องกันและลดความเสียหายของพืชผล ซึ่งเป็นประโยชน์ต่อการเกษตรและเศรษฐกิจโดยรวม จากผลการทดลองชี้ให้เห็นว่าการตรวจจับโรคของใบพืชจากชุดข้อมูลที่ผ่านการบวนการ CIE LAB และ K-means มีค่าความแม่นยำอยู่ที่ 82.7%

Keywords: โรคในใบพืช, CIE Lab color space, K-means, Vision Transformer

NCIT2024_32: วิเคราะห์โรคเลือดออกใต้เยื่อหุ้มสมองชั้นดูรา โดยการจัดกลุ่มโรค และ ICD-10 Data analysis of subdural hemorrhage by subgroup classification and ICD-10

Abstract

Subdural hemorrhage คือโรคเลือดออกใต้เยื่อหุ้มสมองชั้นดูรา ในการสืบค้นอ้างอิงปัจจุบันใช้ระบบ ICD-10 ซึ่งได้แก่รหัส S065 (Acute traumatic subdural hemorrhage) และ I620 (Acute non-traumatic subdural hemorrhage) อย่างไรก็ตามการบันทึกการวินิจฉัยที่เป็น Diagnosis text จะมีการแบ่งประเภทโรคเป็นแบบ Acute หรือ Chronic ซึ่งทฤษฎีปัจจุบัน Chronic subdural hemorrhage กลไกการเกิดโรค และการดำเนินโรคที่แตกต่างกันออกไป ทำให้การดึงข้อมูลไปใช้ต่อในการบริหารจัดการทรัพยากร งานวิจัยต่างๆ ยังไม่ได้ประสิทธิภาพเท่าที่ควร จึงเป็นที่มาของงานวิจัยนี้ วัตถุประสงค์ : เพื่อศึกษาการอ้างอิงถึงโรค Subdural hemorrhage จากการใช้ ICD-10 เปรียบเทียบกับการแบ่งประเภท Subdural hemorrhage ตามกลไกการเกิดโรค วิธีดำเนินงานวิจัย : การศึกษาแบบ Retrospective study ข้อมูลผู้ป่วยในโรงพยาบาลค่ายสุรนารี ตั้งแต่ 1 ส.ค. 2563 ถึง 31 ก.ค. 2567 ที่ได้รับการวินิจฉัยเป็น Subdural hemorrhage มาทำการแบ่งกลุ่มใหม่ตามกลไกการเกิด ออกเป็น Acute traumatic subdural hemorrhage, Acute non-traumatic subdural hemorrhage และ Membrane-associated subdural hemorrhage จากนั้นวิเคราะห์ตัวแปรที่แสดงรูปแบบของตัวกลุ่มโรคแต่ละประเภทนำเสนอ ผลการวิจัย : 95 รายที่ได้รับการคัดเลือกพบว่า S065 และ I620 สามารถอ้างอิงถึงกลุ่ม Acute traumatic subdural hemorrhage และกลุ่ม Acute non-traumatic subdural hemorrhage ได้อย่างแม่นยำ แต่กลุ่ม Membrane-associated subdural hemorrhage ถูกอ้างอิงจาก S065 จำนวน 22 ราย คิดเป็นร้อยละ 40 และ I620 จำนวน 33 ราย คิดเป็นร้อยละ 60 เมื่อวิเคราะห์ตัวแปรพบว่ากลุ่ม Membrane-associated subdural hemorrhage มีอัตราตายน้อยที่สุดและชนิดการรักษาของผู้ป่วยในจะพิจารณารับการผ่าตัดเป็นส่วนใหญ่ สรุปผลการวิจัย : การแบ่งประเภท Subdural hemorrhage ตามกลไกการเกิด สะท้อนรูปแบบของโรคได้ชัดเจนกว่า การแบ่งตาม ICD-10 ควรมีการเพิ่มรหัสที่เป็นสากลที่จะอ้างอิงถึงโรค Membrane-associated subdural hemorrhage หรือ Chronic subdural hemorrhage

Keywords: Chronic subdural hemorrhage, Subdural hemorrhage, ICD-10

NCIT2024_33: A study of the performance of machine learning models in image classification for classifying electronic product and its customs tariffs

Abstract

This thesis aims to evaluate the performance of machine learning models in classifying electronic product images and their respective customs tariffs using deep learning techniques. The study focuses on applying Convolutional Neural Networks (CNN) to enhance the accuracy and efficiency of image classification systems, particularly in the customs domain. By integrating these models into web and mobile applications, the system will facilitate faster and more accurate classification of products for customs declarations. This research also compares the performance of different machine learning models, highlighting the advantages of using CNNs for this task. The findings indicate that CNN-based models can significantly improve the classification accuracy, making them suitable for customs and tariff management.

Keywords: Customs Tariffs, Image Classification, Convolutional Neural Networks

NCIT2024_34: Optimizing Gas Efficiency in Ethereum Smart Contracts: A Comparative Study of Development Tools and Techniques

Abstract

This research focuses on reducing transaction fees on the Ethereum blockchain by optimizing the efficiency of smart contracts written in Solidity. The study found that various techniques, such as using call data instead of memory, ignoring boundary operations, and utilizing the unchecked function (under safe conditions), significantly reduce gas costs. Experiments conducted using development tools like Remix, Truffle, and Hardhat demonstrated that the choice of tools and configurations can impact gas efficiency. Furthermore, the research highlights the importance of efficient data management and reducing unnecessary computations in minimizing gas costs.

Keywords: Gas optimization Transactions, Gas Fees, Blockchain, Solidity

Posters

Not included in IEEE Xplore

A Personal Authentication Method Using Insole-Type Gait Sensors Based on Deep Metric Learning

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Abstract—In this study, we propose a personal authentication method using insole-type gait sensors based on deep metric learning. In previous research, the machine learning model used for personal authentication (random forest) faced the problems of being unable to authenticate unseen subjects. Therefore, we replaced the random forest with deep metric learning, aiming to create a more versatile system capable of authenticating unseen subjects while also improving personal authentication accuracy. In the evaluation experiment, we used gait data collected from 12 subjects with commercially available insole sensors and evaluated the effectiveness of the proposed system using the Equal Error Rate (EER). As a result, the proposed system demonstrated superior performance compared to the conventional system.

Index Terms—Gait, Insole-Type, Biometric Authentication

I. INTRODUCTION

In recent years, with the widespread use and technological advancements of mobile devices, sensitive and personal information is now constantly being stored on them. The importance of personal authentication technologies that verify the identity of the device user when accessing such information has become more important than ever. One commonly used authentication method is Single-Factor Authentication (SFA). This method involves verifying the user's identity only once, typically at the start of a session, using a single authentication method. A common example of this is authentication by entering a username and password. However, this approach is not considered very secure because unauthorized access can easily occur if the username or password is compromised. To overcome these challenges of single certification, a method called continuous authentication was introduced [1] [2]. Continuous authentication continuously verifies the user's identity during device usage by utilizing physical and behavioral characteristics, preventing unauthorized use by third parties. By implementing continuous authentication, the risk of unauthorized access can be reduced, and stronger security can be achieved [3]. Furthermore, continuous authentication uses unconscious, everyday actions rather than deliberate behaviors, allowing authentication without placing a burden on the user. Therefore, we have focused on gait, an unconscious and highly

unique behavior that is difficult to forge, and have developed a personal authentication system for continuous authentication using gait data measured by commercially available insole-type gait sensors [4]. In this paper, we propose an enhanced personal authentication method using deep metric learning to improve the versatility and accuracy of this system, and we demonstrate its effectiveness through evaluation experiments.

II. PREVIOUS PERSONAL AUTHENTICATION SYSTEM

A. Overview of Previous Personal Authentication Systems

Fig. 1 shows an overview of the previous personal authentication system. The system outputs the probability of identification using gait data measured by insole-type gait sensors (hereinafter referred to as gait sensors) and a machine learning model (random forest). If the identification probability calculated by the model is greater than the pre-set threshold, the input is authenticated as the person. If it is below the threshold, authentication is rejected as not being the person. In this study, we used gait sensors developed by NEC Corporation [5]. The gait sensors are attached to the insoles, and gait parameters are measured for every two steps of both the left and right foot while walking. Table I shows the 24 gait parameters that can be measured by the gait sensors. In this study, 23 gait parameters were used, excluding the frailty level, which is not directly related to the walking motion. As part of the preprocessing of the obtained gait parameters, the difference data between both feet's gait parameters (the difference between the left foot's gait parameters and the right foot's gait parameters) is calculated. Additionally, a moving average over 10 steps (a total of 5 values) was applied to calculate the gait parameters for both the left and right foot. Thus, the input to the system is the difference data between both feet, obtained from the moving average of each foot's gait parameters measured by the gait sensor. The output is the personal authentication result, determined by the identification probability obtained from the random forest and the pre-set threshold.

