

Conference Abstracts

17th IIAI International Congress on Advanced Applied Informatics

December 16-18, 2024, Jakarta, Indonesia

Venue: Hotel Ciputra, Jakarta

December 16: Onsite Sessions

	Victory 2 (6th floor)	Affandi (1st floor)
9:30AM-10:00AM	Registration (6th floor) & Welcome Coffee (6th floor)	
10:00AM-10:20AM	Opening Ceremony	
10:30AM-11:30AM	Keynote Session	
11:30AM-1:00PM	Lunch (Complementary, 6th floor)	
1:00PM-3:05PM	DSIR 1	SCAI 1
3:05PM-3:25PM	Coffee Break (6th and 1st floor)	
3:25PM-4:40PM	LTLE 1	ESKM 1
6:30PM-8:30PM	Welcome Reception (Complementary, 6th floor)	

December 17: Onsite Sessions

	Victory 2 (6th floor)	Affandi (1st floor)
9:00AM-10:15AM	DSIR 2	ESKM 2
10:15AM-10:35AM	Coffee Break (6th and 1st floor)	
10:35AM-11:50AM	LTLE 2	SCAI 2
11:50AM-1:00PM	Lunch (Complementary, 6th floor)	
1:00PM-2:40PM	LTLE 3	ESKM 3
2:40PM-3:00PM	Coffee Break (6th and 1st floor)	
3:00PM-4:40PM	SCAI 3	ESKM 4
6:30PM-8:30PM	Banquet & Award Presentation (Complementary, 6th floor)	

December 18: Onsite, Hybrid, and Online Sessions (GMT+7)

	Online	Affandi (1st floor) or Hybrid
9:00AM-10:15AM		SCAI 4
10:15AM-10:35AM	Coffee Break (1st floor)	
10:35AM-11:35PM		DSIR 3 + LTLE 4 (Hybrid)
11:35PM-12:40PM	Lunch (Complementary, 6th floor)	
12:40PM-1:30PM		SCAI 5 (Hybrid)
1:30PM-1:40PM	Coffee Break (1st floor) + Onsite Adjournment	
1:40PM-5:00PM	SCAI 6 + LTLE 5	

Message from the Congress General Chair

Welcome to IIAI AAI 2024-Winter Congress.

The 17th IIAI International Congress on Advanced Applied Informatics (IIAI AAI 2024-Winter) is sponsored by the International Institute of Applied Informatics, Indonesia.

The purpose of IIAI AAI is to bring together researchers and practitioners from academia, industry, and government to exchange their research ideas and results and to discuss the state of the art in the areas of the conference. Four sub-conferences, the 19th International Conference on e-Services and Knowledge Management (ESKM), the 17th International Conference on Learning Technologies and Learning Environments (LTLE), the 17th International Conference on Data Science and Institutional Research (DSIR), and the 16th International Conference on Smart Computing and Artificial Intelligence (SCAI), are held with the AAI 2024-Winter.

We would like to thank Executive Vice General Chair Dr. Ford Lumban Gaol, Program Chair Dr. Katsuhide Fujita, Publication & Finance Chair Dr. Tokuro Matsuo, Director of Local Management Dr. Satoshi Takahashi, Local Arrangement Chair Dr. Takaaki Hosoda, the organizing committee chairs, the organization staff, and the members of the Program Committee for their hard work. And most importantly, we would like to thank all the authors for sharing their ideas and experiences through their outstanding papers contributed to the congress. I hope that IIAI AAI 2024-Winter will be successful and enjoyable to all participants.

Kunihiko Takamatsu
Institute of Science Tokyo, Japan
Congress General Chair, IIAI AAI 2024-Winter Congress

A Message from the Program Chair

Welcome to the 17th IIAI International Congress on Advanced Applied Informatics (IIAI AAI 2024-Winter), sponsored by the International Institute of Applied Informatics, Indonesia. This congress consists of four subconferences to cover a wide range of topics of applied informatics: ESKM...International Conference on e-Services and Knowledge Management; LTLE...International Conference on Learning Technologies and Learning Environments; DSIR...International Conference on Data Science and Institutional Research; and SCAI...International Conference on Smart Computing and Artificial Intelligence. Each subconference and their topics of interests are related to each other. IIAI AAI 2024-Winter provides an international forum for researchers, scientists, engineers, industry practitioners, and students throughout the world to share their experiences, new ideas, and research results about all aspects of computer and information science.

