



7th International Conference on Image, Vision & Pattern Recognition (IVPR)
May 26-29, 2025
Kitakyushu, Japan
<http://cennser.org/IVPR>



12th International Conference on Informatics, Electronics & Vision (ICIEV)
May 26-29, 2025
Kitakyushu, Japan
<http://cennser.org/ICIEV>

7th International Conference on Imaging, Vision & Pattern Recognition (IVPR)

&

12th International Conference on Informatics, Electronics & Vision (ICIEV)

Venue:

Hibikino/Wakamatsu Campus, Kyushu Institute of Technology, Japan (26/5 only)
Kitakyushu International Conference Center,
Kitakyushu, Fukuoka, Japan

Date: 26 May ~ 29 May 2025

Supported by:



Welcome Message

We are pleased to welcome you to the Joint 2025 7th International Conference on Imaging, Vision & Pattern Recognition (IVPR), & 12th International Conference on Informatics, Electronics & Vision (ICIEV), held in Kyushu Institute of Technology (Hibikino campus, Wakmatsu) and Kitakyushu International Conference Center, Kitakyushu, Japan. Earlier, IVPR-ICIEV was held in Bangladesh, Japan, the USA, and the UK successfully.

We thank the Center for Natural Science & Engineering Research (CNSER), Kitakyushu International Conference Center, the committee members, reviewers, and excellent & dynamic volunteers for their support. Special thanks to the City of Kitakyushu and Kitakyushu Convention and Visitors Association. We are very grateful for the extensive efforts of many individuals who worked diligently to ensure a successful, high-quality conference. Without these volunteers' hard work and dedication, the conference could not have been successful.

We would like to thank the two distinguished keynote speakers and amazing panel of speakers from industry and academy, and presenters from Japan, Bangladesh, the UK, The Netherlands, India, Korea, etc. for their support and participation. We wholeheartedly thank the committee members, especially Dr. Yuichiro Tanaka, Prof. Atsushi Inoue, Prof. Hakaru Tamukoh, Akinobu Mizutani, Dr. Tahera Hossain, Dr. Christina Garcia, Prof. Md Atiqur Rahman Ahad, and others. We would like to especially thank the Secretaries - Mahmudul Hasan, Nusrath Tabassum, Afroza Rahman, Md Ibrahim Mamun, Sozo Lab members of Kyushu Institute of Technology, and Kamal Lab members of Gunma University, for their tremendous commitment and support for a long period for these conferences. Most importantly, we wish to thank all the authors for sharing research results at the conference and collectively pushing the state of the art in these important areas forward.

In 2026, we will organize the 8th IVPR in the green city - the Kitakyushu, Japan again. Please inform others to submit quality papers to the conference. We invite the attendees to participate in the conference activities actively and to enjoy the opportunity to learn from one another (on-site or online). Though it is an onsite conference, we open it FREE for all globally to attend and share their thoughts and build networking. We hope to have your cordial support and participation in future conferences. Thanks a lot indeed.

General Chair IVPR 2025:

Matthew Turk, Toyota Technological Institute at Chicago, USA
Toshio Fukuda, Nagoya University, Japan

General Chair ICIEV 2025:

Anton Nijholt, University of Twente, The Netherlands
M.A.S. Kamal, Gunma University, Japan
Sozo Inoue, Kyushu Institute of Technology, Japan

Conference Program

Japan time: Time Zone Converter: <https://www.timeanddate.com/worldclock/converter.html>

Presentation: 10 min (QA session will be held at the end as a Panel with all presenters)

<p>Day 1: 26 May</p>	<p>Day 1 Venue: Wakamatsu / Hibikino campus, Kyushu Institute of Tech.;</p> <p>Conference Room 1, 2nd floor Kitakyushu Science and Research Park (KSRP) Same building of ODORIVA.</p> <p>Kitakyushu Science and Research Park, Collaboration Center (1st Floor) 2-1 Hibikino, Wakamatsu-ku, Kitakyushu, Fukuoka, 808-0135, Japan Route: JR Orio station, then bus to Gakken Toshi Hibikino / Wakamatsu Campus (Kyushu Institute of Technology / KyuKouDai)</p>
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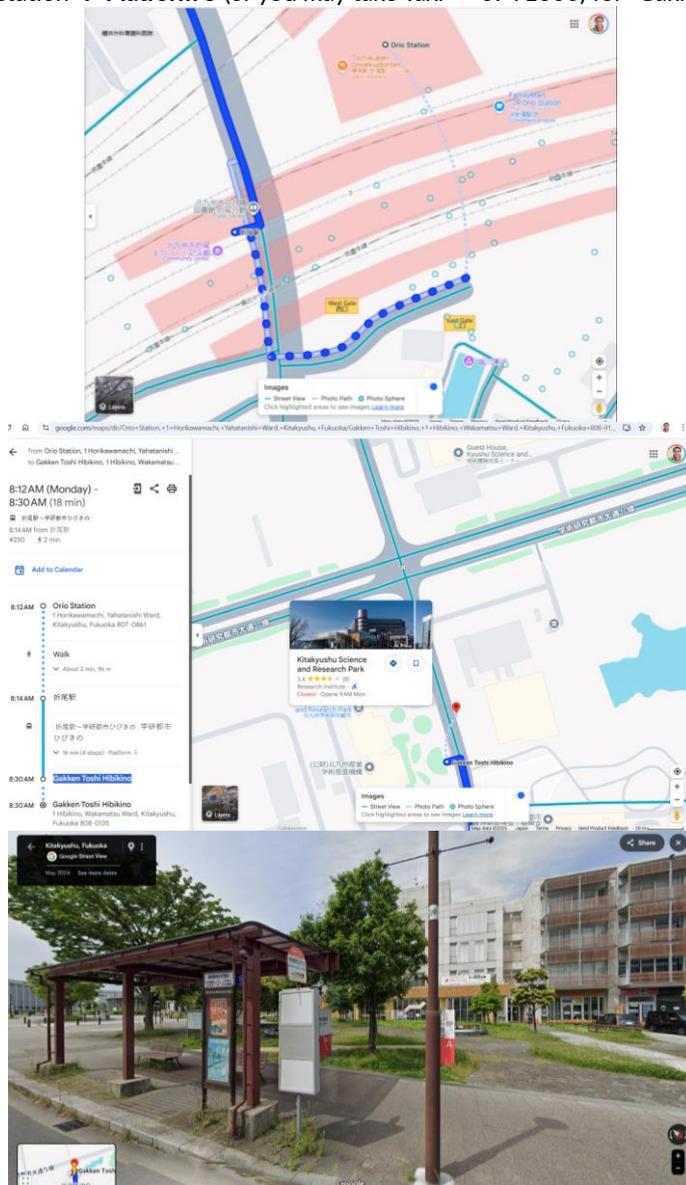
Detailed instruction on bus route to the venue for Day1 is: <http://censser.org/ICIEV/hibikino.pdf>

You may find the following Japanese words on the bus.

学研都市ひびきの

学術研究都市

In short, exit JR ORIO station → **Platform 5** (or you may take Taxi - ~JPY1600) for “Gakken Toshi Hibikino”



See the BUS Stop and behind the yellow-whitish building.

Conference Room 1, 2nd floor Kitakyushu Science and Research Park (KSRP); Same building of ODORIVA.

<p>08:00</p>	<p>Registration on the First day</p>
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09:00	Welcome Message: Prof. Sozo Inoue, Kyushu Institute of Tech., Japan Dr. M. A. S. Kamal, General Chair, SMIEEE, Gunma Univ., Japan
09:10	Workshop 1: Live Demo and Tutorial on Human-Centered AI with FonLog Organizer: Christina Garcia (Kyushu Institute of Tech.) Sozo Inoue (Kyushu Institute of Tech.) Fonlog Introduction and Demo Forecasting Parkinson's Disease Wearing-off Dr. John Noel Victorino, Chief Technology Officer @ SolX Technologies Inc. Optimizing Forecasted Activity Notifications with Reinforcement Learning Dr. Muhammed Fikry, Universitas Malikussaleh Improved Evaluation Metrics for Sentence Suggestions in Nursing and Elderly Care Record Applications Dr. Defry Hamdhana, Universitas Malikussaleh Analysis of Care Records for Predicting Urination Times Haru Kaneko, PhD D3, Kyushu Institute of Technology Large Language Models for Generating Semantic Nursing Activity Logs: Exploiting Temporal and Contextual Information Nazmun Nahid, PhD D3, Kyushu Institute of Technology Predicting and Analyzing Emotion of Elderly People in Care Facilities Min Xinyi, PhD D2, Kyushu Institute of Technology Extraction and Summarization from Visiting Nurse Transcriptions Using Improved Prompt Techniques Milyun Ni'ma Shoumi, PhD D2, Kyushu Institute of Technology Toward Detecting and Explaining Stress of Nurses Elsen Ronando, PhD D2, Kyushu Institute of Technology Relabeling for Indoor Localization in Nursing Care Facility Dr. Christina Garcia, Assistant Professor, Care XDX Center, Kyushu Institute of Technology Feedback Session End of Workshop
10:20	Invited Session 1: Session Chair: Tahera Hossain, Nagoya University, Japan Keynote Speech 1: Syoji Kobashi, University of Hyogo, Japan Invited Industry Talk 1: Ahmed Boudissa, TomTom N.V., The Netherlands
11:20	Coffee break then Kitakyushu Science and Research Park (KSRP) Tour
11:20	Workshop 2: Kitakyushu Science and Research Park (KSRP) Tour and Domestic Service Robot https://www.brain.kyutech.ac.jp/~hma/ws-os-iciev2025/ Organizer: Hakaru Tamukoh (Kyushu Institute of Tech.) Yuichiro Tanaka (Kyushu Institute of Tech.) Akinobu Mizutani (Kyushu Institute of Tech.)
11:20	Tour to Kitakyushu Science and Research Park (KSRP)
12:30	Online Technical Session S-A: (For Overseas Participants only due to visa issues) Session Chair: ASM Bakibillah (Institute of Science Tokyo) Paper ID: 3, Title: IntegraDenoNet: A Deep Learning Based Single Cell Multiomics Integration and Cell Type Identification

	<p>Authors: Md.Shaharia Hossen (United International Univ.); Sakib Mahmood Saad (United International Univ.); Maria Akter Rimi (United International Univ.); Marin Akter (United International Univ.); Fahim Hafiz (United International Univ.); Riasat Azim (United International Univ.)* Paper ID: 17, Title: Fast and Cost-Aware Workload Prediction for Accurate Auto-scaling Using Knowledge Distillation. Authors: Sharmen Akhter (Kyung Hee Univ.)*; Eui-Nam Huh (Kyung Hee Univ.)</p> <p>Paper ID: 44, Title: Data-Driven Diagnosis: Feature Engineering and Hyperparameter Tuning for Imbalanced Cardiovascular Disease Classification Authors: Ankon Karmokar (Jagannath Univ.); Md. Manowarul Islam (Jagannath Univ.)*; Arnisha Akhter (Jagannath Univ.); Uzzal Acharjee (Jagannath Univ.)</p> <p>Paper ID: 64, Title: Machine Learning Insights into Gasoline Vehicle Ownership Patterns in the United States: The Role of Sociodemographic Factors Authors: Mahbub Hassan (Universiti Malaysia Perlis (UniMAP))*; Saikat Sarkar Shraban (Shahjalal Univ. of Science and Technology); Md Abdus Samad Kamal (Gunma Univ.)</p>
12:30	Lunch Break (You can visit the Cafeteria / Coop next to the venue)
14:00	Workshop 2: (Continue) Workshop on domestic service robots
16:00	Coffee break and Robot demonstration
16:30	Discussion on future robots
17:30	Outcome presentation and further discussion
18:00	Welcome Reception
Day 2: 27 May	Venue (Day 2-4): Kitakyushu International Convention Center, Kokura, Kitakyushu-city, Fukuoka, Japan https://g.co/kgs/1QMoSmo
	