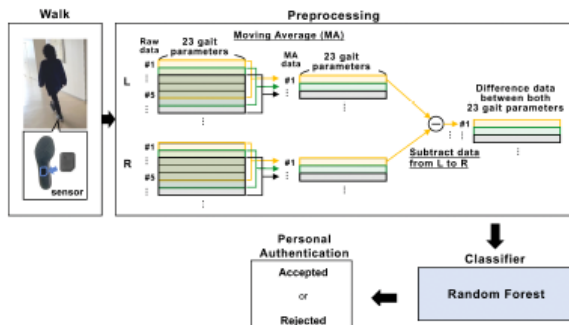


Fig. 1: Previous personal authentication system.

TABLE I: Gait parameters measurable by gait sensors.

Description (Unit)	Description (Unit)
Walking speed (km/h)	Stride length (cm)
Maximum foot sole angle in plantarflexion (deg)	Maximum foot sole angle in dorsiflexion (deg)
Foot height (cm)	Circumduction (cm)
Toe-in/out angle (deg)	Hallux value angle (deg)
Minimum toe clearance (cm)	Foot clearance (cm)
Roll angle at heel contact (deg)	Roll angle at toe-off (deg)
Center of pressure exclusion index (%)	Peak angular velocity during swing phase (deg/s)
Maximum speed during swing phase (m/s)	Cadence (step/min)
Duration of loading response (sec)	Duration of preswing (sec)
Stance phase time (sec)	Swing phase time (sec)
Duration from heel contact to foot flat (sec)	Duration from foot flat to heel release (sec)
Duration from heel release to toe release (sec)	Frailty level (-)

B. Problems with Previous Personal Authentication Systems

Through previous evaluation experiments [4], it has been demonstrated that high-accuracy personal authentication can be performed using the difference data between both feet calculated from gait parameters with a random forest, confirming the usefulness of the system. However, due to the nature of the random forest, it is necessary to pre-train on the gait data of the individual being authenticated. When a new individual appears, retraining is required, which limits the system's versatility. To overcome such limitations, it is necessary to build a system that allows authentication without the need to learn the gait data of the individual being authenticated, requiring only registration. This would enhance the system's versatility and enable the realization of a more practical personal authentication system. Based on these considerations, this paper proposes a personal authentication system based on deep metric learning.

III. PROPOSED PERSONAL AUTHENTICATION SYSTEM

Fig. 2 shows an overview of the personal authentication system based on deep metric learning. Gait data measured

by the gait sensor is used to output an embedding vector through a deep metric learning model. The cosine similarity between the pre-registered embedding vector and the authentication embedding vector output during authentication is calculated. If the similarity is greater than the pre-set threshold, the input is authenticated as the person. If it is below the threshold, authentication is rejected as not being the person. The constructed deep metric learning model has two intermediate layers with 64 nodes, using the sigmoid function as the activation function. The final output embedding vector is 16-dimensional. The weights of the layers were initialized randomly. For training, the Adam optimizer was used, and the loss function was Triplet Margin Loss. Additionally, cosine similarity was used for distance calculation, with the margin set to 0.2. Thus, the input to the system is the difference data between both feet, obtained from the moving average of each foot's gait parameters measured by the gait sensor. The output is the personal authentication result, determined by the cosine similarity between the registration embedding vector and the authentication embedding vector obtained from the deep metric learning model, along with the pre-set threshold.

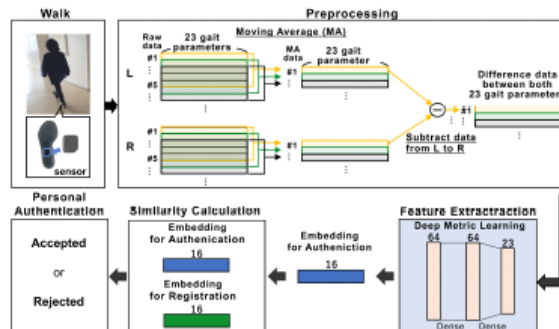


Fig. 2: Proposed Personal Authentication System.

IV. DATASET ACQUISITION

Gait data was measured from 12 healthy men in their 20s. The measurements were conducted in a 63.7-meter-long corridor inside a building, where the participants walked back and forth at least five times at their normal pace. From the gait parameters measured every two steps for both the left and right foot, a moving average over 10 steps (a total of 5 values) was applied, and the difference between the gait parameters of both feet (left foot - right foot) was calculated to obtain the difference data between both feet. Although the number of difference data points between both feet varies for each subject, the number of data points used for training and evaluation in the experiment was unified to 195, which is the minimum number of data points among all subjects. Additionally, the first 195 data points were used for all subjects.

V. EVALUATION METHOD

The evaluation metric used was the Equal Error Rate (EER). EER represents the error rate at the point where the

False Rejection Rate (FRR) and the False Acceptance Rate (FAR) are equal. The EER is calculated as the intersection point between the curve that connects the points where the relationship between FAR and FRR is reversed, and the straight line where FAR equals FRR. The lower this value, the higher the accuracy of the personal authentication. The specific evaluation method involves treating the data of each subject registered in the system as legitimate data and the data of other subjects as attack data (data attempting unauthorized access). The EER for each subject is calculated, and the average EER across all subjects is computed to evaluate the authentication performance.

VI. EVALUATION EXPERIMENT 1

A. Overview

To evaluate the accuracy of the proposed system's personal authentication, a comparative evaluation was conducted with the personal authentication accuracy of the previous system shown in Fig. 1. In Evaluation Experiment 1, the 195 difference data points between both feet for each of the 12 subjects ($A \sim L$) were divided into 110 for training, 20 for validation, 45 for testing, and 20 for registration in the proposed system. Note that the registration data was used only for evaluating the proposed system.

B. Result

Table II shows the results. In the proposed system, 11 out of the 12 subjects showed equal or better personal authentication accuracy in terms of EER compared to the previous system. Additionally, the average EER of the proposed system was more accurate than that of the previous system. These results confirm that the proposed system is a more accurate personal authentication system compared to the previous system.

TABLE II: Results of Evaluation Experiment 1.

Sub.	Previous System		Proposed System	
	Threshold	EER (%)	Threshold	EER (%)
A	0.73	2.42	0.71	4.85
B	0.89	3.43	0.74	2.83
C	0.70	0.10	0.75	0.00
D	0.71	0.00	0.87	0.00
E	0.65	0.00	0.57	0.20
F	0.50	0.00	0.85	0.00
G	0.78	0.00	0.87	0.00
H	0.73	0.10	0.73	0.00
I	0.84	0.30	0.84	0.00
J	0.58	0.00	0.82	0.00
K	0.91	6.57	0.69	4.65
L	0.81	4.65	0.84	0.00
mean (std)	0.74 (0.12)	1.17 (2.14)	0.77 (0.09)	1.04 (1.91)

VII. EVALUATION EXPERIMENT 2

A. Overview

To evaluate the versatility of the proposed system, we verified its personal authentication accuracy on an unseen subject dataset by separating the training and testing data. Out

of the 12 subjects ($A \sim L$), the data for 7 subjects ($A \sim G$) was used as training data, and the data for 5 subjects ($H \sim L$) was used as testing data. Furthermore, from the 195 difference data points between both feet for each of the 7 training subjects ($A \sim G$), 175 were used for training and 20 for validation. For the 5 testing subjects ($H \sim L$), their 195 difference data points were divided into 20 for registration and 175 for testing, and the experiment was conducted.

B. Result

Table III shows the results. Although the accuracy decreased for 4 out of the 5 subjects (H, I, K, L) compared to Evaluation Experiment 1, 3 out of the 5 subjects (H, I, J) achieved practical or near-practical accuracy. This confirms the personal authentication accuracy and versatility of the proposed system for unseen subjects, demonstrating its usefulness. Moving forward, expanding the dataset used for system development and evaluation will be necessary.