The congress received a total submission of 135 papers from 16 different countries/regions. These papers were refereed by 138 Program Committee Members. After careful and rigorous review, 40 papers were selected as regular papers and the acceptance rate was 29.6%. And, 19 papers were selected as short/position papers to be presented at the congress and published in the congress publications. We would like to thank all the researchers who submitted papers to this congress and we are pleased to have with us those who are accepted.

I would like to express my appreciation to the following people: the congress general chair, Prof. Kunihiko Takamatsu, executive vice general chair, Prof. Ford Lumban Gaol, publication & finance chair, Prof. Tokuro Matsuo, who supervised and personally contributed to every step including paper review and session organization. My appreciation also goes to the program/conference chairs of Prof. Daisuke Ikeda (ESKM), Prof. Yuichi Ono (LTLE), Prof. Naruhiko Shiratori (DSIR), and Prof. Takafumi Nakanishi (SCAI), for their valuable contributions not only to their subconferences but also to the whole IIAI AAI 2024-Winter. Also, I would like to express my appreciation to the organizing chairs, the members of the program committee and secondary reviewers who contributed a great amount of their time to evaluate the submissions to maintain high quality of the congress; and all the authors, attendees, and presenters who really made this congress possible and successful. I would like to express my special gratitude to associations and companies to support the congress.

We sincerely hope you will enjoy the congress!

Katsuhide Fujita, Ph.D.
Program Chair, IIAI AAI 2024-Winter Congress
Tokyo University of Agriculture and Technology, Japan

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Abstracts

ESKM 2024-Winter

A Comparative Study on Artificial Neural Networks and Random Forests for Fish Weight Prediction

Nurul Firdaus

This study investigates the predictive performance of two different machine learning (ML) models on the fish weight prediction and compare the results. The chosen models are based on artificial neural networks (ANN) and random forests (RF). The performance evaluation are done by analyzing and comparing such values as R-squared, Mean Squared Error (MSE) and Root Mean Squared Error (RMSE). The results showed that the ANN model performed better than the RF model.

A Relaxation Creation Method with A Knowledge Base for Environmental Actuators Control

Chinngai Li, Yasuhiro Hayashi and Yasushi Kiyoki

Various sensors and actuators can detect conditions and respond via networked systems in our daily lives. However, there are no effective integrated methods to combine and control these devices to enhance human intentions, such as relaxation or concentration. Currently, environmental actuators are manually controlled based on an individual's condition. This paper proposes a relaxation creation method with a knowledge base for actuators control. Sensor data are converted into the control combinations of each actuator by the correlation computation between human vital data and the knowledge base in the form of a conversion matrix. The knowledge base reflects human intentions and behaviors toward an environment. The significant feature of the conversion matrix is its creation and selection. Without big data, its creation can be accomplished rapidly based on the experts' knowledge. The selection represents a specific mental state and human intention. This paper will present the details of this method, including how to acquire human vital data in a cyber-physical system, construct a knowledge base, and control environmental actuators. The feasibility of this method was confirmed through the experiments. A simple matrix calculation between sensor data and the knowledge base makes it possible to create an individual intended environment.

Addressing Class Imbalance in Customer Review: Analysis using Focal Loss and SVM with BERT

Zhenming Li and Kazutaka Shimada

In today's digital marketplace, customer reviews play a critical role in influencing consumer decisions and informing business improvements. Among these, "Request" and "Complaint" reviews provide direct insights into customer needs and areas of dissatisfaction. However, they often constitute a minority in review datasets, creating a class imbalance problem that hinders effective classification. In our research, we propose a novel approach to address class imbalance by incorporating Focal Loss into the fine-tuning of a BERT model for classifying customer reviews. Using a dataset with "Request", "Complaint", and other comment types, we demonstrate that Focal Loss significantly improves classification for the highly underrepresented "Request" class. Additionally, replacing BERT's fully connected layer with an SVM classifier further enhances performance on "Request". However, we observed a slight decrease in classification effectiveness for the "Complaint" class, suggesting that complementary techniques may be necessary to achieve balanced performance. Our approach offers a robust solution for enhancing customer feedback analysis, enabling businesses to better capture and respond to critical customer insights.

Aspect-oriented Opinion Extraction with LoRA Fine-tuning and Prompt

Hidekazu Yanagimoto, Iroha Kisaku and Kiyota Hashimoto

This paper proposes a system for Aspect-Oriented Opinion Pair Extraction (AOPE) by fine-tuning a pre-trained large language model with LoRA and adjusting prompts. AOPE is a task that extracts users' aspects and their opinions from reviews, requiring a deep understanding of text, especially capturing the dependency structures within reviews. Pre-trained large language models have high capability for text comprehension, so the goal is to utilize this effectively. However, adapting a pre-trained large language model to a specific task is challenging. Fine-tuning demands substantial computational resources, and generating appropriate prompts for each task is a laborious process. Our proposed method uses LoRA to reduce the computational resources needed for fine-tuning and combines prompts to improve performance. Evaluation experiments demonstrated that combining prompts with fine-tuning improved accuracy. While there are some areas where accuracy is lower than traditional methods, the efficiency in computational resources highlights the effectiveness of the proposed approach.