08:15	Registration and Breakfast
09:00	<p>Invited Session 2 Session Chair: Kou Yamada (Gunma Univ.) Keynote Speech 2: Mohammad Abu Yousuf (Vice-Chancellor, Gazipur Digital Univ., Bangladesh) Invited Talk 2: Takahiro Ueno, Fukuyama Univ., Japan</p>
10:00	<p>Technical Session S-1 (Onsite only): Session Chair: Tomohiro Shibata (Kyushu Institute of Tech.)</p> <p>Paper ID: 23, Title: Modeling Fuel Consumption Behavior from Driving Activity and Vehicle Motion Data Using Machine Learning Authors: Nur Husnina Asyura Binti Mezalan (Gunma Univ.)*; Cho Eika (Gunma Univ.); Nusrath Tabassum (Gunma Univ.); Md Abdus Samad Kamal (Gunma Univ.); Yamada Kou (Gunma Univ.)</p> <p>Paper ID: 32, Title: Analysis of the changes in the attitude of the news comments caused by knowing that the comments were generated by a large language model Authors: Nanase Mogi (Kansai Univ.)*; Megumi Yasuo (Ritsumeikan Univ.); Yutaka Morino (Kansai Univ.); Mitsunori Matsushita (Kansai Univ.)</p> <p>Paper ID: 37, Title: Multimodal Foundation Model for Cross-Modal Retrieval and Activity Recognition Tasks</p>

	<p>Authors: Koki Matsuishi (Kyushu Institute of Tech.); Kosuke Ukita (Kyushu Institute of Tech.); Tsuyoshi Okita (Kyushu Institute of Tech.)</p> <p>Paper ID: 45, Title: Quantum computation as trajectory monitoring requires only one qubit in answer register in quantum phase estimation Authors: Teturo Itami (Univ. of Hyogo)*; Nobuyuki Matsui (Univ. of Hyogo); Tejiro Isokawa (Univ. of Hyogo)</p> <p>Paper ID: 20, Title: An Ensemble Approach to Named Entity Recognition for Bangla-English Code-Switched Texts Using XLM-R, BiLSTM-CRF, and CRF Authors: Sultana Tasnim Jahan (Univ. of Chittagong); Rashed Mustafa (Univ. of Chittagong)</p> <p>Paper ID: 24, Title: Real-time Vehicle Abnormality Prediction: Enhancing Road Safety Through Naturalistic Driving Data Authors: Nusrath Tabassum (Gunma Univ.)*; Md Abdus Samad Kamal (Gunma Univ.); M.A.H. Akhand (Khulna Univ. of Engineering and Technology); Kou Yamada (Gunma Univ.)</p>
11:20	Coffee Break
11:40	<p>Invited Session 3 Session Chair: A. S. M. Bakibillah, Institute of Science, Tokyo, Japan</p> <p>Invited Talk 3: Tahera Hossain, Nagoya Univ., Japan</p> <p>Invited Talk 4: Hamada Rizk, Osaka Univ., Japan</p>
12:30	Lunch Break (Onsite – Halal lunch will be provided for those who requested)
12:35	<p>Online Technical Session S-B: (For Overseas Participants only due to visa issues) Session Chair: Hakaru Tamukoh, Kyushu Institute of Tech.</p> <p>Paper ID: 31, Title: A Fuzzy Logic and Spherical Fuzzy Logic-Based Multi-Criteria Decision Framework for Sustainable and Smart Urban Mobility Strategy Selection Authors: Shoyeb Muhammad (Department of Industrial and Production Engineering, Jashore Univ. of Science and Technology, Jashore-7408)*; Ashik Adnan (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515); Md. Abdus Samad Kamal (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515); Kou Yamada (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515)</p> <p>Paper ID: 34, Title: Occlusion-Aware Learning and Test-Time Adaptation for 3D Human Pose Estimation Authors: Md Imtiaz Hossain (Kyung Hee Univ.)*; Sungjun Yang (SIGONGtech); Eui-Nam Huh (Kyung Hee Univ.)</p> <p>Paper ID: 47, Title: Optimizing Task Offloading in Fog Computing with HAGSA-NS: A Hybrid Adaptive Gravitational Search Algorithm Authors: Md. Emran Biswas (Hajee Mohammad Danesh Science and Technology Univ.); Tangina Sultana (Hajee Mohammad Danesh Science and Technology Univ.); Md. Delowar Hossain (Hajee Mohammad Danesh Science and Technology Univ.); MST. Khadeja Sarker (Hajee Mohammad Danesh Science and Technology Univ.); Ga-Won Lee (Kyung Hee Univ.); Eui-Nam Huh (Kyung Hee Univ.)*</p>
13:50	<p>Technical Session S-2 (Onsite only): Session Chair: Rashed Mustafa (Univ. of Chittagong)</p> <p>Paper ID: 35, Title: Refining NeRF: The Power of High-Resolution Omnidirectional Vision Authors: Sho HASEGAWA (Shibaura Institute of Tech.); Chinthaka Premachandra (Shibaura Institute of Tech.)</p> <p>Paper ID: 43, Title: Realizing Human-Robot Cooperative Rope-Spinning with CPG-Based Control Using Visual Information Authors: Kakeru Yamasaki (Kyushu Institute of Tech.)*; Koki Iida (Kyushu Institute of Tech.); Patrick Hénaff (ENIB - École Nationale d'Ingénieurs de Brest); Tomohiro Shibata (Kyushu Institute of Tech.)</p>

	<p>Paper ID: 14, Title: Intelligent Lane Detection and Path Planning for Multi-Lane Autonomous Vehicle Navigation in Varied Weather Authors: Ashik Adnan (Gunma Univ.)*; Shoyeb Muhammad (Jashore Univ. of Science and Technology); Md Abdus Samad Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 39, Title: Novel View Synthesis using Gaussian Splatting with Image Depth Prior Authors: Bashir Hossain (Gunma Univ.)*; Nusrath Tabassum (Gunma Univ.); M.A.S. Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 63, Title: Study on bacteria image analysis towards Anti-Microbial resistance mechanism problem Authors: Abhinav Jayaraj (Univ. of East London)*; Md Atiqur Rahman Ahad (Univ. of East London)</p>
15:00	<p>Invited Session 4 Session Chair: Md Tawhidul Islam Khan, Saga Univ., Japan</p> <p>Invited Talk 5: Takuro Yonezawa, Nagoya Univ., Japan</p> <p>Invited Talk 6: Takumi Kitajima, Mie Univ., Japan</p>
15:50	Coffee Break
16:10	<p>Panel: Future Creation for Elderly and Child Care Invited Speaker 8: Sozo Inoue, Kyushu Institute of Tech., Japan. Invited Speaker 9: Yoshifumi Nishida, Institute of Science, Tokyo, Japan. Invited Speaker 10: Yuki Taoka, Institute of Science, Tokyo, Japan. Invited Speaker 11: Momoko Nakatani, Tokyo Institute of Tech., Japan. Invited Speaker 12: Shigeru Owada, Sony CSL, Japan.</p>
17:10	<p>Technical Session S-3 (Onsite only): Session Chair: Norikazu Ikoma (Nippon Institute of Tech.)</p> <p>Paper ID: 9, Title: Acoustic Emission Tomography for Damage Visualization in Homogeneous Material Surface Using Iterative Reconstruction Algorithm Authors: MD ABDUR RAHMAN (Saga Univ.)*; NAZMUSH SAKIB (Saga Univ.); Md. Mehedi Hassan (Tsuruta Orthopedic Hospital); TASHIRO HIBIKI (Saga Univ.); TAWHIDUL ISLAM KHAN (Saga Univ.)</p> <p>Paper ID: 18, Title: Model Predictive Control of an Autonomous Wheelchair: Integrating Pedestrian Reactions via the Social Force Model Authors: Xiaozhuo Zuo (Gunma Univ.)</p> <p>Paper ID: 33, Title: Fault tolerant control using double feedback control system-Case of lost signal from feedback loop- Authors: Daisuke Koyama (Gunma Univ.)*; Nghia Thi Mai (Posts and Telecommunications Institute of Tech.); Md Abdus Samad Kamal (Gunma Univ.); Iwanori Murakami (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 71, Title: LLM-based Indoor Localization in Nursing Care Facility: A Zero-Shot Ablation Study Authors: Christina Garcia (Kyushu Institute of Tech.)*; Sozo Inoue (Kyushu Institute of Tech.)</p> <p>Paper ID: 69, Title: Virtual Data Generation for Complex Industrial Activity Recognition : An Approach Based on Interpolation Algorithms Authors: Atsushi Yanagisawa (Kyoto Univ.)</p>
18:20	Closing Second Day
Day 3: 28 May	Venue: Same as Day 2: Kitakyushu International Convention Center, Kokura
08:30	Registration and Breakfast
09:00	Technical Session S-4 (Onsite only):

	<p>Session Chair: Atsushi Inoue, AnChain AI</p> <p>Paper ID: 2, Title: On Variational Bayes Approach to State Space Modeling with Its Implementation for Simple Mathematical Models Authors: Norikazu Ikoma (Nippon Institute of Tech.)*</p> <p>Paper ID: 6, Title: Deep Learning based Post-earthquake Structural Damage Assessments with Small Datasets Authors: Kaveesh Abeysuriya (Univ. of East London)*; Mihaela Anca Ciupala (Univ. of East London); Meghana Manikonda (Univ. of East London); Kruttika Jamalpuram (Univ. of East London); Aishwarya Nitin Sonar (Univ. of East London); Saeed Sharif (Univ. of East London); Seyed Ali Ghorashi (Univ. of East London); Alper Ilki (Istanbul Technical Univ.)</p> <p>Paper ID: 36, Title: Knowledge Distillation for Reservoir-based Classifier: Human Activity Recognition Authors: Masaharu Kagiya (Kyushu Institute of Tech.); Tsuyoshi Okita (Kyushu Institute of Tech.)*</p> <p>Paper ID: 38, Title: A Tracking Method of Multiple Animals Using YOLOv5 Authors: Toshifumi Kimura (Univ. of Hyogo)*; Hidetoshi Ikeno (The Univ. of Fukuchiyama); Mizue Ohashi (Univ. of Hyogo); Ryuichi Okada (Kobe Univ.); Mamiko Ozaki (Kobe Univ.); Hiroyuki Ai (Fukuoka Univ.); Shunya Habe (Semco Co., Ltd.); Teijiro Isokawa (Univ. of Hyogo)</p> <p>Paper ID: 41, Title: Fall Anxiety: Quantum State Probability as a Key Feature in Parkinson's Risk Prediction Authors: Septian Sukmana (Kyushu Institute of Tech.)*; Tomohiro Shibata (Kyushu Institute of Tech.)</p>
10:10	<p>Invited Session 5 Session Chair: Hamada Rizk, Osaka Univ., Japan</p> <p>Invited Industry Talk 13: Shuichi Ishida, CEO, TriOrb Inc., Japan</p> <p>Invited Talk 14: Md Tawhidul Islam Khan, Saga Univ., Japan</p> <p>Invited Talk 15: A. S. M. Bakibillah, Institute of Science, Tokyo, Japan</p>
11:25	Coffee Break
11:35	<p>Technical Session S-5 (Onsite only): Session Chair: Takahiro Ueno, Fukuyama Univ., Japan</p> <p>Paper ID: 49, Title: Gaze analysis of a walker user for the development of a gaze-based interface to operate a robotic walker Authors: Kengo IWAMOTO (Kyushu Institute of Tech.)*; Yuuta SHINODA (Kyushu Institute of Tech.); Tomohiro SHIBATA (Kyushu Institute of Tech.)</p> <p>Paper ID: 50, Title: A Real-Time Vision-Based System for Human Gesture Recognition in Collaborative Work Cells Authors: Natchanon Suppaadirek (Kyushu Institute of Tech.)*; Shreyan Shukla (Dronacharya Group of Institutions); Piyush Mudgal (Dronacharya College of Engineering); Tomohiro Shibata (Kyushu Institute of Tech.)</p> <p>Paper ID: 25, Title: A Novel Multiagent Approach for Optimal Right Turn Coordination of Connected Automated Vehicles at Urban Intersections Authors: Mahmudul Hasan (Gunma Univ., Japan)*; A.S.M Bakibillah (Institute of Science Tokyo); Md Abdus Samad Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 26, Title: Optimizing Traffic Network for Rapid Transit of Emergency Vehicles at the Scene of a Disaster Authors: Riku Munakata (Gunma Univ.)*; M.A.S. Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 42, Title: Controlling UAV Swarms for Adaptive Search and Coordinated Rescue Operations Authors: MD SAMSUL AREFIN SARKER (Gunma Univ.)*; MD SAMSUL AREFIN SARKER (Gunma Univ.); M.A.S. KAMAL (Gunma Univ.); KOU YAMADA (Gunma Univ.)</p>