TABLE III: Results of Evaluation Experiment 2.

Sub.	Threshold	EER (%)
H	0.73	0.10
I	0.84	0.30
J	0.58	0.00
K	0.91	6.57
L	0.81	4.65
mean (std)	0.74 (0.12)	1.17 (2.14)

VIII. CONCLUSION

In this study, we evaluated a personal authentication method using insole-type gait sensors based on deep metric learning. Compared to the previous system, the proposed system demonstrated not only improved personal authentication accuracy but also high versatility, being able to handle unseen subjects. This confirmed the usefulness of the proposed system. Moving forward, we aim to further improve authentication accuracy by increasing the number of subjects.

ACKNOWLEDGMENT

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Implementation of Receiver-Initiated MAC Protocol in the ns-3 Simulator

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Abstract—The receiver-initiated MAC protocol is recognized for enhancing energy efficiency in multi-hop networks, but further energy-saving techniques and parameter optimizations are needed for practical applications. In this study, we implemented a receiver-initiated MAC protocol on the ns-3 simulator, providing a foundation for future improvements. This protocol supports both sender and receiver modes, allowing asynchronous communication initiated by receivers through beacons. By adding an energy model and simulating clock drift, we enhanced the realism within the ns-3 environment. Simulation results, based on an agricultural sensor network scenario, revealed key characteristics of duty cycle and latency variations associated with network rank, confirming energy-saving effects. These findings offer valuable insights for future efforts to optimize protocol efficiency and explore configurations suitable for diverse applications.

Index Terms—IoT, WSN, MAC, duty cycling, ns-3

I. INTRODUCTION

Sensor networks are increasingly utilized across diverse fields such as environmental monitoring, smart cities, agriculture, and healthcare. In many cases, sensor nodes are battery-powered, so optimizing power consumption is essential. In particular, when many nodes are deployed or located in remote or hard-to-access areas such as mountainous regions, replacing batteries becomes difficult. Therefore, extending the lifetime of sensor networks is essential.

In many use cases, considering the variability of communication environments and scalability, a mesh network configuration is preferred. Mesh networks enhance both communication range and adaptability to environmental changes; however, as each node serves a relay function, it must remain in a listening state, making it challenging to allocate sufficient sleep time.

One approach is to synchronize all nodes to wake, communicate, and sleep together. However, low-cost crystal oscillators often lack precise timing, leading to synchronization issues and unnecessary wake-ups. Thus, an asynchronous approach that supports energy savings is preferable.

To meet these challenges, receiver-initiated MAC protocols offer energy-efficient solutions. In this protocol, the receiver initiates communication and the transmitter responds asynchronously. These protocols involve various parameters, and network performance depends on optimal configurations tailored to each application.

In this study, a fundamental receiver-initiated MAC protocol was implemented on the ns-3 simulator to support further protocol extensions and establishing a foundation for optimal parameter exploration. Additionally, simulations using the implemented protocol confirmed the characteristics of the receiver-initiated protocol.

II. RECEIVER-INITIATED MAC

In this study, we implemented a receiver-initiated MAC protocol based on the classic RI-MAC protocol [1] and RIT [2], the only internationally standardized receiver-initiated protocol as of 2024.

The receiver-initiated MAC protocol operates with two modes: Sender mode and Receiver mode. By switching between these modes as needed, nodes can enable energy savings for both transmission and reception.

In the core mechanism of data transmission for receiver-initiated protocols, the receiver broadcasts a beacon to notify surrounding nodes that it is ready to receive. The sender detects this beacon and responds by transmitting data to the receiver that sent the beacon.

Fig. 1 shows the flow of operations in each mode.

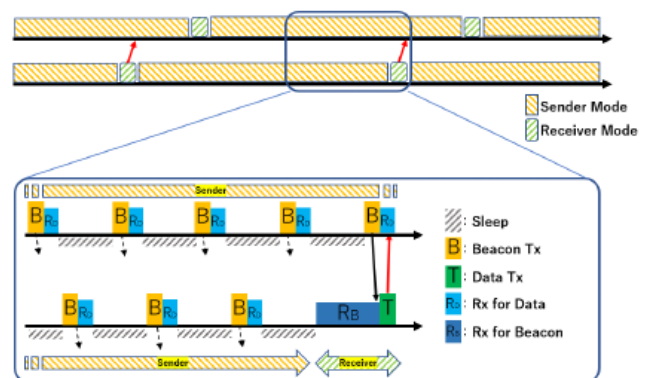


Fig. 1. Example of Receiver-Initiated Operation.

1) *Receiver Mode*: The node transmits a beacon and then activates the receiver circuit to wait for incoming data for a fixed period. If no beacon is received within the timeout, the node enters sleep mode. Upon waking, it checks the sender

flag to decide if it should switch to sender mode. The node operates mainly in this mode for most of the time, depending on the user application and data generation frequency.

2) *Sender Mode*: Switching to this mode, the node activates the receiver circuit, and awaits a beacon. Upon receiving a beacon within the timeout period, the node references the beacon sender information to decide if it is the correct destination for transmission. If suitable, the node transmits data and then proceeds to wait for an ACK. Once the ACK is confirmed, and switch to sleep mode.

III. IMPLEMENTATION IN NS-3

ns-3 is an event-driven network simulator widely used as an open-source project for computer network research and education. In this study, we implemented a receiver-initiated MAC protocol on ns-3, aiming to enhance the realism and accuracy of the simulation. The following sections provide a detailed explanation of the implementation.

A. Receiver-Initiated MAC

ns-3 includes an LrWpan model based on the IEEE 802.15.4 standard. In this study, we extended the MAC layer by building upon this implementation, allowing partial communication between existing protocols and the newly implemented protocol. Modifications to existing classes include adjustments to the LrWpan header class with the addition of a beacon frame type for the receiver-initiated MAC. This beacon type includes rank information (1 byte) within the command payload, representing the network level. This enables the sender to determine if the beacon transmitter is an appropriate recipient. Details on destination selection are provided in the following section.

B. Routing

In the routing process, each router utilizes a metric called "rank". The rank indicates the number of hops required for a router to reach the parent node (data aggregation node).

The beacon periodically broadcast by the receiver contains rank information. The sender receives this beacon and uses the rank information to determine whether the sender is an appropriate target for data transmission.

In this study, the implementation is focused on scenarios where all routers transmit data to the parent node. Therefore, routers respond only to beacons from upstream routers and transmit data accordingly, enabling efficient convergecast throughout the entire network.

C. Energy Model for the LrWpan Module

ns-3 has not yet implemented a energy model for the LrWpan module. Therefore, we implemented a model based on a design proposed in previous studies [3]. This model assigns different power consumption values to each state of the LrWpanPhy layer (transmit, receive, and sleep) and calculates cumulative energy consumption based on the duration spent in each state. Specifically, we modified the LrWpanPhy class to send notifications to the energy model whenever the Phy state changes. Additionally, to improve simulation accuracy, a

delay was introduced during state transitions, enabling a more accurate reflection of actual device behavior.

Furthermore, if a node's battery is depleted, all transmission and reception processes are halted to minimize the impact on the network.

D. Clock Drift

In real-world sensor networks, slight discrepancies in each node's clock, known as clock drift, are common. This drift results from environmental factors, including manufacturing variances in crystal oscillators, temperature fluctuations, and voltage changes, particularly affecting small, low-cost sensor nodes. Over time, these discrepancies can accumulate, leading to significant misalignment in communication timing between nodes and impacting network performance. Therefore, reproducing clock drift is essential for realistic simulations.

In this implementation, random delays were added to each node's sleep time to simulate clock drift, based on a specified drift ratio that varies sleep duration each time. The variance is calculated with the configured drift ratio and a Uniform-RandomVariable model. For example, with a 10% drift ratio applied to 5 s, the sleep duration will vary randomly between 4.5 and 5.5 s.

It is important to note that clock drift is affected by temperature and voltage fluctuations. Ideally, these factors should be incorporated into a predictive model. However, in this study, a uniform distribution model is used to approximate clock drift for simplicity.

IV. SIMULATION EXECUTION EXAMPLE

To evaluate the implemented protocol, a simulation was conducted based on a specific execution scenario. The following provides details on the network configuration used in the simulation.

A. Simulation Parameters

Table I lists the configurable parameters for network setup, and Table II shows possible simulation outputs. These parameters are used to set up the network and generate various results.