Autonomous Driving System for Multiple Mobile Robots using Roadside Cameras

Hiroto Shima, Tatsuya Ishii, Seiji Komiya and Toshihiro Wakita

In recent years, autonomous delivery and catering robots have become increasingly popular. However, there are still issues that need to be resolved. Possible issues include blind spots caused by obstacles, robots blocking each other's paths, and high robot costs. In this research, the robot is not equipped with any sensors on the robot side, and only sensors on the road side are used to realize automatic driving of the robot. We proposed a cooperative path planning method using roadside sensors, and proved its usefulness through accuracy and running experiments.

Customizing OpenWrt firmware on 5G Modem Routers: A Performance Evaluation

Alexander Nurenie

This research investigates the performance impact of customizing Open Wrt firmware on 5G modem routers, comparing the original Open Wrt firmware with two manufacturer-specific firmware versions: Taktikal and Rooter. By evaluating various performance metrics, including CPU utilization, system throughput, and memory usage, we found that customizing OpenWrt firmware can lead to substantial performance gains in 5G modem routers. Our analysis revealed that the customized Open Wrt firmware significantly outperforms both Taktikal and Rooter, demonstrating improvements in CPU performance (116% to 400%), system load (466% to 1033.33%), and memory usage (8.05% to 13.37%). To measure performance, we installed the Luci

app Statistical on each firmware version. This software allowed us to directly monitor CPU performance, system load, and memory usage. The excess applications contributed to the performance overhead of Tactical and Rooter. By using Linux scripts to uninstall and install applications, we were able to permanently modify the firmware and optimize its performance. This research also demonstrates how to directly modify OpenWrt firmware using SSH terminals and Linux scripts. The excess applications included in Tactical and Rooter significantly impacted their performance, demonstrating the importance of carefully managing the software installed on 5G modem routers. demands of diverse applications and services.

Design and implementation of digital student ID system based on verifiable credentials

Eisuke Ito, Takashi Yamaguchi and Ryo Itokawa

With the rise of smartphone usage, digital credentials are gaining feasibility, and several are already in use. For instance, digital vaccination certificates have been issued by government health authorities in various countries, including Japan, where the Digital Agency and Ministry of Health, Labour and Welfare provide them. The mobile driver's license, with ISO specifications set in 2021, is anticipated to be particularly transformative. Our study investigates the development of digital student and staff IDs on smartphones. Using the World Wide Web Consortium's (W3C) Verifiable Credentials (VC) specification, digital student IDs can be securely issued with built-in electronic identity verification. This enables functionality like building access, library borrowing, and lecture attendance verification. This paper details the design and verification processes, along with a prototype system for digital student IDs.

Knowledge-based Indicative Method to Accelerate CO2 Utilization via Direct Air Capture

Tomoyuki Tateno, Naoki Ishibashi and Yasushi Kiyoki

Direct air capture (DAC) plays an important and expanding role in CO2 net-zero pathway. Using DAC, an innovative negative CO2 emission technology in its early commercial stages, carbon capture and utilization (CCU) can effectively reduce CO2 concentrations in the atmosphere. Air-captured CO2 can be used as a climate-neutral feedstock for a range of products that require a carbon source, from concrete to synthetic fuels. CCU is primarily undertaken from a macro perspective rather than a micro, realistic, and practical perspective. Given the complexity of the combinatorial optimization process for DAC deployment decision and the limitations of available data, there is no method or tool that can accurately assess the viability and projections to achieve net-zero emissions. Therefore, we propose the development of knowledge-based method to make goals more concrete and a tool to ensure a certain degree of accuracy for DAC investment decisions, such as answering the 5W1H for CCU projects. This research presents a knowledge-based indicative method with a combinatorial optimization and constraint satisfaction solution for the most suitable location recommendation for DAC with cost estimation and market projection. This supports CCU early-stage decisions from a micro-local perspective and promotes the use of the most applicable and scalable solutions.