12:45	Lunch Break (Onsite – Halal lunch will be provided for those who requested)
12:50	<p>Online Technical Session S-C: (For Overseas Participants only due to visa issues)</p> <p>Session Chair: Tahera Hossain, Nagoya Univ., Japan</p> <p>Paper ID: 28, Title: Multi-Frequency Disturbance Rejection Control via Delay-Coordinated DOB for Minimum Phase Systems Authors: Siripong Sangsarpan (Thai-Nichi Institute of Tech.)*; Nghii Thi Mai (Posts and Telecommunications Institute of Tech.); Md Abdus Samad Kamal (Gunma Univ.); Iwanori Murakami (Gunma Univ.); Kou Yamada (Gunma Univ.)</p> <p>Paper ID: 46, Title: AI-Enabled IoT System for Continuous Health Monitoring and Early Risk Detection Authors: Kamran Sharafi (Jagannath Univ.)*; Mohsinur Murad (Jagannath Univ.); Hassan Mahmud (Univ. of Information Technology and Sciences); Dr. Md. Manowarul Islam (Jagannath Univ.); Dr. Uzzal Acharjee (Jagannath Univ.); Arnisha Akhter (Jagannath Univ.)</p> <p>Paper ID: 48, Title: Phishing Detection Using Gradient-Weighted Ensemble with Hybrid Sampling and Weighted Ensemble Feature Selection Authors: Mrinal Basak Shuvo (Hajee Mohammad Danesh Science And Technology Univ.); Arjon Talukder (Hajee Mohammad Danesh Science and Technology Univ.); Sadia Islam Neela (Hajee Mohammad Danesh Science And Technology Univ.); Prakriti Paramarathi Roy (Hajee Mohammad Danesh Science And Technology Univ.); Tangina Sultana (Hajee Mohammad Danesh Science and Technology Univ., Bangladesh); Md. Delowar Hossain (Hajee Mohammad Danesh Science And Technology Univ., Bangladesh); Dr. Md. Arshad Ali (Hajee Mohammad Danesh Science and Technology Univ., Bangladesh); Eui-Nam Huh (Kyung Hee Univ., Yongin, South Korea)*</p> <p>Paper ID: 57, Title: Efficient Single-Lane Obstacle Overtaking for Autonomous Vehicles in Smart Cities Authors: Mohammad Hossain (Univ. of Prince Mugrin), M.A.S Kamal (Gunma Univ.)</p>
14:00	<p>Organized Session: Service Robotics Session Co-Chairs: Hakaru Tamukoh, Kyushu Institute of Tech. Dr. Sansei Hori, Tamagawa Univ.</p> <p>Paper ID: 55, Title: Hand Gesture Recognition with Deep Learning-Free Feature Extraction Authors: Keita Okumura (Kyushu Institute of Tech.)*; Kosei Isomoto (Kyushu Institute of Tech.); Yuichiro Tanaka (Kyushu Institute of Tech.); Hakaru Tamukoh (Kyushu Institute of Tech.)</p> <p>Paper ID: 56, Title: Multi-Speed Obstacle Detection Using Parallel SNN with Event-Based Vision Sensors Authors: Yuta Ohno (Kyushu Institute of Tech.)*; Yuga Yano (Kyushu Institute of Tech.); Yuichiro Tanaka (Kyushu Institute of Tech.); Hakaru Tamkoh (Kyushu Institute of Tech.)</p> <p>Paper ID: 58, Title: Demonstration Data Quality Estimation with Modality Priority Adjustment Using Separate Encoders Authors: Hiromasa Yamaguchi (Kyushu Institute of Tech.)*; Yuga Yano (Kyushu Institute of Tech.); Hakaru Tamukoh (Kyushu Institute of Tech.)</p> <p>Paper ID: 59, Title: Number-Marked Prompting for Empty Space Estimation Considering Object Relationships in Unknown Environments Authors: Ryo Terashima (Kyushu Institute of Tech.)*; Yuga Yano (Kyushu Institute of Tech.); Koshun Arimura (Kyushu Institute of Tech.); Hakaru Tamkoh (Kyushu Institute of Tech.)</p> <p>Paper ID: 60, Title: Experimental Evaluation of Adaptive Dual-Mode Vision System for ROS2: Integrating YOLO-World and SAM2 for Robotic Manipulation Authors: GAI NAKATOGAWA (Tamagawa Univ.)*; SANSEI HORI (Tamagawa Univ.)</p> <p>Paper ID: 61, Title: Toolchain for Data Augmentation and Evaluation of Object Detection Authors: Ginga Kise (NIT, Kitakyushu); Yuma Yoshimoto (NIT, Kitakyushu)*</p> <p>Paper ID: 62, Title: An FPGA Accelerated Architecture for Prolonging the Operating Time of Home Service Robots</p>

	Authors: Haruki Miura (NIT, Kitakyushu); Rion Yofu (NIT, Kitakyushu); Yuma Yoshimoto (NIT, Kitakyushu)*
15:30	<p>Invited Session 6 Session Chair: Mohammad Abu Yousuf (Gazipur Digital Univ., Bangladesh)</p> <p>Invited Talk 16: Miho Ohsaki, Doshisha Univ., Japan</p> <p>Invited Talk 17: Kimiaki Shirahama, Doshisha Univ., Japan</p> <p>Invited Talk 18: Eiji Aoki, Institute for Hypernetwork Society, Japan</p>
16:45	Coffee Break
17:00	<p>Technical Session S-6 (Onsite only): Session Chair: Kou Yamada, Gunma University</p> <p>Paper ID: 13, Title: MNMD: A multimodal non-invasive mental disorder detection method Authors: Rashed Mustafa (Univ. of Chittagong)*; Mahir Shadid (International Islamic Univ., Chittagong, Bangladesh); A.H.M Sajedul Hoque (Eötvös Loránd Univ. (ELTE))</p> <p>Paper ID: 15, Title: Hyperventilation-induced Cerebral Patterns Analysis for Neurocognitive Disorder Detection via AI Models Authors: Kusum Tara (Saga Univ.)*; Ruimin Wang (Saga Univ.); Yoshitaka Matsuda (Saga Univ.); Satoru Goto (Saga Univ.); Takako Mitsudo (Minkodo-Minohara Hospital, Fukuoka; NHO Hizen Psychiatric Medical Center, Saga); Takao Yamasaki (Minkodo-Minohara Hospital, Fukuoka; International Univ. of Health and Welfare, Fukuoka); Takenao Sugi (Saga Univ.)</p> <p>Paper ID: 52, Title: Psychological Data Collection of Elderly Care Workers for LLM-based Stress Detection Authors: Naoya Miyake (Kyushu Institute of Tech.); Haru Kaneko (Kyushu Institute of Tech.)*; Elsen Ronando (Kyushu Institute of Tech.); Xinyi Min (Kyushu Institute of Tech.); Christina Garcia (Kyushu Institute of Tech.); Sozo Inoue (Kyushu Institute of Tech.)</p> <p>Paper ID: 8, Title: TRANSFER LEARNING IN CLASSIFYING ACOUSTIC EMISSION SIGNALS FROM OSTEOARTHRITIC KNEES Authors: Nazmush Sakib (Saga Univ.); Md Abdur Rahman (Saga Univ.); Md. Mehedi Hassan (Tsuruta Orthopedic Hospital); Tawhidul Islam Khan (Saga Univ.)*; Shuya Ide (Tsuruta Orthopedic Hospital)</p> <p>Paper ID: 51, Title: Prediction of QoL in healthy older adults using non-motor information from smart devices Authors: Yu Makido (Kyushu Institute of Tech.)*; John Noel Victorino (Ateneo de Manila Univ.); Kengo Iwamoto (Kyushu Institute of Tech.); Tomohiro Shibata (Kyushu Institute of Tech.)</p> <p>Paper ID: 53, Title: WIP: Towards Automating Entry and Exit Logs in Nursing Records Utilizing Video and Large Language Models Authors: RYUYA MUNEMOTO (Kyushu Institute of Tech.); Nazmun Nahid (Kyushu Institute of Tech.)*; Sozo Inoue (Kyushu Institute of Tech.)</p>
19:00	<p>Banquet & Award Ceremony (Venue: Mikuni World Stadium Kitakyushu) (For registrants: if you want to buy any extra ticket(s), please contact the registration desk)</p> <div style="display: flex; justify-content: space-around;">   </div>
Day 4: 29 May	Tour & Online
10:00	Technical Tour (Registration desk for more information)
15:00	Post-ABC (Activity & Behavior Computing) Event (Online): Session Chair: Sozo Inoue, Kyutech, Japan

16:00	Tremor (Activity Recognition) Challenge - 2 Session Chair: Shahera Hossain, Univ. of East London, UK
17:00	Meeting of the Organizing Committee of IVPR-ICIEV 2026

Keynote/Invited Speakers:

A. S. M. Bakibillah, Tokyo Institute of Technology, Japan.



Ahmed Boudissa, TomTom, The Netherlands.



Eiji Aoki, Institute for Hypernetwork Society, Japan.



Hamada Rizk, Osaka University, Japan.



Khan Md Tawhidul Islam, Saga University, Japan.



Miho Ohsaki, Doshisha University, Japan.



Kimiaki Shirahama, Doshisha University, Japan.



Mohammad Abu Yousuf, Vice-Chancellor, Gazipur Digital University, Bangladesh.



Momoko Nakatani, Tokyo Institute of Technology, Japan.



Tahera Hossain, Nagoya University, Japan.



Shigeru Owada, Sony CSL, Japan.



Shuichi Ishida, CEO, TriOrb Inc., Japan.



Sozo Inoue, Kyushu Institute of Technology, Japan.



Syoji Kobashi, University of Hyogo, Japan.



Takahiro Ueno, Fukuyama University, Japan.



Takumi Kitajima, Mie University, Japan.

Takuro Yonezawa, Nagoya University, Japan.



Yoshifumi Nishida, Institute of Science Tokyo, Japan.



Yuki Taoka, Institute of Science Tokyo, Japan.



Abstracts of Technical Papers IVPR-ICIEV 2025

Day 1: 12:30 Online Technical Session S-A:

3: IntegraDenoNet: A Deep Learning Based Single Cell Multiomics Integration and Cell Type Identification

Md.Shaharia Hossen (United International Univ.); Sakib Mahmood Saad (United International Univ.); Maria Akter Rimi (United International Univ.); Marin Akter (United International Univ.); Fahim Hafiz (United International Univ.); Riasat Azim (United International Univ.)

Abstract: The correlation between different phases of biological data, such as transcriptomics, metabolomics, and other omics, is important in the case of disease analysis. Multiomics aims to combine diverse omics data into a unified dataset, revealing interrelationships and their influence on complex biological processes. Although multiomics methodologies are relatively new, their demonstrated potential to accurately uncover insights has captured the bioinformatics field. However, limited datasets and challenges in preparing unbiased models have hindered widespread application. This research introduces an innovative deep learning-based method for the seamless integration of multiomics single-cell data, allowing for accurate classification of omics expression levels. Omics data are reconstructed using a denoising autoencoder with a learning rate scheduler, cosine annealing. Reconstructed data are integrated with labels for further downstream analysis. Our proposed method achieved minimal classification loss, approximately 0.05% compared to other recent methods. Furthermore, the proposed method achieved a consistent accuracy greater than 90% in three multiomics datasets, beating four advanced state-of-the-art (SOTA) methods. The proposed model 'IntegraDenoNet' demonstrates improved classification accuracy and advances possibilities in precision medicine.

17: Fast and Cost-Aware Workload Prediction for Accurate Auto-scaling Using Knowledge Distillation.

Sharmen Akhter (Kyung Hee Univ.); Eui-Nam Huh (Kyung Hee Univ.)*

Abstract: With the increasing demands for service requests in cloud computing, maintaining seamless and low-latency service with reliability and lower cost by reducing resource waste becomes challenging due to the high variability and dimensionality of heterogeneous service types and dynamic workloads. Existing auto-scaling approaches often employ reactive and predictive methods, leading to resource over-provisioning or under-provisioning, impacting cost and performance. This paper proposes a novel knowledge Distillation (KD) based workload Prediction approach, DistPred. DistPred predicts workload precisely leading to lower resource waste and costs based on a proposed novel KD technique, Filter-KD. This work poses twofold contributions: 1) a KD approach, Filter-KD for regression problems that restrict the wrong prediction to be propagated to the student, and 2) a fast and accurate workload prediction approach, DistPred, using the distillation approach. DistPred significantly reduces latency, optimizes resource utilization, and minimizes cost and waste through near-accurate workload prediction for auto-scaling. The proposed DistPred reduces resource waste by an average of 88%, i.e., eight (8) times than the baselines for seven (7) diverse architecture setups on the large-scale benchmark standard Google Cloud Trace dataset while achieving a 50% (approx.) faster inference. Extensive ablation studies demonstrate the superiority of the DistPred.