TABLE I
SIMULATION INPUT PARAMETERS.

Parameter	Unit	Description
Router Node Count	-	number of nodes in the network
Node Spacing	m	Distance between neighboring nodes
User Data Generation Interval	s	Interval between user data generation events
User Data Payload Length	bytes	Size of each user data packet
MAC Beacon Interval	s	Interval for beacon tx in receiver mode
MAC Sender Timeout	s	Timeout period for waiting to receive a beacon in sender mode
MAC Receiver Timeout	s	Timeout period for receiving data after beacon tx in receiver mode
Clock Drift Ratio	%	Drift ratio used in the clock drift model
Transceiver On/Off Switching	s	Time required to switch the transceiver ON and OFF
Source Capacity	mAh	Battery capacity for the energy source model
Source Voltage	V	Voltage of the energy source model
Tx Current	mA	Current consumption of the transceiver in transmit mode
Rx Current	mA	Current consumption of the transceiver in receive mode
Sleep Current	uA	Current consumption of the transceiver in sleep mode

TABLE II
SIMULATION OUTPUT PARAMETERS.

Parameter	Unit	Description
Network Lifetime	days	Lifetime of network
Duty Cycle	%	Ratio of wake-up time to total time per node
Packet Delivery Ratio	%	Success rate of packet transmission and reception
Packet Latency	s	Latency from Tx to Rx per node

B. Simulation Setup

In this simulation, we assumed a use case for an agricultural sensor network. The network setup includes one parent node and twelve routers arranged in a 3×4 grid.

Each router node is positioned 70 m apart, ensuring communication is limited to neighboring nodes. The parent node is placed above the grid of routers, with rank settings incrementing by one for each layer, starting from the parent node.

For the battery model, we used the BasicEnergySource-Model implemented in ns-3. This model simulates battery depletion at a constant rate.

C. Simulation Parameters Used

The parameter settings used in the simulation are shown in Table III. The user payload data is assumed to be 8 bytes in total, consisting of temperature (4 bytes) and humidity (4 bytes). The time required for switching the transceiver ON and OFF was set according to the measured values of the AT86RF231, as referenced in the energy model design study [3]. The current consumption for each Phy state was based on the measured values of the TWELITE module, which utilizes the NXP JN516x chip.

TABLE III
EXAMPLE OF SIMULATION INPUTS.

Parameter	Values
Router Node Count	12
Node Spacing	70m
User Data Generation Interval	60 s
User Data Payload length	8 bytes
MAC Beacon Interval	1000 ms
MAC Sender Timeout	1000 ms
MAC Receiver Timeout	5 ms
Clock Drift Ratio	1.0 %
Transceiver On/Off Switching	0.11 ms
Source Capacity	2000 mA
Source Voltage	3.3 V
Tx current	17mA
Rx current	18mA
Sleep current	1uA

D. Execution

Clock drift is generated randomly, but variations in the seed can cause significant changes in the simulation results. Therefore, ten simulations were conducted under identical conditions with different seeds. The simulation terminates when all nodes within a specific rank range in the network are depleted of battery power. This is because once all nodes within a particular rank are lost, data propagation becomes impossible, and the network is no longer functional.

TABLE IV
EXAMPLE OF SIMULATION RESULTS.

Parameter	Unit	Average	Standard Deviation	Minimum	Maximum
Network Lifetime	days	68.58	1.21	66.28	70.33
Duty Cycle	%	3.25	1.90	1.12	6.88
Packet Delivery Ratio	%	97.69	0.92	91.78	99.02
Packet Latency	s	2.34	1.6	0.002	28.28

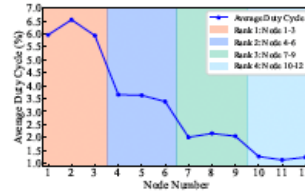


Fig. 2. duty-cycle per node.

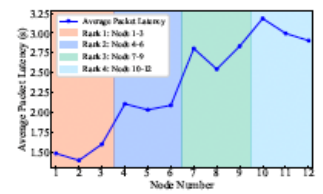


Fig. 3. packet latency per node.

E. Results

The simulation results are shown in Table IV.

1) *Duty-cycle*: Lower-rank nodes closer to the parent node experience increased wake-up times as they relay packets more frequently from lower nodes. In particular, in this implementation, nodes switch to transmitter mode upon receiving relay packets, causing wake-up times to grow at an accelerating rate for low-rank, high-depth nodes as relay frequency increases. Fig. 2 shows the duty-cycle of each node, confirming that lower-rank nodes exhibit higher wake-up ratios.

2) *Latency*: In receiver-initiated MAC protocols, the average wait time for each sender to receive a beacon is given by:

$$\text{Average Wait Time} = \frac{T_{\text{BeaconInterval}}}{2} \quad (1)$$

In this simulation, $T_{\text{BeaconInterval}}$ is set to 1 s, so the expected average wait time for a sender is 0.5 s. Therefore, an increase in rank by one is predicted to result in an approximately 0.5 s increase in packet latency. As shown in Fig. 3, the average packet latency per node aligns well with this prediction, indicating that the protocol behavior closely follows expectations.

V. CONCLUSION

In this study, a receiver-initiated MAC protocol was implemented on the ns-3 simulator, and its characteristics were evaluated. The simulation results revealed unique behaviors in terms of duty-cycle and packet latency. Future studies will focus on improving energy efficiency and exploring approaches for optimal parameter tuning.

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Estimation of Step Width Using Insole-Type Gait Sensors

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Abstract—Step width is associated with fatigue and fall risk, and estimation of step width may be useful for monitoring fatigue and preventing falls. The objective of this study is to estimate step width from gait parameters using a commercially available insole-type gait sensor. This study employs multiple machine learning models to estimate step width and compares the resulting accuracy with that of step width calculated using a marker-less motion capture system. The findings indicate that step width can be estimated with reasonable accuracy from insole-type gait sensors.

Index Terms—gait, insole, step width, estimation

I. INTRODUCTION

As Japan's population ages, it is important to narrow the gap between average life expectancy and healthy life expectancy. Healthy life expectancy is the period of time during which people can go about their daily lives without problems. Extending this period will lead to improved quality of life and reduced medical costs. In order to achieve this, it is recommended to increase the amount of physical activity in daily life. Increasing physical activity is expected to reduce the risk of hypertension [1] and diabetes [2], as well as cancer incidence and death risk [3].

However, excessive activity can build up fatigue and increase the risk of falls [4], [5]. Falls, especially in the elderly, carry the risk of fractures and hospitalization [6]. Therefore appropriate fatigue management is needed.

One of the gait parameters (GPs) associated with fatigue is step width. It is known that step width and its fluctuations increase during fatigue [5], [7]. Recently, the estimation of GPs using wearable sensors has attracted much attention because of people's growing interest in daily health management. Estimation of step width has also been done [8], [9], but it requires wearing multiple sensors for estimation, which remains a convenience issue.

In this context, the objective of this study is to estimate step width from measured GPs using only commercially available insole-type gait sensors.

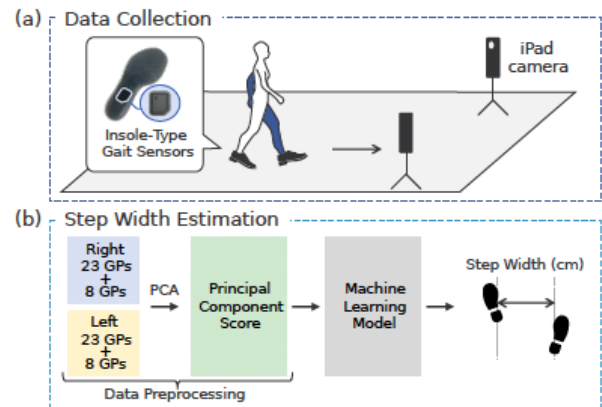


Fig. 1. Overview of this study. (a) Collection of data. (b) Estimation of step width. GPS, gait parameters.

II. METHODS

Fig. 1 shows an overview of this study. GPs were collected through experimentation, and step width were estimated using a machine learning model.

A. Data Collection

The data were collected from eight healthy students in their 20s (seven males and one female) and included measurements of GPs and step width. Gait analysis sensors (NEC Corporation, Japan) and a markerless motion capture system, OpenCap [10], were employed to quantify GPs and step width, respectively. Subjects were instructed to walk along a 7.0 m straight path in the room in one of four ways: as usual, slower than usual, faster than usual, or with a wider step width than usual. A minimum of ten trials of each gait type was conducted for each subject.