Personal Spaces for Security Guard Robots in a Campus

Tatsuya Umemura, Haruki Mochizuki, Mari Ueda and Ryoza Kiyohara

Labor shortage is a growing issue in several countries, including Japan. One area facing a labor shortage in Japan is university campus security, where robots are sometimes used for patrol duties. These patrol robots primarily operate at night, checking for obstacles and monitoring people. Their purpose is twofold: to deter suspicious individuals and to safeguard non-malicious individuals, such as elderly people who may inadvertently enter the campus. For a patrol robot to accurately determine whether an object is human, it must approach closely. However, many people may be uncomfortable with robots coming too close. In this study, we investigated the acceptable personal space between humans and robots from an auditory perspective. This paper reports the findings and discusses future research directions.

Position Estimation Using CSI with Individual Differences Removed through Supervised Contrastive Learning.

Wataru Tokioka, Hidekazu Yanagimoto and Kiyota Hashimoto

In this paper, we propose a CSI-based position estimation system that mitigates individual differences by using Supervised Contrastive Learning. CSI represents Wi-Fi propagation conditions, allowing for detection of environmental changes, such as the presence of people. However, differences due to varying observation areas or individual characteristics have been shown to significantly reduce performance when training and test data differ. To address this, we employ Supervised Contrastive Learning to generate features that neglect individual differences. We evaluate the performance of our proposed method using an indoor human position estimation task. The results confirmed that the proposed method can estimate positions with higher accuracy than conventional methods, even when tested with different individuals.

The Interaction Between Entrepreneurial Characteristics and Ecosystems in Japan: Building a New Model for Entrepreneurs

Katsuki Yasuoka, Takaaki Hosoda, Kiyomi Miyoshi, Tokuro Matsuo and Qiang Ma

The purpose of this paper is to explore the relationship between entrepreneurial behavior characteristics and the entrepreneurial ecosystem in Japan and to develop a new model of entrepreneurial characteristics. The rate of entrepreneurship in Japan remains stagnant and has not been able to break through the stagnation of economic growth and innovation. While traditional studies have focused on the internal factors of entrepreneurs, recent years have highlighted the importance of EE in entrepreneurship. In this study, we construct a new model of entrepreneurial characteristics that considers the interaction between entrepreneurs and EE by dividing entrepreneurs into internal and external factors and clarify the impact of EE on entrepreneurs in Japan. Through interviews, the interaction between internal and external factors of entrepreneurs will be examined, and the model of entrepreneurial characteristics will be used to gain a deeper understanding of the reality of entrepreneurs in Japan. The results of this study are expected to highlight the real needs and challenges of entrepreneurs and contribute to the development of entrepreneurship.

Using Data Across Dissimilar Domains with Technical and Legal Assurance of Privacy

Hiroshi Yoshiura, Masatsugu Ichino, Tetsuji Kuboyama, Hideki Yoshii, Yoichi Midorikawa, Shusuke Kawamura and Ryunosuke Shimmura

As online activities expand across diverse domains, generating extensive datasets, the need for data grows—not only across a few similar domains but also across many dissimilar domains. However, this need faces two problems: data in dissimilar domains describe neither the same people nor the same features,

and cross-domain transfer of data containing personal information requires privacy protection. We propose combining data in different domains through common latent clusters instead of common people or features. Privacy is assured both technically and legally by transforming data into statistics, applying fully homomorphic encryption to the statistics, computing cross-domain co-clustering with the encrypted statistics, and applying differential privacy. We demonstrate how our proposed method can use data across dissimilar domains while assuring technical and legal privacy.

Waiting Time Estimation Method Using BLE and 2D-LiDAR

Koki Umekawa and Ryoza Kiyohara

On campuses such as that of universities, several people eat in a limited amount of time in a small cafeteria. Because users have limited time, it is important to know the waiting times and congestion levels in advance, to eliminate wastage of time. In this paper, we propose a method to estimate actual waiting times by estimating the causes of congestion. Specifically, we estimate the number of people using Bluetooth Low Energy (BLE) and the concentration of people in specific locations using two dimensional light detection and ranging (2D-LiDAR) to estimate the required time. We evaluated the method by simultaneously making measurements and observations at a restaurant on a university campus during lunchtime. The results showed that it was possible to clearly distinguish between cases where the restaurant was crowded and cases where it took a long time to eat.