44: Data-Driven Diagnosis: Feature Engineering and Hyperparameter Tuning for Imbalanced Cardiovascular Disease Classification

Ankon Karmokar (Jagannath Univ.); Md. Manowarul Islam (Jagannath Univ.); Arnisha Akhter (Jagannath Univ.); Uzzal Acharjee (Jagannath Univ.)*

Abstract: Cardiovascular diseases (CVDs) have emerged as the primary cause of mortality across the globe, and this lays a strong emphasis on the importance of prediction models in securing effective medical interventions at the required time and with appropriate accuracy. This study presents a robust machine-learning framework that combines feature engineering, hyperparameter tuning, and ensemble model evaluation to improve CVD prediction. Preprocessing applies feature engineering methodologies, such as outlier removal, capping, and normalization, to make data quality tuned. Five advanced models—Random Forest (87.43%), Gradient Boosting (89.30%), AdaBoost (87.01%), XGBoost (88.11%), and LightGBM (88.02%)—get optimized using RandomizedSearchCV. Among all, Gradient Boosting achieves the highest validation accuracy (89.30%) and proves to be the best classifier. The proposed framework is much superior to traditional methods in terms of precision, sensitivity, and specificity, which can be put to use in diagnostic and preventive planning as well as in clinical decisions regarding cardiovascular health care.

64: Machine Learning Insights into Gasoline Vehicle Ownership Patterns in the United States: The Role of Sociodemographic Factors

Mahbub Hassan (Universiti Malaysia Perlis (UniMAP)); Saikat Sarkar Shraban (Shahjalal Univ. of Science and Technology); Md Abdus Samad Kamal (Gunma Univ.)*

Abstract: Understanding the persistence of gasoline vehicle ownership in the United States is essential for advancing decarbonization goals and designing equitable transportation policies. This study uses data from the 2022 National Household Travel Survey (NHTS) to investigate sociodemographic determinants of household gasoline vehicle ownership. A total of 7,404 vehicle-household records were analyzed using four supervised machine learning classifiers: Logistic Regression, Naive Bayes, Random Forest, and XGBoost. The models were trained on key socioeconomic and geographic variables, including household income, household size, census division, and urban rural classification. Model performance was evaluated using a combination of hold-out testing and five-fold cross-validation, with accuracy, precision, recall, and F1 score as metrics. Random Forest achieved the highest overall accuracy (91%) and F1 score (0.92), followed by XGBoost (86% accuracy, 0.86 F1 score). Logistic Regression and Naive Bayes showed moderate but consistent performance. Feature importance analysis revealed household income, vehicle ownership, and census division as key predictors across all models. These findings highlight the superior performance of ensemble methods and the continued significance of socioeconomic and regional factors in predicting gasoline vehicle ownership. The results support the need for robust, data driven models to inform equitable and targeted transportation policy interventions.

Day 2: 10:00 Technical Session S-1:

23: Modeling Fuel Consumption Behavior from Driving Activity and Vehicle Motion Data Using Machine Learning

*Nur Husnina Asyura Binti Mezalan (Gunma Univ.)**; *Cho Eika (Gunma Univ.)*; *Nusrath Tabassum (Gunma Univ.)*; *Md Abdus Samad Kamal (Gunma Univ.)*; *Yamada Kou (Gunma Univ.)*

Abstract: Modeling fuel consumption based on driving states is essential in developing eco-driving and route selection strategies for advanced driver assistance systems. However, accurately predicting vehicle fuel consumption is challenging due to dynamic factors like road slope, vehicle conditions, and rapid changes in driving behavior. Developed based on ideal road and vehicle conditions, traditional empirical models often fail to adapt to these conditions, leading to inaccurate estimations. This study explores incorporating throttle position, a critical indicator of driving activity regarding motion control, acceleration, and speed, to enhance predictive accuracy, overcoming the unknown slope effects. Since the throttle position indicating the applied torque to the engine has a complicated relationship associated with engine and vehicle speeds, gear, and road slope, machine learning methods are employed to develop the model instead of typical empirical models, like VT-Micro, for standard driving. The results show that the Random Tree performed best on the test dataset. They are further evaluated on a cross-dataset, which is not used for training, where NN outperformed all models. SVM also demonstrated competitive performance across both datasets. In contrast, VT-Micro consistently exhibited poor accuracy, particularly in transient driving conditions. These findings underscore the advantages of using activity information with machine learning for modeling complex, nonlinear vehicle dynamics, providing more accurate and adaptive fuel consumption predictions for sustainable transportation planning and energy management.

32: Analysis of the changes in the attitude of the news comments caused by knowing that the comments were generated by a large language model

*Nanase Mogi (Kansai Univ.)**; *Megumi Yasuo (Ritsumeikan Univ.)*; *Yutaka Morino (Kansai Univ.)*; *Mitsunori Matsushita (Kansai Univ.)*

Abstract: This study investigated the attitudes of people toward texts generated by large language models (LLMs), such as social networking service posts and news comments. Recently, the number of people viewing texts generated by LLMs has increased. Because an LLM can generate natural texts that are almost indistinguishable from those written by humans, there is a concern that generating such natural texts may cause problems such as maliciously guiding public opinion. To evaluate the reception of LLM-generated texts, we conducted an experiment based on the hypothesis that the knowledge that a text was generated by an LLM would influence user acceptance. In the experiment, news comments in which AI-generated comments were mixed were shown to the participants. We controlled whether the user was aware that the text had been generated by an LLM, and assessed their viewpoints from four perspectives: perceived friendliness, trustworthiness, empathy, and reference. The results showed that a generated comment imitating the opinion of an expert increased in rank when it was disclosed that the LLM generated the comment. In particular, “reliability” and “informative” were sensitive to this disclosure, while “familiar” and “empathy” were not. This indicates that expert labeling significantly enhances perceived reliability, and the finding raises concerns about the possibility of news viewers being implicitly guided to a particular opinion.

37: Multimodal Foundation Model for Cross-Modal Retrieval and Activity Recognition Tasks

Koki Matsuishi (Kyushu Institute of Tech.); Kosuke Ukita (Kyushu Institute of Tech.); Tsuyoshi Okita (Kyushu Institute of Tech.)

Abstract: In recent years, the widespread adoption of wearable devices has highlighted the growing importance of behavior analysis using IMU. While applications span diverse fields such as healthcare and robotics, recent studies have increasingly focused on multimodal analysis, in addition to unimodal analysis. Several studies have proposed multimodal foundation models that incorporate first-person video and text data; however, these models still fall short in providing a detailed analysis of full-body human activity. To address this limitation, we propose Activity Understanding and Representations Alignment - Multimodal Foundation Model (AURA-MFM), a foundational model integrating four modalities: third-person video, motion capture, IMU, and text. By incorporating third-person video and motion capture data, the model enables a detailed and multidimensional understanding of human activity, which first-person perspectives alone fail to capture. Additionally, a Transformer-based IMU encoder is employed to enhance the model's overall performance. Experimental evaluations on retrieval and activity recognition tasks demonstrate that our model surpasses existing methods. Notably, in the zero-shot classification for action recognition, our method achieved significantly higher performance, with an F1-score of 0.6226 and an accuracy of 0.7320, whereas the existing method recorded an F1-score of 0.0747 and an accuracy of 0.1961.

45: Quantum computation as trajectory monitoring requires only one qubit in answer register in quantum phase estimation

Teturo Itami (Univ. of Hyogo)*; Nobuyuki Matsui (Univ. of Hyogo); Tejiro Isokawa (Univ. of Hyogo)

Abstract: Quantum computation scheme developed so far using classical apparatuses is extended to systems with two qubits. We will explain how to make a CNOT gate in an easy-to-understand manner using numerical examples. After that, we show that, in quantum phase estimation algorithm, our system requires only one qubit in answer register. This feature is an interesting advantage of such computational systems.

Contribution of the Paper: Our work gives a tool how to assemble classical apparatuses to make universal gates in quantum computers.

20: An Ensemble Approach to Named Entity Recognition for Bangla-English Code-Switched Texts Using XLM-R, BiLSTM-CRF, and CRF

Sultana Tasnim Jahan (Univ. of Chittagong); Rashed Mustafa (Univ. of Chittagong)

Abstract: NamedEntity Recognition (NER) in Bangla-English code-switched textis quite challenging due to tokenization irregularities, linguistic variances, and the absence of annotated datasets. Current NER algorithms focus mainly on monolingual or organized multilingual texts, with little attention paid to code-switched data. The efficacy of conventional methods is further constrained by the difficulties in managing grammatical errors, unclear entity boundaries, and tokenization issues. This paper suggests an ensemble-based NER method that combines the CRF, BiLSTM-CRF, and XLM-R models in order to solve this problem. The final categorization is decided by a majority voting process after each model independently predicts entity labels. This hybrid approach ensures

improved generalization and lower entity recognition mistakes by utilizing transformer-based contextual embeddings in conjunction with sequence-labeling approaches. The results of experiments show that the suggested method greatly enhances entity detection in intricate, code-switched texts by achieving more accuracy and robustness when compared to individual models. The study has significant applications in social media analysis, customer support automation, and multilingual information extraction, all of which depend on the ability to handle mixed-language text. We intend to investigate self-learning strategies for domain adapt ability, add more varied linguistic patterns, and enlarge the dataset in subsequent research. Furthermore, the performance of NER in code mixed, low-resource environments may be further improved by using meta-learning techniques and adaptive fine-tuning.

24: Real-time Vehicle Abnormality Prediction: Enhancing Road Safety Through Naturalistic Driving Data

Nusrath Tabassum (Gunma Univ.); Md Abdus Samad Kamal (Gunma Univ.); M.A.H. Akhand (Khulna Univ. of Engineering and Technology); Kou Yamada (Gunma Univ.)*

Abstract: Real-time driving assistance is highly desired to improve individual driving safety by identifying abnormal driving activity associated with near-collision scenarios caused by physical, mental, or unknown factors and communicating to the driver to facilitate collision-free driving. This paper introduces an early abnormality detection scheme using the driver's car-following behavior instead of a typical wearable or sensor-based framework that can be used to estimate the time-to-collision (TTC) index as a surrogate safety measure for detecting a potential conflict or accident. As a fraction of a second is often crucial in preventing an accident, early prediction of TTC is proposed as an effective early warning to a driver on the eve of advance notice of a potential conflict situation. Our system provides a warning to the driver 25% earlier. Different machine learning models are applied here with a threshold of 4 seconds. Our experimental results demonstrate superior accuracy in predicting TTC and classifying potential vehicle conflicts.

12:35: Online Technical Session S-B:

31: A Fuzzy Logic and Spherical Fuzzy Logic-Based Multi-Criteria Decision Framework for Sustainable and Smart Urban Mobility Strategy Selection

Shoyeb Muhammad (Department of Industrial and Production Engineering, Jashore Univ. of Science and Technology, Jashore-7408); Ashik Adnan (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515); Md. Abdus Samad Kamal (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515); Kou Yamada (Division of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma Univ., Kiryu 376-8515)*

Abstract: With the rapid expansion of Industry 4.0, the need for an efficient, sustainable, and smart mobility system has become an unavoidable part of any smart city. Formulating and selecting appropriate strategies is one of the key aspects of building a smart mobility system, as it must meet the dynamic demand of the hectic schedule and complex urban road network. However, an updated decision-support framework for strategy selection for smart mobility systems is lacking in the existing literature. Thus, this study aims to identify and formulate the most important strategies for sustainable urban mobility systems and prioritize them using different multi-criteria decision-making frameworks.

This study relies on the Analytic Hierarchy Process (AHP), Fuzzy-AHP, and Spherical Fuzzy-AHP methods to prioritize and rank the identified strategies. Later, it conducts a comparative sensitivity analysis among the three approaches to verify their robustness and variations. "Sustainable Urban Mobility Plans," "Intelligent Traffic and Parking Management," "Public Awareness and Behavioral Change," and "Optimized Demand-Responsive Transit" were of the utmost importance. Whereas AHP and Fuzzy-AHP give similar rankings, though there was a little variation in weights, Spherical Fuzzy-AHP shows different rankings and, of course, different weights. As a Spherical Fuzzy system can capture membership, non-membership, and hesitancy, it provides a much more sophisticated analysis. This study can provide policymakers and urban mobility planners with a robust decision-support framework to take appropriate strategies to make a smart and sustainable mobility system for smart cities.