TABLE I
GAIT PARAMETERS MEASURABLE BY GAIT SENSORS.

Description (Unit)	
Walking speed (km/h)	Stride length (cm)
Maximum foot sole angle in plantarflexion (deg)	Maximum foot sole angle in dorsiflexion (deg)
Foot height (cm)	Circumduction (cm)
Toe-in/out angle (deg)	Hallux value angle (deg)
Minimum toe clearance (cm)	Foot clearance (cm)
Roll angle at heel contact (deg)	Roll angle at toe-off (deg)
Peak angular velocity during swing phase (deg/s)	Maximum speed during swing phase (m/s)
Duration of loading response (sec)	Duration of preswing (sec)
Stance phase time (sec)	Swing phase time (sec)
Duration from heel contact to foot flat (sec)	Duration from foot flat to heel release (sec)
Duration from heel release to toe release (sec)	Center of pressure exclusion index (%)
Cadence (step/min)	Frailty level (-)

B. Data Preprocessing

1) *Gait Parameters*: Table I shows the GPs that can be measured by the gait analysis sensors. The aforementioned GPs are measured for each foot and for each two steps taken. In this study, a total of 31 GPs were utilized. 23 GPs excluding frailty level, and eight additional parameters were calculated from existing GPs. These included gait cycle time (sec), bottom dorsiflexion angle (deg), plantarflexion percentage (%), dorsiflexion percentage (%), step length (cm), gait ratio (m/min), double support time (%), and single support time (%). The GPs used for estimation were the average of each trial, with a total of 62 dimensions combined for each GP, representing the left and right.

2) *Step Width*: OpenCap is capable of measuring the coordinates of joints such as the neck, hip, and heel. From the measured coordinate data of each trial, a single gait cycle, commencing with the left foot, was extracted for analysis. Given the variability in the number of frames across subjects and trials, a process of time normalization was employed to standardize the gait cycle to 101 frames. The step width was calculated as the distance between the left and right heels, with the mean value of the step width obtained for each frame designated as the target for estimation.

C. Estimation Using Machine Learning Models

In order to estimate the step width from the GPs, several machine learning models were built and the optimal model was identified. Table II shows the models that were tested in this study. In each of the five models shown in the table, the parameters were adjusted the best model. In this study, the Python language and scikit-learn library were used to implement the machine learning models, and default values were used for the other parameters.

TABLE II
MACHINE LEARNING MODELS USED FOR ESTIMATION

Model	Parameters
Multiple linear regression	-
Ridge regression	alpha = {0.1, 1, 10}
Lasso regression	alpha = {0.1, 1, 10}
SVR	kernel = {'rbf', 'poly', 'linear'}
	C = {0.1, 1, 10}
	gamma = {0.1, 1, 10}
	degree = {2, 3, 4}
LightGBM	n_estimators = {50, 100}
	max_depth = {3, 5, 7}

TABLE III
STEP WIDTH MEASURED BY OPENCAP

Gait Type	Step Width (cm)		
	avg. ± SD	min.	max.
Normal	12.2 ± 1.3	8.6	15.1
Slow	12.9 ± 2.0	7.3	18.3
Fast	11.9 ± 1.2	8.0	14.7
Wide	24.0 ± 5.6	15.5	39.0

The principal component scores, obtained through the application of principal component analysis to the GPs, were utilized as the input for each model. As the GPs are 62-dimensional data, dimensionality reduction was performed by principal component analysis to prevent overfitting of the estimated models to the training data. The cumulative contribution rate (CCR) was used as the criterion for selecting principal components, with the smallest number of dimensions for which the CCR exceeded 90% being applied. As a result, the 62-dimensional GPs were reduced to 16 dimensions.

D. Evaluation Methods

The accuracy of the estimated step width was evaluated using the mean absolute error (MAE) and the root-mean-square error (RMSE). Leave-one-subject-out cross-validation was employed to calculate these error values, ensuring the reliability of the results.

III. RESULTS AND DISCUSSION

A. Measurement of Step Width

Table III shows the average, standard deviation, minimum, and maximum values of the step widths measured by OpenCap for each type of gait. The magnitude of each step width when given the instruction to walk at different speeds (Normal, Slow, and Fast) was almost the same. When given the instruction to walk with a wider step width, the step width was about twice as wide as the other three types of step widths.

TABLE IV
EVALUATION RESULTS AND OPTIMAL PARAMETERS FOR EACH MODEL

Model	Parameters	MAE (cm)	RMSE (cm)
Multiple linear regression	-	5.3 ± 4.1	6.7 ± 4.1
Ridge regression	alpha = 10	5.2 ± 4.1	6.6 ± 4.1
Lasso regression	alpha = 1	4.3 ± 4.1	5.9 ± 4.1
SVR	kernel = 'linear'	4.4 ± 3.8	5.8 ± 3.8
	C = 0.1 gamma = 1		
LightGBM	n_estimators = 50 max_depth = 3	3.6 ± 3.8	5.2 ± 3.8

B. Estimation of Step Width

Table IV shows the best results obtained in the evaluation of each model and the corresponding parameters. The five models were employed to estimate the step width based on the principal component scores of the GPs, and the LightGBM model yielded the most optimal estimation results for both the MAE and the RMSE.

C. Discussion

This study estimated the step width from single insole-type gait sensors. The results demonstrated that the MAE could be estimated with an accuracy of 3.6 ± 3.8 .

Table V shows a comparison of the estimation results of this study with those of previous studies. The mean value of error is similar to that of the previous study, but the standard deviation is larger. One possible reason for this discrepancy is the type of data used in the estimation.

In this study, the step width was estimated based on discrete GPs calculated from IMU data, whereas previous studies used raw IMU data to estimate step width. In general, it is accepted that continuous data, such as raw IMU data, is more effective at capturing temporal characteristics than discrete data and is better able to reflect minute changes during gait. Therefore, it is believed that the limited information available from discrete data, in comparison to previous studies that used continuous data, affects the size of the standard deviation.

In contrast, it was demonstrated that the step width can be estimated with reasonable accuracy from a single insole-type sensor, despite the use of discrete data. The employed sensor is a commercially available product that can be utilized over an extended period without requiring battery replacement. Consequently, the findings from this research can facilitate the long-term monitoring of step width for a large population.

IV. CONCLUSION

This study employed a machine learning model to estimate step width from GPs that can only be measured with insole-type gait sensors. Although the estimation error was larger than that of the multi-sensor approach, it was shown that it is possible to estimate step width with some accuracy using only insole-type gait sensors.

TABLE V
COMPARISON OF ACCURACY WITH PREVIOUS STUDIES

Studies	Subjects	Sensors	MAE (cm)	RMSE (cm)
Diaz et al. [8]	4 healthy subjects	5 IMUs (thighs, calves, lower back)	2.53	-
Wang et al. [9]	12 patients	3 IMUs (pelvis and shanks)	3.3 ± 0.7	4.1 ± 0.6
	17 healthy subjects		2.9 ± 0.5	3.5 ± 0.5
Ours	8 healthy subjects	Commercial IMU-based gait analysis sensors (placed inside insoles)	3.6 ± 3.8	5.2 ± 3.8

From the point of view of convenience, the approach of estimating the step width from the insole-mounted sensor is considered to be better, because once the sensor is attached to the insole, the user does not have to go through the trouble of wearing the sensor. Therefore, in the future, it would be interesting to investigate whether the estimation accuracy can be improved by using the raw data from the insole-mounted sensor to estimate the step width.

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A method of measuring respiratory movements using 2D camera

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Abstract—Pulmonary function tests for respiratory diseases can generally be performed using spirometry, which is only available in medical facilities such as hospitals. We have been studying the construction of a non-invasive and simple pulmonary function diagnostic system. This paper proposes to measure respiratory movements using a two-dimensional camera.

Keywords—COPD, respiratory-movements, 2Dcamera, spirometry

I. INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common respiratory disease. It is caused by inflammation of the bronchi and destruction of the alveoli (air sacs) due to the exposure to harmful substances such as smoking. In 2019, approximately 3.23 million people died of COPD [1], and it is the third leading cause of death globally. This made the COPD to be one of the most serious diseases. Today, pulmonary function tests for respiratory diseases can be done by using spirometry, X-ray, or computed tomography (CT), which is only available in medical facilities such as in hospitals[2]. However, the X-ray or CT scan may expose patients with radioactive which can be challenging for some patients to take the examination. In addition, the non-radioactive method like spirometry required direct contact to the patients. In the world after pandemic, it can be uncomfortable for some people to intimately contact with the device, i.e. putting mouthpieces in their mouths and take deep breaths.