LTLE 2024-Winter

A Study of the Evaluation of the Pedagogical Effectiveness of Graph Expression of Source Code and Design Patterns

Kota Araki and Mika Ohtsuki

Our goal is to provide a system to understand and check the relationships among the various documents produced in the software development process for university students, who are mainly novice software development engineers. To facilitate students' understanding of software documentation, we developed a system that displayed source code and design patterns converted into graph data in 3D on a virtual space built on Unity. This system is expected to enable students to understand the structure of source code and design patterns intuitively. 3D is expected to enable a wider range of visualization than 2D and to enable visualization of documents that are related to each other on a larger scale. To confirm the effectiveness of this system, an evaluation was carried out in an actual classroom setting. In the evaluation, Students were asked to solve tests on design patterns and source code structure. Progress in understanding the structure was then compared through learning with several tools, including this system. The evaluation results showed an improvement in test scores, but no significant difference from other tools. Future tasks are to correct the problems in this system that were the cause of this difference.

Design and Implementation of a Practical AI Security System Learning Kit for Intrusion Detection

Jirawan Khoprakhon, Suppachai Howimanporn and Sasithorn Chookaew

Artificial intelligence (AI) is an essential component of today's security systems, especially in intrusion detection systems that use AI to analyze images and signals from closed-circuit television (CCTV) cameras and sensors, which will increase detection accuracy and reduce human errors. Therefore, vocational education must be developed in line with the advancement of AI technology to better prepare students for careers in related industries. However, the current challenge is that vocational education needs to fully integrate AI technology, primarily due to the lack of appropriate learning materials and understanding of the application of AI in security systems. This study aims to create a practical AI security system learning kit for intrusion detection to teach students practical skills in AI-driven security systems in real-world scenarios. A total of 20 vocational students were recruited for the experiment study. The results showed that the students had high-practical skills and positive attitudes after using the learning kit

Design Concept of Data Visualization in Developing a Supervision System for Pre-service Engineering teachers

Kanitta Hinon, Phuchit Satitpong and Kittinan Petsri

The supervision system for pre-service engineering teacher is a system used for supervising teachers' instruction through a network. With the utilization of information technology and cloud technology as key components to enable supervisors to supervise via online, accessible via communication devices and all types of computers. The purpose of developing this supervision system is to illustrate collaborated data in terms of graphic to enhance the effectiveness of collaboration between supervising instructors and pre-service engineering teaching trainees. In terms of the structural design of the supervision system, the concept of data visualization has been employed. This involves a combination of factors for presenting data and methods for graphic data presentation, which support collaborative work among users within the system. The results of the research have shown that 1) from the analysis and design of the structure of the supervision system, the structure consists of four main components (1) input factors (2) system processes (3) data visualization results and (4) feedback, 2) the suitability of the components in designing the data visualization structure of the system is at the highest level, and 3) the overall suitability for the use of data visualization in the supervision system is also at the highest level.

Effects of noise factors on Japanese EFL learners' listening

Rikutaka Kanayama and Yuuichi Ono

This study aims to investigate how listening materials with background noise affect foreign language learners' listening comprehension of the target language. To identify suitable noise conditions and noise levels, an experiment was conducted using a dictation task. Thirty-five Japanese university students participated in the experiment, during which they completed a dictation task on audio with three different types of background noise, followed by a rating of the audio's perceived clarity. After analyzing the data, the results yielded several key insights. First, specific noise conditions that significantly affected the perception of the listening materials were identified. Second, it was observed that acoustic features of individual phonemes, altered by the noise, tended to affect both accuracy and perceived clarity. These findings are expected to contribute to the development of listening materials with appropriate background noise to enhance learners' listening skills.

Exploring the Modality of Network-Type Thinking in Young Children with Picture Books

Ryosuke Kozaki, Kenya Bannaka, Koichi Akashi, Hibiki Ito, Katsuhiko Murakami, Sayaka Matsumoto, Yasuhiro Kozaki and Kunihiko Takamatsu

This study investigated the concrete modality of network-type thinking and knowledge entity formation of young children aged from four to six, employing the picture books. More precisely, we analyzed the techniques with which they associate words and concepts from read stories. As a result, it was demonstrated that the children substantially hire verbs and syntagmatic association when developing a knowledge network. In addition, it was also shown that six-year-olds recalled significantly more keywords than younger children when it came to syntagmatic (or "serial") thinking method. Furthermore, this paper indicates some of the future possibilities of the findings that are to be applied to the more effective selection of picture books in nursery school settings for their language development.

Feedback System for Teaching Activities Based on Deep Learning

Song Gao, Yu Bai and Fuzheng Zhao

University teaching evaluation is challenging due to the scale of operations. Traditional methods like classroom observations and student surveys are time-consuming and subjective. While educational big data offers quantitative insights, it lacks emotional context. This paper proposes a novel approach to teaching evaluation using laughter recognition. By analyzing laughter, an intuitive emotional cue, we can gain valuable insights into the teaching process. This approach leverages AI technology to inject emotion into the evaluation process, addressing the limitations of traditional methods and big data analytics. The paper validates the accuracy of a deep learning-based feedback system designed for this purpose. By recognizing laughter, the system can provide more nuanced and human-centered evaluations of teaching activities.