34: Occlusion-Aware Learning and Test-Time Adaptation for 3D Human Pose Estimation

Md Imtiaz Hossain (Kyung Hee Univ.); Sungjun Yang (SIGONGtech); Eui-Nam Huh (Kyung Hee Univ.)*

Abstract: 3D Human Pose Estimation (3DHPE) under occlusions remains a persistent challenge due to the inherent variability and unpredictability of occlusion patterns in real-world scenarios. Traditional pose estimation methods often fail to generalize effectively to occluded inputs because they rely on single-mode intrinsic distributions learned from unoccluded or sparsely occluded data during training. To address this limitation, we propose, OALAM, Occlusion-Aware Learning with an Augmented Mixture, a novel framework that introduces a synthetic occlusion-aware training strategy and facilitates adaptation during test time with respect to occlusions. Unlike conventional approaches, our method models pose sequences as a mixture of distributions by augmenting training data with diverse synthetic occlusions, enabling the network to learn robust contextual dependencies. During inference, OALAM adapts to uncertain and complex occlusion patterns by leveraging the learned mixture distribution, dynamically recalibrating its representation to better match the occluded test-time domain. Experimental results demonstrate that OALAM significantly outperforms baseline methods on multiple benchmark datasets, confirming its effectiveness and generalizability for occlusion-aware 3DHPE.

47: Optimizing Task Offloading in Fog Computing with HAGSA-NS: A Hybrid Adaptive Gravitational Search Algorithm

*Md. Emran Biswas (Hajee Mohammad Danesh Science and Technology Univ.); Tangina Sultana (Hajee Mohammad Danesh Science and Technology Univ.); Md. Delowar Hossain (Hajee Mohammad Danesh Science and Technology Univ.); MST. Khadeja Sarker (Hajee Mohammad Danesh Science and Technology Univ.); Ga-Won Lee (Kyung Hee Univ.); Eui-Nam Huh (Kyung Hee Univ.)**

Abstract: The swift proliferation of Internet of Things (IoT) devices and the demand for minimal latency applications has rapidly increased the incorporation of fog computing alongside traditional cloud computing. Nevertheless, efficient task offloading in fog settings remains a significant issue due to variable network conditions, resource constraints, and stringent quality-of-service (QoS) requirements. This research proposes a novel Hybrid Adaptive Gravitational Search Algorithm with Neighborhood Search

(HAGSA-NS) to enhance task offloading in fog computing, solving these issues. HAGSA-NS integrates the global exploration capabilities of the Adaptive Gravitational Search Algorithm (AGSA), the diversity-enhancing features of Differential Evolution (DE), and the local exploitation benefits of Neighborhood Search (NS). This hybrid approach enables effective and efficient task allocation, even in highly dynamic and resource-constrained environments. The effectiveness of HAGSA-NS is evaluated against two prevalent optimization methods, Particle Swarm Optimization (PSO) and Genetic Algorithm (GA), using two primary metrics: ideal fitness values across iterations and average computational latency. Experimental results demonstrate that HAGSA-NS consistently outperforms PSO and GA, achieving reduced fitness values and significantly decreased delays. HAGSA-NS achieves an average delay of 1.0, whereas PSO exhibits a delay of 4.234 and GA demonstrates a delay of 1.791. These findings highlight the benefits of HAGSA-NS in terms of solution quality and computational efficiency, positioning it as a viable strategy for work offloading in fog computing environments.

13:50 Technical Session S-2 (Onsite only):

35: Refining NeRF: The Power of High-Resolution Omnidirectional Vision

Sho HASEGAWA (Shibaura Institute of Tech.); Chinthaka Premachandra (Shibaura Institute of Tech.)

Abstract: As NeRF technology becomes more widely adopted, research has increasingly focused on enhancing its performance. Despite its potential, NeRF still faces several challenges, including long training times, high computational demands, and lower accuracy compared to other 3D reconstruction methods such as photogrammetry. A critical step in NeRF generation is camera pose estimation, which typically involves extracting features such as object boundaries and corners from captured images. We found that using an omnidirectional camera can reduce shooting time while still enabling accurate NeRF generation, even when the camera lacks a high-performance image sensor. In this study, we aimed to improve the quality of camera pose estimation in order to enhance the accuracy of NeRF generation by increasing the resolution of partitioned omnidirectional images and improving the definition of object boundaries. Our experiments demonstrated that these improvements effectively reduced noise in the generated NeRFs and improved their overall accuracy. Therefore, our findings suggest that even with consumer-grade devices, such as general omnidirectional cameras, it is possible to generate a more accurate NeRF space by incorporating the proposed processing.

43: Realizing Human-Robot Cooperative Rope-Spinning with CPG-Based Control Using Visual Information

Kakeru Yamasaki (Kyushu Institute of Tech.); Koki Iida (Kyushu Institute of Tech.); Patrick Hénaff (ENIB - École Nationale d'Ingénieurs de Brest); Tomohiro Shibata (Kyushu Institute of Tech.)*

Abstract: Achieving coordinated motion through flexible objects remains a significant challenge in Human-Robot Interaction (HRI). This study investigates a novel application of Central Pattern Generator (CPG) control, previously used in handshake robots, to a rope-spinning task involving human-robot cooperation. A real-time motion feedback system was developed using Azure Kinect, enabling a robot to synchronize its movements with human input by dynamically adjusting CPG outputs. We evaluated the system's performance by varying rope lengths (250--400\,cm) and analyzing spatial trajectories and

Euclidean distances between the human and robot end-effectors. Results showed that while high coordination was achieved under shorter rope conditions, longer ropes introduced increased slack and tension variability, which reduced the robot's tracking stability. Frequency analysis also revealed weaker synchronization on the robot side, particularly in the vertical (Z) direction. These findings indicate that vision-based feedback alone is insufficient for robust adaptation to the dynamic characteristics of flexible objects. The vision-based method demonstrated lower amplitude fidelity and synchronization precision than our previous force-feedback approach. Future work will focus on integrating multimodal feedback, combining visual and force sensing, to improve coordination and robustness in flexible-object-mediated HRI.

14: Intelligent Lane Detection and Path Planning for Multi-Lane Autonomous Vehicle Navigation in Varied Weather

Ashik Adnan (Gunma Univ.); Shoyeb Muhammad (Jashore Univ. of Science and Technology); Md Abdus Samad Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)*

Abstract: Rapidly advancing intelligent and autonomous driving systems demand reliable computer vision-based perception technology, particularly for safe path detection in various weather and road conditions, which is essential for efficient vehicle navigation. This paper proposes a novel lane detection and path planning framework that integrates a Keras-based SCNN model with an advanced road center estimation technique designed to enhance multi-lane perception and path planning under challenging conditions. Furthermore, we address the issue of lane detection when lines are illuminated by vehicle headlights or streetlights, even under severely reduced visibility conditions caused by heavy rainfall, using a color filtering technique. We propose a path planning technique that integrates the widely used slope calculation method with convolutional neural networks (CNN). The Keras model facilitates the detection of lane lines, enabling the calculation of the center trajectory based on the identified road lanes. The projection technique demonstrates effective performance in low visibility, adverse weather conditions, and multi-lane scenarios. Experimental results demonstrate that the proposed approach outperforms existing lane detection methods by effectively predicting the road center and enhancing path stability across varied weather conditions, multi-lane roads, and complex driving environments. By integrating deep learning-based lane perception with real-time road center estimation, this work significantly improves autonomous vehicle navigation in dynamic and challenging environments.

39: Novel View Synthesis using Gaussian Splatting with Image Depth Prior

Bashir Hossain (Gunma Univ.); Nusrath Tabassum (Gunma Univ.); M.A.S. Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)*

Abstract: Gaussian splatting, a novel view synthesis method rising in popularity, relies heavily on the geometry acquired from the input views. In this work, we find the effects of depth prediction on providing that geometry and explore how it improves the views synthesized from monocular images by Gaussian splatting. As this method of predicting novel views relies on a spatial comprehension of the scene, involving the shapes of the structures and their distance from the camera, the geometry of the input scenes are extracted by itself. Through leveraging a pretrained depth estimating network, we anticipate a significant on the number of parameters the gaussian network will have to learn. Moreover, with an explicit geometry available for both the predicted novel view and

its ground truth, using the same pretrained depth estimator, we seek to establish a depth based structural loss when it comes to this task. Our experiments include the ScanNet and DL3DV datasets for synthesizing novel views based on monocular images and the depth frames estimated from them.

63: Study on bacteria image analysis towards Anti-Microbial resistance mechanism problem

Abhinav Jayaraj (Univ. of East London); Md Atiqur Rahman Ahad (Univ. of East London)*

Abstract: Antimicrobial resistance (AMR) infections claim well over a million lives each year and the toll is still on rise. Quantitative microscopy can help reveal phenotypic cues, yet manual annotations of bacterial images is prohibitively slow and expensive. In this study, we investigate whether a single deep learning model U-Net can deliver accurate low-cost segmentation masks on two datasets (i) DeepBacs – Escherichia coli bright field segmentation dataset (binary task) and (ii) Clinical Bacteria Dataset (Multi-class task: Gram positive bacteria, Gram negative bacteria and background). After required augmentations, the binary model is trained with Binary Cross Entropy + Dice loss, while the multi-class model uses Dice, Unified Focal, Soft IoU and Soft Dice loss to mitigate severe class imbalance. The binary network achieves 97.7% pixel accuracy, 0.82 dice and recall >99% of all pixels, the multi-class network achieves 80.1% balanced accuracy, 0.72 average dice and 0.71 mean IoU, with Gram-positive bacteria having IoU = 0.63 and Gram-negative bacteria having 0.5. Side by side visualizations confirm that residual errors are confined to fuzzy boundaries and dense Gram-negative clusters. These results, demonstrated that deep learning segmentation can replace laborious hand-masking, giving microbiologists rapid, scalable access to morphological data that supports AMR studies. Future work will contain ablation study of the loss components and benchmark alternative architecture such as StarDist and vision transformer hybrids such as Swin-Unet to further improve boundary precision and instance separation.

Technical Session S-3 (Onsite only):

9: Acoustic Emission Tomography for Damage Visualization in Homogeneous Material Surface Using Iterative Reconstruction Algorithm

MD ABDUR RAHMAN (Saga Univ.); NAZMUSH SAKIB (Saga Univ.); Md. Mehedi Hassan (Tsuruta Orthopedic Hospital); TASHIRO HIBIKI (Saga Univ.); TAWHIDUL ISLAM KHAN (Saga Univ.)*

Abstract: Acoustic Emission Tomography (AET) is an advanced non-destructive evaluation (NDE) technique that enables subsurface defect detection by analyzing acoustic wave propagation characteristics. This study presents an application of AET for damage visualization in an aluminum specimen using an Iterative Reconstruction Algorithm (IRA). A single acoustic emission (AE) transducer was utilized with 16 linear projections at different angles, employing a dedicated R15 α receiver and a transmitter transducer for data acquisition. The investigation was conducted on both an undamaged aluminum surface and an aluminum specimen with an induced circular defect to compare the slowness distribution. The artificially generated signals collected from multiple projection angles were processed to determine the time-of arrival (TOA) variations, which served as the primary input for reconstructing slowness distribution maps. The tomographic reconstruction results demonstrated a uniform slowness distribution in the undamaged aluminum sample, whereas the damaged region exhibited localized increases in slowness, effectively highlighting the internal defect. The ability of AET to visualize subsurface

damage through variations in wave propagation characteristics underscores its effectiveness as a diagnostic tool for material integrity assessment. This study confirms the capability of AET in providing accurate and reliable defect visualization in homogeneous materials. The findings highlight the potential of AET for applications in aerospace, automotive, and industrial manufacturing sectors, where real-time structural health monitoring (SHM) and defect detection are critical for ensuring safety and reliability.

18: Model Predictive Control of an Autonomous Wheelchair: Integrating Pedestrian Reactions via the Social Force Model

Xiaozhuo Zuo (Gunma Univ.), Masakazu Mukai (Kogakuin Univ.), Md Abdus Samad Kamal (Gunma Univ.), Kou Yamada (Gunma Univ.)