We have been studying the construction of a non-invasive and simple pulmonary function diagnostic system [3]. In previous studies [3][4], we used distance information from depth sensors to observe chest movements during breathing. However, this approach required a 3D sensor, which is challenging to implement for home use. In this study, we propose an alternative method to use a simple visual camera to capture a sequence of two-dimensional images. We then segment the upper body from the background, and measure the changes in the chest's movement over time. This method only requires a single camera, making it easy to implement on any handheld device for home use.

II. METHOD

Breathing causes the lungs to expand and contract. We took the image sequences from the side using a 2D camera. This is

because the chest moves back and forth during breathing. Fig.1 shows an illustration of the measurement position. The resulting image is processed frame by frame. The procedure is as follows.

1, Crop the image with the bold frame in Fig.1. The resulting images were converted to greyscale images($f_t(i, j)$) and the vertical direction is denoted by j and the horizontal direction is denoted by i and the time as t

2, Binarize the image (Eq. 1)

$$B_t(i, j) = \begin{cases} 1, f_t(i, j) > \text{threshold} \\ 0, \text{otherwise} \end{cases} \quad (1)$$

3, Calculate the area of the body part (A_t) using equation 2

$$A_t = \sum_{i=0}^{I-1} \sum_{j=0}^{J-1} B_t(i, j) \quad (2)$$

To make binarization easier at step2, the subjects were taken videos wearing white T-shirts in front of a black background. This time the thresholds were set adaptively. The changes in area were taken as the displacement of lung volume due to breathing. At the same time, we measured respiratory function using a spirometer and it was taken as the correct lung function.

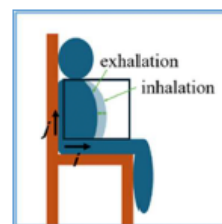


Fig.1 how to take videos

III. EXPERIMENTAL RESULTS

The images were taken at a distance of 1[m] from the subject so that the entire chest was included and the results analyzed. Fig.2 shows an example of the resulting image, which has been grayscale, and processed into a binarized image. The background and the body can be separated.

The results of the analysis for each image are shown in Fig.3. The vertical axis of Fig.3 shows the body part (A_t) and the horizontal axis shows the frame (t). The waveform due to respiration can be seen.

For reference, Fig.4 shows the results of a lung function test using spirometry at the same time. It is scaled according to Fig.3. Fig.3 shows a waveform roughly similar to Fig.4. The differences in waveforms due to different devices will be studied in the future.



Fig.2 Left is the input image and right is the binarized image

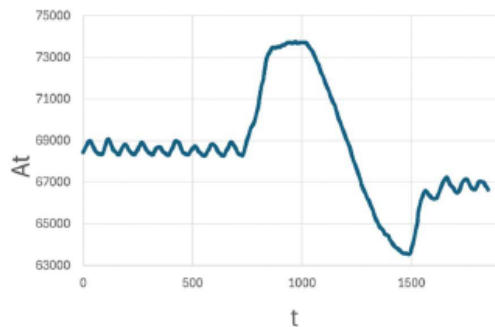


Fig.3 Changes in the area of body parts in the image due to breathing.

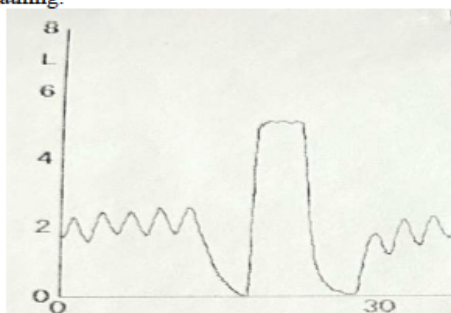


Fig.4 Results from spirometry
(The scaled according to Fig. 3.)

IV. CONCLUSION

This study aims to construct a “non-invasive and simple lung function diagnostic support system” that can easily measure lung motion during resting breathing. In this study, we measured the movements of the upper body to estimate the respiratory function using a 2D camera. As a result, we found that it is possible to determine inhalation and exhalation from the movements of upper body. By plotting the changes of upper body from the image sequence into waveform, we observed a similar trend to the waveform measured by spirometry, with the amplitude changes corresponding to the degree of breathing. By comparing the waveforms during resting breathing with the tidal volume measurements from a spirometer, it suggests the possibility to determine vital capacity from such waveforms during maximum breathing. In the future, it is expected that by calculating lung capacity from the respiratory waveforms measured by 2D camera, this method could offer a simpler method for measuring respiratory functions compared to the current testing methods.

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Preliminary Study on Environmental Estimation Using Insole-Type Gait Sensors

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Abstract—In recent years, as the aging society progresses, the demand for gait support technologies has increased. Gait analysis technologies have become essential for fall prevention, rehabilitation, and assisting people with disabilities. This study aims to classify and estimate the surfaces or environments that pedestrians walk on, using insole-type gait sensors and analyzing the collected walking data. Estimating walking environments offers a new approach to enhancing gait safety and providing appropriate support. Experiments evaluated classification accuracy using walking data from various surfaces like corridors and grass.

Index Terms—Gait Analysis, Insole Sensors, Environmental Estimation, Rehabilitation

I. INTRODUCTION

In recent years, the rapid aging of the global population has significantly increased the burden on the healthcare and welfare sectors. In particular, falls and declines in physical function among the elderly often lead to a transition to long-term care and a deterioration in Quality of Life. Consequently, preventing falls and maintaining or improving physical function have become critical issues. The demand for gait support and analysis technologies has been increasing yearly, playing a vital role in rehabilitation and disability support.

Conventional gait analysis technologies mainly focus on individually analyzing a person's gait to detect gait impairments or abnormalities [1]. For example, in medical institutions and rehabilitation facilities, the degree of normal gait is measured to design appropriate treatment or rehabilitation programs [2]. However, these technologies are primarily designed for indoor environments, and have not yet sufficiently developed to account for changes in walking under outdoor conditions, such as slopes, grass, and sand [3].

Outdoor environments significantly affect a person's gait. While walking is stable on paved roads, it is known that balance is easily lost on unstable surfaces, such as grass or sand [3], [4]. Gait analysis technologies that can adapt to such environmental changes are in demand, but current technologies

face challenges in accurately capturing the effects of outdoor environments.

In this study, we propose a novel method to estimate the walking environment using an insole-type gait sensor, specifically the NEC gait analysis sensor, which is easy to wear and causes minimal inconvenience. The goal is to collect walking data across various environments using this sensor and analyze the data to build a machine learning model capable of estimating the walking environment.

II. METHODS

A. Collection of Gait Data by Environment

In this study, gait data were collected from two subjects (both in their 20s, male, healthy) using an insole-type gait sensor. The insole-type gait sensor used in the measurements can measure a total of 24 gait parameters for each foot every two steps, as shown in Table I.

TABLE I: Gait parameters measurable by gait sensors.

Description (Unit)	
Walking speed (km/h)	Stride length (cm)
Maximum foot sole angle in plantarflexion (deg)	Maximum foot sole angle in dorsiflexion (deg)
Foot height (cm)	Circumduction (cm)
Toe-in/out angle (deg)	Hallux value angle (deg)
Minimum toe clearance (cm)	Foot clearance (cm)
Roll angle at heel contact (deg)	Roll angle at toe-off (deg)
Peak angular velocity during swing phase (deg/s)	Maximum speed during swing phase (m/s)
Duration of loading response (sec)	Duration of preswing (sec)
Stance phase time (sec)	Swing phase time (sec)
Duration from heel contact to foot flat (sec)	Duration from foot flat to heel release (sec)
Duration from heel release to toe release (sec)	Center of pressure exclusion index (%)
Cadence (step/min)	Frailty level (-)

Walking data were collected in five different environments: flat ground (corridor), uphill, downhill, grass, and sand. In uphill and downhill conditions, the load variation during walking is significant, leading to changes in muscle usage and gait patterns. This study aims to capture these variations. Grass and sand were selected due to the instability of these surfaces, which require different movements and body control compared to normal walking. These environments were chosen to clarify the differences in gait patterns under such conditions.