Improving Remote Class UX design using Functional Resonance Analysis Method

Shigeru Kusakabe

This paper covers our approach to improvement of remote class UX design using FRAM, Functional Resonance Analysis Method. Remote class materials are tightly coupled with information technology artifacts. The Covid crisis has accelerated the fusion of education and information processing technology to provide distance learning in educational organizations. Some remote learning materials remain in conditions to be improved after developed in an ill-prepared limited period. Methods of improvement in conventional systems engineering such as review work but have limitations. We elaborated an improvement approach based on HCD, Human-Centered-Design, specifically based on the five elements of UX design. We use FRAM to facilitate analysis and idea of improvement within and across the boundary of the UX design elements. The combination of this approach with a qualitative interview enabled us to realize clues to desired work-products, improved student persona in addition to improved remote class materials.

LLMs and VR in the classroom: potential for interactive and immersive language learning

Alexander Petermaier, Katja Fraedrich, Thomas Keller and Elke Brucker-Kley

The integration of digital tools in education has been on the rise, particularly in language learning. This study explores the potential of combining Large Language Models (LLMs) and Virtual Reality (VR) to create an interactive and immersive language learning environment. The research addresses the challenges faced by language learners and teachers, such as anxiety, lack of authentic language environments, and varying student abilities. A prototype was developed to enhance students' expressive skills, particularly speaking, by simulating an authentic language environment through VR and providing natural communication guidance via LLMs. The prototype was tested with 16 sixth-grade students and three teachers, and its effectiveness was evaluated using standardized questionnaires. Results indicated high user acceptance and usability, though improvements in speech-to-text transcription quality were suggested. The study concludes that VR and LLMs hold significant promise for language education, offering engaging and effective learning experiences, though further research with larger participant groups and longer durations is recommended.

Proposal of a Learning Support System Enabling Nursing Personnel to Self-Evaluate Clinical Reasoning Ability

Reo Satou, Haruki Ueno, Yoko Tsukamoto and Hiroshi Komatugawa

This paper proposes a learning support system that allows nursing personnel to self-evaluate their clinical reasoning abilities. In a long-term learning environment, it is essential to develop a program that constantly focuses on the ability to address patient issues, applicable from beginners to experienced professionals. However, the learning environments for beginners and experienced individuals are fundamentally different. In this study, we identify "clinical reasoning ability" as a common competency throughout the timeline of nursing personnel development and examine a learning support model that trains individuals within two distinct environments for beginners and experienced professionals. Based on this model, we attempt to propose a learning support system that enables learners to self-assess their abilities.

Quantitative Evaluation of Perceived Acceptability of Accentual Patterns in Four-Mora Japanese Words Based on Lexical Attributes - for Implementation into CALL System for Japanese Learners -

Ikuyo Masuda-Katsuse and Ayako Shirose

We generated four-mora Japanese word utterances with various pitch accent features and mapped native speakers' perceived pitch accent acceptability onto a distribution of pitch accent features. The results confirmed that even for words classified as having the same accent type, the acceptability distribution differed depending on the lexical properties of the word.

Scholarly Communication Research in Library and Information Science: Mapping Themes and Trends

Thoa Ninh

The aim of this paper is to identify key themes and trends in scholarly communication research in Library and Information Science. VOSviewer and CiteSpace software are used to analyze 980 scholarly articles retrieved from Web of Science in order to visualize the co-occurrence of all keywords and to identify emerging themes. The findings highlight the growing importance of open access, digital platforms, and alternative metrics, as well as the impact of the COVID-19 pandemic on researchers. This study contributes to the field by providing a more comprehensive overview of scholarly communication practices in Library and Information Science, supporting researchers to identify future research directions, and helping libraries provide appropriate scholarly communication services for researchers.

ThriveBuddy: Towards Student Well-being Through AI-Powered Digital Mentorship

Sirinda Palahan

This paper presents ThriveBuddy, a work-in-progress Q&A system and LLM-based chatbot designed to enhance student well-being and academic success by offering research-backed, practical advice for life improvement. The system uses interviews from credible YouTube sources as its external data corpus, providing students with evidence-based tips on topics such as stress management, productivity, and personal development. Initial evaluations highlight the effectiveness of MiniLM as the retrieval model, achieving the highest precision (0.2515), recall (0.7544), and F1-score (0.3772) for accurate document retrieval. For response generation, BART emerged as the optimal model, delivering the highest Answer Correctness (0.5255) along with strong scores in Answer Relevancy (0.7792) and Faithfulness (0.4080). These results underscore ThriveBuddy's potential as an accessible, supportive tool for students, with further refinements planned through a pilot study at a university in Thailand to enhance its accuracy, usability, and impact.