Abstract: As society continues to age, there is a growing demand for safe and reliable mobility solutions to help elderly and disabled individuals maintain an active and comfortable lifestyle. This paper focuses on developing intelligent automated wheelchairs and introduces an optimal control system for automatic trajectory generation in typical active pedestrian environments. In particular, we propose replacing the conventional pedestrian model with the social force model (SFM) to replicate the future motion of pedestrians, which not only provides more realistic predictions of pedestrian movements when they encounter wheelchairs but also better simulates complex environments with a high pedestrian density. Such predicted information is fed to the optimization framework for controlling the wheelchair without increasing the computational burden, enabling wheelchairs to navigate the environment intelligently while accounting for various safety constraints.

33: Fault tolerant control using double feedback control system - Case of lost signal from feedback loop

Daisuke Koyama (Gunma Univ.); Nghia Thi Mai (Posts and Telecommunications Institute of Tech.); Md Abdus Samad Kamal (Gunma Univ.); Iwanori Murakami (Gunma Univ.); Kou Yamada (Gunma Univ.)*

Abstract: In this paper, we examine a fault tolerant control using the double feedback control for output failure. For plants with uncertainty, it is difficult to design a control system that keeps stability and has low sensitivity characteristics. To design a control system with stability and low sensitivity, the double feedback control system has been proposed. The double feedback control system has a structure in that the two-degree-of-freedom control system is included in the two-degree-of-freedom control system. This structure provides excellent low sensitivity characteristics to the double feedback control system. In addition, the control structure can maintain the stability of the control system even if an internal controller has a failure that has lost signal from the output. However, the necessary and sufficient condition that the double feedback control system is internally stable for a failure in which a controller loses signal from the output is not clarified. In this paper, we show the necessary and sufficient condition that the double feedback control system is internally stable for a failure in which a controller loses signal from a feedback loop.

71: LLM-based Indoor Localization in Nursing Care Facility: A Zero-Shot Ablation Study

Christina Garcia (Kyushu Institute of Tech.); Sozo Inoue (Kyushu Institute of Tech.)*

Abstract: In this study, we use Large Language Models (LLMs) for room recognition in a nursing facility, leveraging contextual data to address data limitations. Traditional models struggle with Received Signal Strength Indicator (RSSI) variability and sparse data. LLMs offer a promising alternative by integrating domain knowledge to address signal inconsistencies and improve localization accuracy. We generate contextual prompts that link activity data, timestamps, and RSSI signals to room identification. By leveraging prompting with contextual information, specifically activity, spatial, and temporal including integrating domain knowledge, we aim to identify common areas and patient wings while addressing difficult-to-classify room pairs. We conduct an ablation study comparing three different context groups for indoor localization, with signal data preprocessed into an LLM-compatible format. The LLM is trained to understand relevant contextual features, including activity type, time of day, and RSSI strength, to predict room locations. The model is tested on unseen data to assess its generalization ability and effectiveness in room identification. We evaluate the model using real-world data collected during the dayshift from a nursing care facility equipped with 25 BLE beacons. Room recognition performance is measured using F1 scores and accuracy. We tested zero shot prompting technique in a language model, applying the suggested context, to evaluate performance and assess the impact of contextual information on room identification accuracy. By leveraging the LLM, significant contextual relationships related to location are identified, leading to improved room recognition performance and fewer errors caused by signal inconsistencies. This approach establishes both a valuable baseline and a promising application of LLMs for indoor localization in nursing care facilities.

69: Virtual Data Generation for Complex Industrial Activity Recognition : An Approach Based on Interpolation Algorithms

Atsushi Yanagisawa (Kyoto Univ.)

Abstract: In this study, we propose a virtual data generation method for the OpenPack Challenge that leverages labeled acceleration sensor data and advanced interpolation algorithms (including RBF- and FFT-based methods) to generate high-quality synthetic examples—achieving an F1 score of 0.6379 through label-based grouping with RBF interpolation—and suggest that GAN-based approaches may yield further improvements.

Technical Session S-4 (Onsite only):

2: On Variational Bayes Approach to State Space Modeling with Its Implementation for Simple Mathematical Models

*Norikazu Ikoma (Nippon Institute of Tech.)**

Abstract: Deep Markov Model, which would be called as Deep Kalman filters, as well as Structured Inference Networks, models structure behind time series data by employing nonlinear mapping of neural network for system model and observation model within state space modeling framework. So obtained hidden state estimate becomes distributed representation within neural network that leads to difficulty for interpretation of its meanings. This work begins with applying simple mathematical models to the framework of Deep Markov Model in order to address the above issues. Its implementation employs PyTorch based framework ""Pyro"" of programming language Python in demonstrative

examples of numerical experiment.

6: Deep Learning based Post-earthquake Structural Damage Assessments with Small Datasets

Kaveesh Abeysuriya (Univ. of East London); Mihaela Anca Ciupala (Univ. of East London); Meghana Manikonda (Univ. of East London); Kruttika Jamalpuram (Univ. of East London); Aishwarya Nitin Sonar (Univ. of East London); Saeed Sharif (Univ. of East London); Seyed Ali Ghorashi (Univ. of East London); Alper Ilki (Istanbul Technical Univ.)*

Abstract: This paper presents an in-depth investigation into the application of deep learning techniques to automate post-earthquake damage assessment, taking into account a key challenge encountered in earthquake/structural engineering domain, in particular the small size of datasets, a constraint that often results in model overfitting and decreased model generalisability. To address the dataset limitation challenge, both traditional image-data augmentation and synthetic data generation techniques were evaluated to expand the dataset. Additionally, transfer learning techniques including feature extraction and fine-tuning, as well as model regularisations were used. All these techniques were integrated and applied to MobileNet, the most efficient pre-trained convolutional neural network architecture for the target dataset, selected through a comparative study. Thus, demonstrating the efficiency of the techniques employed, the model achieved an accuracy, precision, recall and F1 score of 0.93 (93%), with enhanced model generalisability without overfitting, proving the model's capacity to handle image-data with diverse structural damage scenarios, while working with a small dataset. Overall, this research highlights the transformative potential of artificial intelligence in structural damage detection and classification, offering scalable and efficient solutions to bolster disaster resilience and infrastructure recovery.

36: Knowledge Distillation for Reservoir-based Classifier: Human Activity Recognition

*Masaharu Kagiya (Kyushu Institute of Tech.); Tsuyoshi Okita (Kyushu Institute of Tech.)**

Abstract: This paper introduces PatchEchoClassifier, a novel energy-efficient time-series model, along with a corresponding distillation method for its implementation. PatchEchoClassifier integrates a tokenizer with a reservoir-based architecture and is applied to human activity recognition (HAR) tasks using one-dimensional sensor data. Experimental results show that PatchEchoClassifier achieved less than half the FLOPS and less than 1/5 of heap size compared to the existing model while maintaining over 80 percent accuracy.

38: A Tracking Method of Multiple Animals Using YOLOv5

Toshifumi Klmura (Univ. of Hyogo); Hidetoshi Ikeno (The Univ. of Fukuchiyama); Mizue Ohashi (Univ. of Hyogo); Ryuichi Okada (Kobe Univ.); Mamiko Ozaki (Kobe Univ.); Hiroyuki Ai (Fukuoka Univ.); Shunya Habe (Semco Co., Ltd.); Teijiro Isokawa (Univ. of Hyogo)*

Abstract: In behavioral experiments on social animals in ethology, it is important to understand not only the detailed location of each of the target animals, but also their swarm behavior emerging from their interactions. Recently, many systems have been developed to support animal behavior analysis. However, these systems require videos under good conditions for easy discrimination of targets from background, leading to their

limited applications. In this paper, a tracking system that is robust to different experimental conditions is proposed. The proposed system adopts YOLOv5, a deep neural network based system, as an object detector from video images and incorporates the existing K-Track system for tracking the detected objects. The performance of the proposed system is evaluated using actual videos obtained from behavioral experiments.

41: Fall Anxiety: Quantum State Probability as a Key Feature in Parkinson's Risk Prediction

Septian Sukmana (Kyushu Institute of Tech.); Tomohiro Shibata (Kyushu Institute of Tech.)

Abstract: Fear of falling remains a significant concern for many Parkinson's Disease (PD) patients. High scores on the Fall Efficacy Scale-International (FES-I) indicate increased fear, which is linked not only to recurrent falls but also to anxiety that limits daily activities, further elevating fall risk. While machine learning offers potential for fall risk prediction, the role of psychological factors and advanced feature engineering—especially for gait data in PD patients—has been underexplored. This study proposes using quantum state probability values as novel features to predict fear of falling. Utilizing a motion capture dataset from the Federal University of ABC, Brazil, the model incorporated demographic data, L-Dopa dosage, and gait features. Among four dataset configurations, the model using only quantum state probability features achieved 93% accuracy with an SVM-RBF classifier. High values of Cohen's Kappa and MCC confirmed strong agreement with actual labels. Visualization using PCA and t-SNE showed that these quantum-based features provided clearer class separation than original features. These findings underscore the potential of quantum computing techniques to improve predictive models related to gait and treatment outcomes in PD patients.

Technical Session S-5 (Onsite only):

49: Gaze analysis of a walker user for the development of a gaze-based interface to operate a robotic walker

Kengo IWAMOTO (Kyushu Institute of Tech.); Yuuta SHINODA (Kyushu Institute of Tech.); Tomohiro SHIBATA (Kyushu Institute of Tech.)

Abstract: As populations in advanced economies continue to age and birth rates decline, a growing shortage of caregivers has emerged. This shortage has led to an inability to meet the demand for rehabilitation through human care-givers, prompting research into the automation of rehabilitation, such as robotic walkers. Estimating the user's intent in a robotic walker can improve safety and provide intuitive control, as well as personalized assistance, thus reducing the psychological barriers users may face when interacting with the robot. This study aims to investigate the intention of direction change based on head orientation by analyzing gaze patterns during turning and while checking the surroundings. Gaze analysis was performed using the Tobii Pro Glasses 3. Participants were asked to perform a task involving both turning while navigating a specific route and checking numbers placed around them, allowing for the collection of gaze data. The collected gaze data were analyzed using three machine learning models: Random Forest, LightGBM, and SVM. The results demonstrated that the SVM model achieved the highest accuracy, with a classification accuracy of 99.4% for healthy participants. For patients with Parkinson's disease (PD), the model trained on healthy participants could not be directly applied. Still, an attempt to improve SVM classification accuracy by adjusting the threshold using the decision function resulted in a classification accuracy of 64% at a threshold of 0.5.

50: A Real-Time Vision-Based System for Human Gesture Recognition in Collaborative Work Cells

Natchanon Suppaadirek (Kyushu Institute of Tech.); Shreyan Shukla (Dronacharya Group of Institutions); Piyush Mudgal (Dronacharya College of Engineering); Tomohiro Shibata (Kyushu Institute of Tech.)*

Abstract: Human-robot collaboration is nonetheless a focus of ongoing research, particularly on the optimization of the working process and productivity. Substantial advancements have occurred, but there is still an inherent need for systems made exclusively for people with disabilities. The current work proposes a new approach to assistive robotics via the development of an intelligent work cell made particularly for older adults or disabled users. The system integrates depth camera technology, machine learning, and MediaPipe-based human tracking to enable real-time human-robot interaction through accurate inference of user intent. The innovation includes the utilization of a gimbal-like system to dynamically adjust the camera position so that constant monitoring of the user's movement in the scene is ensured. In addition, the system has been designed to enable intuitive object manipulation, closing the loop between theoretical research and actual usage in assistive robotics.

25: A Novel Multiagent Approach for Optimal Right Turn Coordination of Connected Automated Vehicles at Urban Intersections

Mahmudul Hasan (Gunma Univ., Japan); A.S.M Bakibillah (Institute of Science Tokyo); Md Abdus Samad Kamal (Gunma Univ.); Kou Yamada (Gunma Univ.)*

Abstract: This paper addresses the optimal coordination of connected automated vehicles (CAVs) in future road transportation, where individual vehicles act as agents and collectively decide optimal flowing behavior, avoiding conflicts. Specifically, vehicles crossing intersections on single-lane roads often encounter congestion, especially with no dedicated signal for right turns. It is expected that vehicles should cooperate to allow any right-turn vehicle to cross the intersection by adjusting the vehicles' timing from the opposite side. Considering all approaching vehicles share relevant information through vehicular communications, the intersection coordination unit (ICU) determines optimal crossing or turning times and guides the vehicles in a way that minimizes overall traffic delay, which also helps improve vehicles' fuel consumption. Under the proposed system, in cyberspace, the controller receives the states and the predicted timing to reach the intersection of each vehicle and the signaling phase and timing from the signal light. Then, a swarm of agents performs an optimization task using a broadcast control approach to find the best time to pass through the right-turning vehicle. The vehicles then move according to their own timing to provide safe space for the right-turning vehicle. The proposed coordination system is evaluated at a typical urban intersection, and its performance is compared to traditional traffic systems. Numerical results show that the proposed coordination system significantly improves average traffic speed and fuel consumption than the traditional traffic system in different scenarios.