Fig. 1: Actual walking environment.

B. Experimental Setup

In each walking environment, subjects were instructed to walk straight at a constant speed to isolate the effect of surface instability on gait. In each environment, the subjects walked for 30 seconds, repeating this process 10 times. The walking data in each environment were transmitted wirelessly from the insole sensor to the data acquisition device (a smartphone).

C. Data Preprocessing and Feature Extraction

The collected gait data contained noise due to sensor errors and sudden variations during walking, which could lead to inaccurate analysis if used as-is. Therefore, in this study, we first applied a moving average to smooth the data, suppress short-term fluctuations, and clarify data trends. Next, we standardized the features with different units and scales to ensure they were evaluated on the same basis. This prevented the model from over-relying on specific features and ensured balanced learning across all features.

After preprocessing, a Random Forest algorithm was used to select important features for classifying gait patterns. In Random Forest, the importance of each feature is determined by calculating the impact of its splits on the classification outcome in each decision tree. To balance model simplicity and accuracy, the top 10 most important features were selected, as using all features could lead to excessive model complexity. Table II shows the extracted important features.

TABLE II: Extracted Important Features.

Feature Name	
Minimum Toe Clearance (MTC): (cm)	Walking Speed: (km/h)
Maximum Foot Sole Angle in Planterflexion: (deg)	Peak Angular Velocity During Swing Phase: (deg/s)
Maximum Speed During Swing Phase: (m/s)	Duration of Preswing: (sec)
Foot Clearance : (cm)	Toe-in/Out Angle: (deg)
Roll Angle at Heel Contact: (deg)	Roll Angle at Toe-off: (deg)

D. Construction and Evaluation of the Machine Learning Model

In this study, a machine learning model using the Random Forest algorithm was constructed to classify the walking environments based on gait data. Random Forest is an ensemble learning method that combines multiple decision trees, with the final classification determined by aggregating the predictions of each tree. Using gait data features for each environment, classification was performed for five different environments: flat ground (corridor), uphill, downhill, grass, and sand.

a) Model Construction: After feature extraction, Random Forest was used to classify the walking environments. The dataset was split into 80% for training and 20% for testing, and the model was trained using the training data. The model was constructed using 100 decision trees.

b) Evaluation Metrics: The following metrics were used to evaluate the model:

- **Precision:** The proportion of samples predicted as "positive" by the model that were actually "positive."
- **Recall:** The proportion of actual "positive" samples that were correctly predicted as "positive" by the model.
- **F1-Score:** The harmonic mean of Precision and Recall, which evaluates the balance between these two metrics.

Additionally, a confusion matrix was used to visually assess the model's performance.

III. RESULTS AND DISCUSSION

During the preprocessing stage, the top 10 most important features were selected, and a Random Forest model was used to classify the walking environments. The model's performance was evaluated using a confusion matrix, as shown in Figure 2. Additionally, three metrics—Precision, Recall, and F1-Score—were used to numerically evaluate the model's performance. These evaluation metrics were calculated for each environment, and the model's performance for each environment is summarized in Table III.

From the results of the confusion matrix in Figure 2, it was confirmed that accurate classification was achieved in flat ground (corridor) and slopes, but misclassification occurred in the flat ground and grass environments.

In the evaluation metrics shown in Table III, a balance was observed between Precision, Recall, and F1-Score, but a slight decline was noted in the flat ground and grass environments. In particular, the misclassification in these environments affected

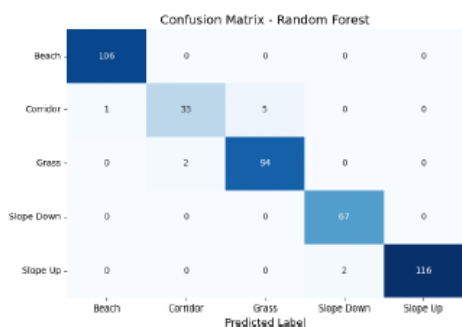


Fig. 2: Confusion Matrix.

TABLE III: Precision, Recall, F1-Score Results.

Class	Precision	Recall	F1-Score
Beach	0.99	1.00	1.00
Corridor	0.94	0.85	0.89
Grass	0.95	0.98	0.96
Slope Down	1.00	0.97	0.99
Slope Up	1.00	0.98	0.99

the model's sensitivity, as indicated by the decrease in Recall. This result may be attributed to the variability in gait data in specific environments or the selection of features.

To investigate the cause of these misclassifications, the selected features were used with t-SNE (t-distributed Stochastic Neighbor Embedding) to visualize the walking data in lower dimensions, as shown in Figure 3, and the data variability was examined.

The t-SNE visualization showed clustering of data from similar environments, visually confirming consistency with the Random Forest classification results. Specifically, the data from flat ground (corridor) and grass were found to be more similar compared to other environments, suggesting this as a possible cause of the misclassification in the confusion matrix. The similarity in gait patterns between flat ground and grass is thought to have contributed to the decline in classification accuracy.

Figure 3 visualizes the data from five environments: flat ground (corridor), uphill, downhill, grass, and sand. Each data point is color-coded according to the environment, clearly illustrating the differences in data distribution between the various environments.

As areas for future improvement, it is suggested to focus on extracting more accurate features and refining data preprocessing to reduce variability between different environments. Specifically, additional data collection and algorithm improvements are needed to address the frequent misclassifications in environments such as flat ground and grass.

IV. CONCLUSION

In this study, we used an insole gait sensor to collect walking data in various environments and constructed an environment classification model. The t-SNE visualization

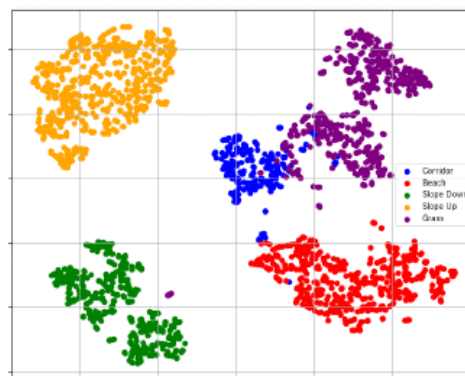


Fig. 3: Visualization of gait data by t-sne.

results clearly demonstrated the differences in walking patterns between different environments, though it was confirmed that environments such as grass and flat surfaces showed high data variability, leading to misclassifications.

The environmental classification using the Random Forest model confirmed high classification accuracy through evaluation metrics (precision, recall, F1 score), but the results suggested that there is still room for improvement in certain environments.

This study presents several challenges. First, there is significant variability in each participant's gait data, and the model has not sufficiently accounted for these differences in individual walking patterns. This makes consistent classification difficult, even under the same environmental conditions. Additionally, the current model does not address combined walking environments (e.g., uphill on sand), leaving more complex data analysis as a remaining challenge.

Future work will aim to expand data collection across a broader range of environments and participants to improve the model's generalizability. It is expected that applying alternative data processing methods and machine learning techniques will enable the construction of a more accurate model capable of environmental estimation.

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A Study of Generative Artificial Intelligence for UI/UX Design

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Abstract—Generative Artificial Intelligence a major evolution of Artificial Intelligence, expanding the connection between humans and computers using natural language rather than programming languages. This evolution, combined with more sophisticated code generation techniques and advanced image models, is resulting in great speedups in various application development processes. As a result, people in UI/UX including researchers have begun to adopt Generative Artificial Intelligence tools into their work practices. Now it has the potential to transform sophisticate UI/UX design process by improving customer experiences, particularly through new opportunities for automation and personalization, while also bringing about many changes. In this study, we will examine a case of Generative Artificial Intelligence integration in UI/UX. Through this, we aim to explore possible directions for developing personalized and group-specific UI/UX designs.

Keywords—UI/UX design, generative AI, large language model, Prompt, Chat GPT

I. INTRODUCTION

Generative Artificial Intelligence (AI) is a rapidly evolving technology that has the potential to transform many industries, as it is a subset of AI that allows machines to create and generate content, art, music, and more. Generative AI uses algorithms that can simulate human behavior, thought processes, and creativity to produce unique and original results, and allows machines to generate new content or data based on input parameters and previously learned patterns. In other words, it is an AI approach that generates new and original content, rather than simply processing or analyzing existing data [1]. Generative AI models are trained on large data sets to learn patterns and generate new outputs similar to the training data. Generative AI originated in the field of “computational creativity” in the late 1990s, and over the past decade, advances in Machine Learning and Deep Learning algorithms have led to significant improvements in the accuracy and quality of generative models [2].