Using Multiple Software to Support Training Activity of Energy Management in Industrial Manufacturing with AIoT Technology

Suratuch Phenprasit, Suppachai Howimanporn and Sasithorn Chookaew

Nowadays, energy management in industrial manufacturing is essential in society, especially in using energy in compressed air systems because it is often among the largest sources of energy consumption in industrial manufacturing. Thus, appropriate energy management can lead to significant cost savings and efficiency improvements. One method of energy conservation measures is to adjust the pressure in compressed air to the lowest possible pressure while still meeting production needs because operating at a higher pressure than required increases energy consumption. However, the lack of learning to use technology to enhance energy conservation hinders the development of engineers' and students' engineering skills. This study proposed using multiple software to support training in energy management, which operates and reduces energy use in compressed air by using Artificial Intelligence of Things (AIoT) to make decisions and ensure production goals with energy conservation are met, providing a sense of reassurance about the efficiency of the proposed method.

DSIR 2024-Winter

A Model for Understanding Student Status Using Attendance Data in the First Semester of University

Naruhiko Shiratori

This study developed a Hidden Markov Model (HMM) to analyze attendance behaviors of first-year university students during their spring semester, aiming to identify distinct behavioral patterns and examine their impacts. Weekly attendance data was used to estimate latent states, and clustering revealed four representative attendance patterns, including stable attendance and increased absenteeism. The results highlight the potential impact of specific behaviors on academic outcomes, underscoring the importance of preventive interventions in student support and its applicability to future academic guidance.

A Systematic Overview of Dropout Prediction and Evaluation in Higher Education

Takaaki Ohkawauchi and Eriko Tanaka

This study addresses the issue of dropout in higher education, investigating the steps necessary to deepen our understanding and improve interventions for this problem. Dropout can occur at multiple levels, including withdrawal from college, course interruption, and, in the short term, disengagement from specific assignments. These phenomena do not occur in isolation but are intricately interrelated. In recent years, machine learning has frequently been employed to predict students at risk of dropping out; however, leveraging this technique effectively requires careful selection of target populations, appropriate learning models, and validated assessment methods. The purpose of this study is to provide a comprehensive overview of the current research status across different phases of dropout studies, highlight critical points, and establish a foundational theory.

Categorical Database for Ensuring Data Integrity in Institutional Research

Tsunenori Inakura, Shotaro Imai, Kunihiko Takamatsu, Sayaka Matsumoto and Masao Mori

Institutional research deals with large and different datasets from various departments, and this can make it hard to keep the data accurate. In this paper, we present categorical databases, which is a method based on category theory, that helps to maintain data integrity. By organizing the database as a category, we can see how the data elements are connected. This makes it easier to do meaningful and precise data analysis. The connections between data can be shown as simple sentences that still make sense, even when the data is updated. This way ensures that data remain consistent in both databases and data warehouses through natural transformations, which means that references to the data stay trustworthy. Categorical databases provide a solid way to manage complex data structures, and they make sure that data integrity is kept.

Eduinformatics and the Universities' Challenge for "Ri": A 100-Year Vision of Higher Education Transcending Time, Place, and Culture through Shu-Ha-Ri

Kunihiko Takamatsu, Koichi Akashi, Sayaka Matsumoto, Ayako Hidetani, Gen Akashi, Hibiki Ito, Katsuhiko Murakami, Kenya Bannaka, Ryosuke Kozaki, Aoi Kishida, Yasuo Nakata, Tsunenori Inakura, Shotaro Imai and Masao Mori

This paper examines the transformation of higher education through the lens of Eduinformatics and the Japanese concept Shu-Ha-Ri. It analyzes the current state of universities, characterized by rigid academic divisions and external pressures, and proposes a path through interdisciplinary fusion and the introduction of absolute perspectives. The paper then envisions a future state 100 years from now that transcends constraints of time, place, and culture. It argues that a "Ri" part of universities creates new values through the fusion of Japanese cultural elements with global diversity by maximizing creativity and sensibility, and actively engages with society to solve real-world problems. The study concludes that while the path to transformation is not unimpeded,

it is essential for the future relevance and impact of higher education.