26: Optimizing Traffic Network for Rapid Transit of Emergency Vehicles at the Scene of a Disaster

*Riku Munakata (Gunma Univ.)**; *M.A.S. Kamal (Gunma Univ.)*; *Kou Yamada (Gunma Univ.)*

Abstract: In Japan, natural disasters, such as earthquakes and typhoons, are frequent, disrupting transportation networks and causing delays in emergency vehicle dispatch. Innovative traffic management is essential to minimize transit time for emergency vehicles, such as ambulances, fire service, and police cars, especially during rescue operations. Addressing this challenge within the context of future smart cities, this paper proposes an optimal route and traffic control scheme designed to reduce emergency vehicle transit times. The proposed approach leverages information and communication technology (ICT) and the Internet of Things (IoT) to integrate and optimize infrastructure, transportation, and public services for intelligent transportation. The scheme enhances emergency response efficiency by utilizing real-time traffic management and adaptive signal control. Simulation results obtained using the AIMSUN traffic simulator demonstrate the effectiveness of the proposed method, highlighting improved rescue efficiency through dynamic route adjustments.

42: Controlling UAV Swarms for Adaptive Search and Coordinated Rescue Operations

*MD SAMSUL AREFIN SARKER (Gunma Univ.)**; *MD SAMSUL AREFIN SARKER (Gunma Univ.)*; *M.A.S. KAMAL (Gunma Univ.)*; *KOU YAMADA (Gunma Univ.)*

Abstract: Rapid and effective search and rescue (SAR) operations are essential for increasing survival rates following natural disasters like earthquakes, tsunamis, and floods. Conventional human-operated methodologies frequently encounter scalability, velocity, and coordination challenges, especially in extensive and unpredictable settings. This study presents an autonomous drone-based system that utilizes advanced search algorithms and supply delivery mechanisms to overcome these limitations. The drones autonomously traverse disaster areas, identify survivors, and replicate the distribution of vital resources, such as food, water, and medicine. The proposed approach incorporates Lévy flight dynamics for improved search coverage and the Social Force Model (SFM) to augment multi-agent coordination while reducing collision hazards. Drones hover to signal supply deployment upon detecting a casualty, facilitating a fast emergency response. The system is assessed by numerical simulations in MATLAB, illustrating that the hybrid technique markedly enhances search efficiency and coverage relative to conventional methods. The suggested framework integrates real-time search with swift supply deployment, providing a scalable and efficient method to improve post-disaster relief activities, improve resource allocation, and expedite aid distribution in urgent situations.

12:50: Online Technical Session S-C:

28: Multi-Frequency Disturbance Rejection Control via Delay-Coordinated DOB for Minimum Phase Systems

*Siripong Sangsarpan (Thai-Nichi Institute of Tech.)**; *Nghiia Thi Mai (Posts and Telecommunications Institute of Tech.)*; *Md Abdus Samad Kamal (Gunma Univ.)*; *Iwanori Murakami (Gunma Univ.)*; *Kou Yamada (Gunma Univ.)*

Abstract: This Work-in-Progress paper proposes a delay-coordinated, low-order disturbance observer (DOB) framework designed for rejecting multi-frequency periodic disturbances in minimum-phase systems. Unlike conventional repetitive control methods that require high-order filters and adaptive frequency tracking, the proposed method utilizes fixed-path delay elements and filter banks, pre-designed for known disturbance

frequencies. Each disturbance component is estimated and compensated independently through parallel DOB channels, offering modularity and implementation simplicity. The proposed structure explicitly separates frequency components via distinct delay terms and applies low-order compensators in each path, enabling precise disturbance rejection while avoiding complexity. Preliminary simulations with three-frequency sinusoidal disturbances demonstrate over 80% reduction in tracking error, as measured by the Integral of Squared Error (ISE), while maintaining robust closed-loop stability. The architecture is especially suited for embedded or resource-constrained applications, where fixed, predictable performance is preferred over adaptive schemes.

46: AI-Enabled IoT System for Continuous Health Monitoring and Early Risk Detection

Kamran Sharafi (Jagannath Univ.); Mohsinur Murad (Jagannath Univ.); Hassan Mahmud (Univ. of Information Technology and Sciences); Dr. Md. Manowarul Islam (Jagannath Univ.); Dr. Uzzal Acharjee (Jagannath Univ.); Arnisha Akhter (Jagannath Univ.)*

Abstract: Traditional healthcare systems often struggle with timely intervention due to reliance on manual tracking and periodic check-ups, which can delay the detection of critical health conditions, especially for patients with long-term issues. To address this, we developed an AI-enabled IoT smart health monitoring system that ensures continuous, real-time health evaluation and rapid response. The system integrates the ESP32 microcontroller for data processing, along with sensors like the MAX30100 for blood oxygen and heart rate, the LM35 for body temperature, and an ECG sensor for cardiac monitoring. These sensors collect real-time health data, which is transmitted to a hospital web server for analysis, risk evaluation, and alert notifications. A mobile app allows patients to view their health data, receive medication reminders, and communicate with healthcare providers. AI predictive algorithms analyze the collected data to detect abnormal patterns and predict health risks, enabling early intervention. Additionally, Power BI provides healthcare professionals with interactive dashboards for real-time decision-making. This system empowers both patients and healthcare providers by offering continuous health monitoring, instant alerts, predictive analytics, and improved patient engagement. By providing faster, data-driven responses, the system enhances healthcare efficiency and ensures better patient outcomes.

48: Phishing Detection Using Gradient-Weighted Ensemble with Hybrid Sampling and Weighted Ensemble Feature Selection

*Mrinal Basak Shuvo (Hajee Mohammad Danesh Science And Technology Univ.); Arjon Talukder (Hajee Mohammad Danesh Science and Technology Univ.); Sadia Islam Neela (Hajee Mohammad Danesh Science And Technology Univ.); Prakriti Paramarthy Roy (Hajee Mohammad Danesh Science And Technology Univ.); Tangina Sultana (Hajee Mohammad Danesh Science and Technology Univ., Bangladesh); Md. Delowar Hossain (Hajee Mohammad Danesh Science And Technology Univ., Bangladesh); Dr. Md. Arshad Ali (Hajee Mohammad Danesh Science and Technology Univ., Bangladesh); Eui-Nam Huh (Kyung Hee Univ., Yongin, South Korea)**

Abstract: Phishing attacks lead to a significant cybersecurity threat, where users get tricked with URLs and attackers dig out sensitive information. As a result, the attackers become superior and eventually cause massive damage. Hence, we have proposed a Machine Learning pipeline that helps us to minimize the impact caused by phishing attacks. This study explores a competent architecture using various ML classifiers, including

Random Forest, XGBoost, and LightGBM. We have used hybrid sampling involving SMOTE, TomekLinks and ADASYN, termed as Triad Sampling Fusion (TSF). For feature selection, we have used a weighted ensemble technique combined with Boruta, RFE, and Elastic Net, referred to as Boruta-RFE-ElasticNet Feature selector (BREN-FS). For the enhancement of the performance of our model, we have performed GridSearchCV for Hyperparameter Tuning and developed a novel custom-weighted ensemble approach, which is coined as the Gradient Unified Weight Ensemble (GUWE), that fuses predictions from multiple models using gradient descent to optimize weights dynamically in order to increase classification performance. For training and evaluation, we have used the Mendeley Phishing Dataset. Our used dataset consists of 88,647 instances along with 111 features. Existing studies retain a relatively large feature subset, which increases computational complexity and overfitting risks. By applying TSF, BREN-FS, and comprehensive evaluation approaches such as GUWE, our study achieved an accuracy of 97.52% which improved the effectiveness of phishing detection, contributing significantly to cybersecurity and reducing online threats.

57: Efficient Single-Lane Obstacle Overtaking for Autonomous Vehicles in Smart Cities

Mohammad Hossain (Univ. of Prince Mugrin), M.A.S Kamal (Gunma Univ.)

Abstract: Intercity transportation often faces road blockages due to construction, accidents, or other obstacles, which significantly impact traffic flow, increase travel time, and pose safety risks. This study explores an efficient solution for autonomous vehicles to overtake obstacles in a single-lane scenario using vehicle-to-vehicle communications. By integrating real-time vehicle-to-vehicle (V2V) communication, this research aims to improve traffic efficiency and safety in smart cities. We propose a cloud-based information sharing system to optimize vehicle movement and decision-making processes. The proposed scheme is based on the solution of an optimal predictive problem with the goal of minimizing driving costs while limiting collision risks in the presence of any opposite vehicle on the overtaking lane. The computational burden of the scheme is almost negligible and can be implemented in real-time. The scheme is evaluated in a variety of traffic conditions, including stopped and slow vehicles in the lane, as well as the presence or absence of an opposite vehicle at the same time. The simulation results show that the proposed scheme effectively obtains the optimal trajectories even in the difficult overtaking contexts considering opposite vehicles. Finally, the optimal overtaking costs are obtained for various states of the associated vehicles and situations, providing an efficient way to overtake the obstacle on a single-lane road.

14:00 Organized Session: Service Robotics

55: Hand Gesture Recognition with Deep Learning-Free Feature Extraction

Keita Okumura (Kyushu Institute of Tech.)^{}; Kosei Isomoto (Kyushu Institute of Tech.); Yuichiro Tanaka (Kyushu Institute of Tech.); Hakaru Tamukoh (Kyushu Institute of Tech.)*

Abstract: Accurate interpretation of hand gestures is vital in many real-time interactive applications. On the other hand, mainstream gesture recognition techniques often depend on deep learning, which demand substantial computational power and are ill-suited for execution on resource-constrained platforms. This study presents an alternative framework to gesture recognition that avoids deep learning by integrating reservoir computing, specifically an echo state network, with a series of computationally light preprocessing pipelines. We examine six distinct preprocessing configurations, each

designed to extract motion-relevant visual features while reducing input dimensionality. Experimental evaluations reveal that one particular configuration—grayscale conversion, frame differencing, and max pooling—offers the best balance between accuracy and efficiency, demonstrating the feasibility of deep learning-free gesture recognition for embedded or low-power environments.

56: Multi-Speed Obstacle Detection Using Parallel SNN with Event-Based Vision Sensors

*Yuta Ohno (Kyushu Institute of Tech.)**; *Yuga Yano (Kyushu Institute of Tech.)*; *Yuichiro Tanaka (Kyushu Institute of Tech.)*; *Hakaru Tamkoh (Kyushu Institute of Tech.)*

Abstract: We propose a parallel spiking neural network (SNN)-based various speed ranges object detection using event-based vision sensors (EVS). Recent works for EVS-based object detection cannot handle multiple speed range objects simultaneously. When a low-speed range is specified, events from faster objects also pass the threshold, causing interference between speed classes that fragment or inflate the detected regions. In our proposed method, each SNN module first extracts events within its designated speed range, subtracting high-speed events from spatially adjacent low-speed candidates to suppress inter speed range interference with the ordering points to identify. The resulting event sets are clustered independently, after which the clusters are fused and output as a unified mask. This approach enables simultaneous detection of both high and low-speed moving obstacles. We evaluated our method on the public dataset, which captures urban driving sequences with synchronized EVS and RGB sensors. Experimental results indicate our method successfully segments obstacle regions across multiple speed classes, outperforming recent works. The experimental results are available at <https://youtu.be/nfhpd4r4x-Q>

58: Demonstration Data Quality Estimation with Modality Priority Adjustment Using Separate Encoders

*Hiromasa Yamaguchi (Kyushu Institute of Tech.)**; *Yuga Yano (Kyushu Institute of Tech.)*; *Hakaru Tamukoh (Kyushu Institute of Tech.)*

Abstract: We propose a method for estimating the quality of demonstration data in imitation learning that allows adjusting the importance of each modality. In related works, features are extracted from a single encoder for the images and state-action pairs, and the contribution is calculated by computing the similarity to good quality data. However, because related works extract features from the images and robot state-action pairs together, it cannot adjust which modality is more important for the calculation of the contribution. Therefore, we propose a method to extract features from images and state-action pairs from their respective encoders. We also introduce a method to adjust the importance of each modal by multiplying the features obtained from each encoder by an adjustment factor. In the experiment, we compare the results of applying multiple adjustment factors and consider their impact on learning.