The beginning of Generative AI was ChatGPT of OpenAI [3], which was released in November 2022 based on the GPT-3.5 (Generative Pre-trained Transformer) model. It is known as a large-scale natural language technology that generates human-like text using Deep Learning. After that, OpenAI released a new Large Language Model (LLM) called GPT-4, and this model showed a greatly improved ability. It has become a level where it is not much different from humans in general conversation. Currently, there are a variety of generative models shown in Fig. 1. Furthermore, Generative

AI such as DALL-E, Stable Diffusion, and Midjourney have been introduced, and they are developing to the level where it can generate images based on text descriptions shown in Fig. 2.

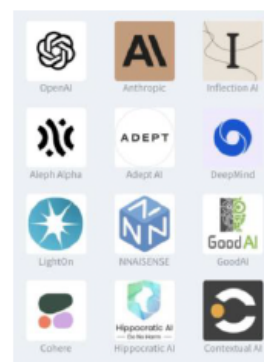


Fig. 1. Examples of Generative AI.

DALL-E [7] is an image generation technology developed by OpenAI that can generate images in a different form than general images. This technology generates an image that matches the text when the image is described with text. Midjourney [8] is an image generation technology developed by Facebook AI Research. This technology finds the middle path in a photo and converts it into the desired image. This allows for more sophisticated images to be generated when generating the desired image. Stable Diffusion [9] is an image generation technology developed by NVIDIA that uses deep learning and probabilistic modeling technology to generate images. This technology resolves the instability of images and enables more stable image generation [4].

With the evolvement of Generative AI, it is understood that the world of creation, such as writing, drawing, and algorithm coding, which were previously considered to be areas only humans could do, is now opening an era where AI can do them. Today, more mature code-generation technology, coupled with advanced image models, has dramatically shortened the development process from a mere idea to a fully operational application. This improvement in efficiency opens a new era of possibilities, inviting Generative AI into the creative process than human beings can do [5].

In the UI/UX design areas, designers require a deep understanding of user behavior and adequate technical skills. However, as current applications are becoming complex in

functionality, creating a perfect balance is more challenging. Therefore, Generative AI can be a good candidate for this purpose. It transforms UI/UX design by enabling designers to leverage AI to create more intuitive and engaging user interfaces. This technology may accelerate the design process and improve the quality of the finished items. By automating basic activities and producing various design possibilities, AI frees designers to focus on improving user experiences and concentrating on creative boundaries [6].

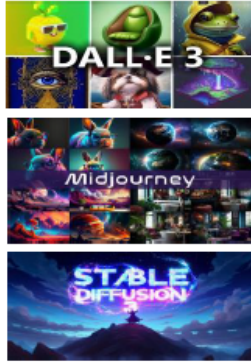


Fig. 2. Generative AI for image generations.

In this study, we will examine a case of Generative AI integration in UI/UX. Through this, we aim to explore possible directions for developing personalized and group-specific UI/UX designs. The rest of this work consists of as follows. Section 2 introduces the intersection of Generative AI and design areas. Section 3 explores a sample case which exploits AI for UI/UX. Section 4 concludes this work.

II. GENERATIVE AI AND DESIGN

With Generative AI we can create many types of content across many different domains such as text, image and video, Sound, speech and music, Design and art, and Simulations and synthetic data. So this section introduces several points where Generative AI can be integrated with UI/UX design.

Generative models, especially those based on transformers, can generate coherent, contextually relevant text—everything from instructions and documentation to brochures, emails, web site copy, blogs, articles, reports, papers, and even creative writing. Image generations such as DALL-E [7], Midjourney [8], and Stable Diffusion [9] can create realistic images or original art, and can perform style transfer, image-to-image translation and other image editing or image enhancement tasks. Emerging Generative AI video tools can create animations from text prompts, and can apply special effects to existing video more quickly and cost-effectively than other methods. Generative AI models can generate unique works of art and design, or assist in graphic design. Applications include dynamic generation of environments, characters or avatars, and special effects for virtual simulations and video games.

Generative AI algorithms can analyze vast amounts of data to discover patterns and insights that can lead to better design decisions. For example, AI can process user behavior data to identify trends that might otherwise be missed by human analysis. This can help design more intuitive and user-friendly interfaces.

Another benefit of AI in UX/UI is its ability to automate repetitive tasks. Imagine being able to quickly generate multiple design prototypes based on user preferences and feedback. This not only speeds up the design process, but also ensures that the design better meets the user's needs. AI also enhances the personalization of designs. By analyzing user interactions, AI can help create personalized experiences for each user. This is especially useful for creating dynamic interfaces that adapt to individual user behavior. For example, AI can suggest content, modify layouts, or adjust navigation paths to match user preferences, improving the overall user experience.



Fig. 3. Application design process.

III. UI/UX DESIGN WITH GENERATIVE AI

Generally, application design requires some precise steps to be done: Wireframes, mockups, and prototypes, shown in Fig. 3. They are created in sequence within one project. Lower fidelity prototypes, like mockups, are easy to modify and experiment with but are a less realistic representation of the application, whereas higher fidelity prototypes, like functional code, provide a felt and functional experience of the application but cannot be easily altered or experimented with. Medium fidelity prototypes blend the ease of experimentation of LoFi prototypes and the functionality offered by HiFi prototypes; both the UI and computation (e.g. LLM prompt) are rough and can be easily edited. So Prototyping is a core part of a designer's process and the introduction of LLM with natural language prompting has made prototyping AI much more accessible. Now designers, can quickly customize an LLM's output to fulfill a wide range of AI functionalities including generating visualizations. Recent good examples are introduced [10, 11].

PromptInfuser, a Figma plugin that enables users to create semi-functional mockups, by connecting UI elements to the inputs and outputs of prompts introduced how coupling prompt and UI design affects designers' workflows [11].

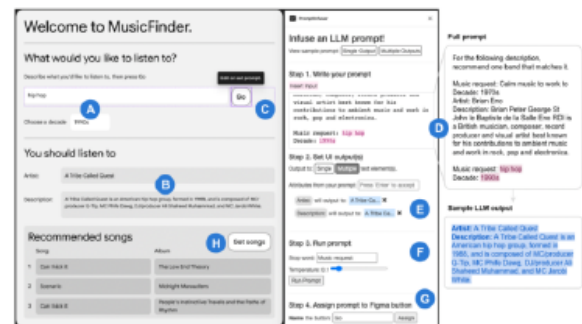


Fig. 4. A sample screenshot of PromptInfuser [8].

Fig. 5 shows a sample screenshot of PromptInfuser. Here, on the left is a Figma mockup for a music search application that was made semi-functional with PromptInfuser on the right. When the "Go" button (C) is clicked by a user, a music search prompt is called (D). The text elements in (A), in this

case: “hip hop” and “1990s”, are inputted into the prompt, which is then run. Afterwards, the completion is split and mapped to the text elements in (B). To split a completion into multiple outputs, the user needs to define a one-shot example in their prompt (D) and then identify the tags to split the completion with in (E). Finally, they can assign the prompt to the “Go” button in (G). Another PromptInfuser widget also exists (H) that takes the outputted artist in (B) and generates three recommended tracks.

This procedure shows the way that designers are prototyping the AI functionality and UI at the same time and PromptInfuser enables a space in which users can conduct prototyping by hooking up dynamic AI prototypes with low-fidelity UI prototypes.

Eventually, it is expected that these kinds of tools can dynamically serve text and image variations by analyzing live data, allowing for more relevant and optimized content delivery. With such capabilities, Generative AI in UI Design enables the final applications to perform better and offer more personalized experience. Along with it, AI could shorten onboarding times, provide immediate value, and simplify complex workflows for a UX design process and future interfaces are expected to adapt in real time to user intentions and contexts.

IV. CONCLUSION AND FUTURE WORKS

The evolution of Generative AI can combine with more sophisticated code generation techniques and advanced image models, which may result in great achievement in various application development processes. As a result, it has the potential to transform businesses by improving customer experiences, particularly through new opportunities for automation and personalization, while also bringing about many changes. This study examined the case of Generative AI integration in UI/UX. Through this, we aim to explore possible directions for developing personalized and group-specific UI/UX designs. Future work will include more detailed classification and comparison on integrating UI/UX design and Generative AI.

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