59: Number-Marked Prompting for Empty Space Estimation Considering Object Relationships in Unknown Environments

*Ryo Terashima (Kyushu Institute of Tech.)**; *Yuga Yano (Kyushu Institute of Tech.)*; *Koshun Arimura (Kyushu Institute of Tech.)*; *Hakaru Tamukoh (Kyushu Institute of Tech.)*

Abstract: We propose a vision language model (VLM)-based on empty space estimation considering object relationship. To achieve stable estimation, we introduce a visual prompting method of overlaying a number of marks on candidate empty spaces in an image. This prompting method is based on the set-of-marks (SoM), which helps the VLM better understand the object relationships. In the experiment, we input marked and unmarked images into the VLM and compared their estimation accuracy. Experimental results indicate that adding numbers can stabilize the output of the VLM and improve the accuracy of the space estimation.

60: Experimental Evaluation of Adaptive Dual-Mode Vision System for ROS2: Integrating YOLO-World and SAM2 for Robotic Manipulation

GAI NAKATOGAWA (Tamagawa Univ.); SANSEI HORI (Tamagawa Univ.)

Abstract: Recent advancements in robotic vision systems demand flexible object recognition capabilities for unknown objects. While zero-shot models like YOLO-World and Segment Anything Model (SAM2) excel in open-vocabulary detection and segmentation, most existing robotic vision systems lack the ability to dynamically adapt to changing environmental conditions or object types. We propose a ROS2 framework with dynamic mode switching that synergistically combines YOLO-World's efficient detection with SAM2's precise segmentation. Our key innovations include: (1) real-time class modification capability for target objects and (2) two operational modes - Fast Mode (30 FPS using YOLO-World) and Precise Mode (10.5 FPS with SAM2-enhanced segmentation). Evaluations on an Ubuntu 22.04/ROS2 Humble system (AMD Ryzen 9 8945HS, 32GB RAM, NVIDIA RTX 4060) with CRANE-X7 robotic arm in Gazebo demonstrated the Fast Mode achieves 0.89 mAP@0.5 with 1.5cm positional error when detecting headsets, while the Precise Mode reaches 0.91 mAP@0.5 with 0.5cm error through SAM2's refined segmentation masks.

61: Toolchain for Data Augmentation and Evaluation of Object Detection

*Ginga Kise (NIT, Kitakyushu); Yuma Yoshimoto (NIT, Kitakyushu)**

Abstract: It has been known that recognition accuracy can decrease in environments that differ from the dataset, and that data augmentation can improve recognition accuracy depending on the type. We performed data augmentation using toolchain and measured IoU, and it appears that the optimal data augmentation differs depending on the environment.

62: An FPGA Accelerated Architecture for Prolonging the Operating Time of Home Service Robots

*Haruki Miura (NIT, Kitakyushu); Rion Yofu (NIT, Kitakyushu); Yuma Yoshimoto (NIT, Kitakyushu)**

Abstract: Population decline and the corresponding shortage are spurring demand for service robots. A key obstacle to wide deployment, however, is the short battery life that results from the heavy on board computation needed for intelligent processing. We introduce a power aware robot system in which the most energy hungry perception modules are migrated from a mobile GPU to an FPGA. Using the RoboCup@Home Tidy Up task as a benchmark, our FPGA prototype reduces system level power draw by 24 W

while maintaining task success rate and real time response.

Technical Session S-6 (Onsite only):

13: MNMD: A multimodal non-invasive mental disorder detection method

Rashed Mustafa (Univ. of Chittagong); Mahir Shadid (International Islamic Univ., Chittagong, Bangladesh); A.H.M Sajedul Hoque (Eötvös Loránd Univ. (ELTE))*

Abstract: Mental health disorders such as anxiety, stress, and depression impact millions worldwide, yet detecting them early and accurately remains a challenge. This study presents the Multimodal Non-Invasive Disorder Detection (MNMD) system, which integrates two key data sources: facial expressions and responses from the DASS-21 questionnaire. To analyze facial expressions, the system applies advanced techniques like Gabor filters, landmark detection, and deep learning models such as CNNs and FCNNs, allowing it to identify subtle emotional cues. Meanwhile, the DASS-21 questionnaire provides textual data that reflects an individual's mental health condition. Since these data sources differ in structure and format, merging them presents a challenge. However, the late fusion model successfully integrates both, maximizing their combined strengths. The system utilizes various machine learning algorithms, including SVM, Naive Bayes, Decision Trees, KNN, LightGBM, CatBoost, and Random Forest, along with deep learning models like CNNs, FCNNs, and FFNNs, achieving an outstanding accuracy of 98.43%. The MNMD system represents a major breakthrough in mental health detection. By combining facial expression analysis with questionnaire-based insights, it offers a more comprehensive and precise method for diagnosing mental health disorders, leading to earlier detection, improved interventions, and better support for those in need.

15: Hyperventilation-induced Cerebral Patterns Analysis for Neurocognitive Disorder Detection via AI Models

Kusum Tara (Saga Univ.); Ruimin Wang (Saga Univ.); Yoshitaka Matsuda (Saga Univ.); Satoru Goto (Saga Univ.); Takako Mitsudo (Minkodo-Minohara Hospital, Fukuoka; NHO Hizen Psychiatric Medical Center, Saga); Takao Yamasaki (Minkodo-Minohara Hospital, Fukuoka; International Univ. of Health and Welfare, Fukuoka); Takenao Sugi (Saga Univ.)*

Abstract: Monitoring hyperventilation (HV) induced cerebral patterns is crucial for early mild cognitive impairment (MCI) and Alzheimer's disease (AD) detection, as these disorders disrupt cerebral blood flow, neuronal excitability, and brain connectivity. This study analyzed electroencephalography (EEG) signals during HV-induced physiological stress using a deep learning convolutional neural network (CNN)-based AI model to observe brain activity changes. A phase-amplitude coupling image-based AI model with Xception architecture was proposed to classify cerebral patterns, capturing disrupted neural communication and non-linear brain dynamics in MCI and AD patients. Spectral topographic mapping and phase-amplitude coupling images were applied to two deep learning architectures, MobileNetV2 and Xception of CNN models. Functional connectivity between EEG channels was examined using Pearson correlation and Granger causality tests, revealing HV-induced connectivity alterations. The CNN models with MobileNetV2 and Xception architectures achieved 92.26% and 94.53% accuracy with spectral topographic mapping images, while phase-amplitude coupling-based architectures reached 96.45% (MobileNetV2) and 98.95% (Xception) accuracy, demonstrating superior performance. The Xception deep learning architecture with phase-amplitude coupling images outperformed other architectures by effectively

identifying cognitive dysfunction and neural desynchronization with reduced delta-alpha and theta-alpha couplings, enhancing early detection for MCI and AD.

52: Psychological Data Collection of Elderly Care Workers for LLM-based Stress Detection

Naoya Miyake (Kyushu Institute of Tech.); Haru Kaneko (Kyushu Institute of Tech.);; Elsen Ronando (Kyushu Institute of Tech.); Xinyi Min (Kyushu Institute of Tech.); Christina Garcia (Kyushu Institute of Tech.); Sozo Inoue (Kyushu Institute of Tech.)*

Abstract: In this paper, we aim to develop a stress detection model for caregivers using data collected from a real-world care facility. The importance of stress management has grown, and many physiological datasets and stress detection studies exist for nurses. However, sufficient data collection in caregiving settings is not being conducted compared to the nursing field. A paper proposed and evaluated a Large Language Model (LLM)-based data augmentation method for detecting nurse stress. However, because it used public nurse stress datasets, the applicability of this method to caregiving settings and whether the LLM had prior exposure to the data remain unclear. In this study, we conduct a data collection experiment and evaluate the results of stress detection machine learning using that data. In the data collection, we create 8-day dataset from four caregivers that includes care record data, wearable sensor data, and self-reported stress labels. Next, we extracted statistical features from the time-series data and performed stress detection using a Random Forest model. As a result, we achieved a maximum classification accuracy of 94.43%. Furthermore, we introduced an LLM-based data augmentation method. In the evaluation, it was compared with the traditional data augmentation method, and it was clarified that the LLM-based augmentation improves stress detection accuracy more efficiently.

8: TRANSFER LEARNING IN CLASSIFYING ACOUSTIC EMISSION SIGNALS FROM OSTEOARTHRITIC KNEES

Nazmush Sakib (Saga Univ.); Md Abdur Rahman (Saga Univ.); Md. Mehedi Hassan (Tsuruta Orthopedic Hospital); Tawhidul Islam Khan (Saga Univ.);; Shuya Ide (Tsuruta Orthopedic Hospital)*

Abstract: Acoustic emission (AE) is a non-destructive evaluation (NDE) method that allows to inspect the internal condition of material by analyzing the signal which are produced due to the internal change in the condition. Compared to the present methods, due to simplicity and immense potential, AE has gained attention in knee health assessment. With the advancement of computational power many researchers have implemented advanced machine learning (ML) algorithms to characterize the AE signals which were generated from human knees. However, most of this research are focused on implementing the unsupervised ML algorithms. The minimal variability between the AE signals from different knee conditions has posed significant challenges in implementing supervised ML algorithms which shows the promise to make the diagnosis significantly simpler than the present approaches. Therefore, this work aims at implementing transfer learning using CNN and wavelet-based images to classify the AE signals which were generated from the knees of the knee osteoarthritis of different Kellgren Lawrence (KL) grades. VGG-16 CNN model has been trained on the images which were generated from AE signals of the participants. The results shows huge promise of transfer learning in classifying the AE signals from different knee health

conditions.

51: Prediction of QoL in healthy older adults using non-motor information from smart devices

Yu Makido (Kyushu Institute of Tech.); John Noel Victorino (Ateneo de Manila Univ.); Kengo Iwamoto (Kyushu Institute of Tech.); Tomohiro Shibata (Kyushu Institute of Tech.)*

Abstract: Although global interest in well-being and QoL is increasing, continuous awareness of one's QoL in daily life remains challenging due to the need for repeated questionnaire responses. In this study, we evaluate the performance of a prediction model for QoL in healthy older adults using a Garmin Venu 3S fitness tracker and a FonLog data collection application to collect non-motor information and QoL data, and predict QoL using a support vector machine (SVM). The results of the prediction using a SVM showed that the Accuracy was approximately 0.96 and the F1-Score for each class was approximately 0.88 or higher. These results suggest the effectiveness of the QoL prediction model using non-motor information. In the future, we plan to improve the processing and prediction in real time, and to evaluate the accessibility, usability, and effectiveness of the system for a wider range of users through experiments with non-motor subjects. Since smartwatches can be worn easily and are not difficult to use on a daily basis, the development of a prediction model is expected to be an easy way to measure QoL.

53: Towards Automating Entry and Exit Logs in Nursing Records Utilizing Video and Large Language Models

RYUYA MUNEMOTO (Kyushu Institute of Tech.); Nazmun Nahid (Kyushu Institute of Tech.); Sozo Inoue (Kyushu Institute of Tech.)*

Abstract: In this study, we propose a system that automatically estimates activity logs from recorded video footage and subsequently corrects errors using contextual data with the help of a large language model (LLM). As the aging population increases, there is a growing demand for solutions that can reduce the burden on care workers and improve the quality of care. The proposed system efficiently estimates care staff activity logs. Using YOLOv7 and DeepSORT tracking on recorded video data, we generate annotations for entry and exit logs. However, the annotation method alone may fail to capture complete entry and exit information. To address this, we incorporate text data related to subjects' social relationships and daily life, and input these together with the inaccurate activity logs into the LLM using our proposed prompt method to estimate the correct activity logs. To evaluate this approach, we collected video and contextual data in both a laboratory and a care facility setting and measured the accuracy of the generated entry/exit records. Using the proposed method, we observed the following improvements over the baseline in a lab setting: precision increased from 0.71 to 0.80, recall from 0.71 to 0.79, F1 score from 0.71 to 0.78, and accuracy from 0.71 to 0.79. In the care facility environment, precision improved from 0.70 to 0.91, recall from 0.68 to 0.89, F1 score from 0.68 to 0.88, and accuracy from 0.68 to 0.89. These results demonstrate that our proposed method is effective in improving the accuracy of entry and exit logging and correcting errors in care records. The study suggests the potential for automating care documentation using LLMs, which could ease the workload of care staff and enhance the quality of elderly care.

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