Fortifying Abridgement Assessment System against Student Collusions by Combining Fast Text Similarity Computation and Disjoint Set Union *Koichi Akashi, Hibiki Ito, Atsuko Yamashita, Katsuhiko Murakami, Sayaka Matsumoto, Kunihiko Takamatsu and Tetsuhiro Gozu*

Various forms of assessment of reading comprehension of students have been and are being practiced worldwide, but limitations apply when it comes to pursuing quantifiability and computability. Abridgement method, however, is undergoing rapid developments under the recent researches, demonstrating potentials to resolve these drawbacks. This method has allowed for handy implementation with plenty of extra features that assist educators throughout the assessment procedures, letting them play a more important role in the field of education. Nevertheless, the system is found partially hackable at this early stage of development despite its usefulness, potentially leading to a failure to detect academic misconduct such as collusion between students while marking. This research, in response to raised concerns about those issues, proposes the invitation of a data structure in graph theory called disjoint set union, accompanied by the deployment of external library that computes text similarity at very high speed, to the system. This additional layer of the assessment architecture is expected to enhance its rigidity, contributing to the sophistication of this educational method itself.

Investigation of Latent Effects and Changes of Adult Learners at Colleges or Graduate Schools

Yuya Yokoyama, Takaaki Hosoda, Morihiko Ikemizu and Tokuro Matsuo

In contemporary society, where radical changes of social structures are being taking place, it is getting more important for adult learners to study to obtain new knowledge and skills. From these circumstances, what triggers adult learners to study and what prevents them from learning are greatly emphasized. There are several forms of study motivation: getting a certification, seeking new career paths, or simply academic interest, among others. However, Japan is behind other countries when it comes to adult relearning due to various hurdles along the way. Meanwhile, recurrent education is attracting attention along with the widespread use of various education methods to handle multiple demands. Therefore, this paper aims to analyze the potential factor of study motivation of adult learners and to grasp what motivates or prevents their relearning. As a first phase, we formulate four hypotheses regarding the relationships between study motivation and achievement. These hypotheses are then validated using questionnaire targeting adult learners. As a result of analysis, the relationships between before and after studying at college or graduate school can be observed. It could also be implied that the questionnaire targeting adult learners who completed college or graduate school would be effective in examining effects and changes.

Predicting Performance in First-Year Required Courses Using Machine Learning: An Analysis of Students' Learning Outcomes Based on At-Enrollment Data

Shintaro Tajiri, Kunihiko Takamatsu, Naruhiko Shiratori, Tetsuya Oishi, Masao Mori and Masao Murota

In response to the growing importance of data literacy across disciplines, this study explores the potential of machine learning to predict student performance in first-year information literacy courses using only at-enrollment data. Conducted at Hokuriku University in Japan, the study utilizes a rich dataset encompassing students' academic background, standardized test scores, cognitive skills assessments, and self-reported academic habits collected at the time of admission. This research uses Random Forest, Support Vector Machine, and Logistic Regression models to identify at-risk students early in the academic year. Our findings reveal that Random Forest achieved the highest accuracy in binary classification with an AUC score of 0.878, highlighting key predictors such as English proficiency, high school GPA, and conceptual skills. This predictive approach demonstrates the feasibility of early intervention for at-risk students, offering insights into student preparedness and support enhancement. By identifying critical factors influencing success in mandatory data science education, this study contributes to the global dialogue on improving foundational data science courses and proposes scalable methods to foster equitable academic outcomes.

The Practical Application of Cluster Analysis of Academic Fields in Bibliographic Information to Enhance Research Performance Evaluation

Satoshi Ozeki

In recent years, the research capabilities of Japanese universities have declined compared to other countries, highlighting the need for effective evaluation of research performance. There are many indicators to measure research performance, and identifying comparable re-searchers is not easy. Therefore, this paper presents an example of identifying comparable researchers by classifying research fields through the application of bibliometrics. Specifically, using the Scopus database, this study performed cluster analysis on the research topic profile information of researchers in the same field from multiple universities to group them. Additionally, we demonstrate an example of applying the results of cluster analysis to enhance the evaluation of research performance.

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A study of characterization of von Neumann-Morgenstern stable sets for patent licensing games

Kei Obayashi and Satoshi Takahashi

In this study, we provide sufficient conditions for the existence of a stable set in a coalition form game in which the core may be empty. Specifically, we consider a patent licensing game in which the license negotiations between a patent holder (the seller) and firms (the buyers) are formulated as a coalition form game. In general, it is said that it is difficult to construct a stable set in the coalition form game in which the core is empty. In previous studies, in patent licensing games, the core of a reduced game is shown, from which a stable set is constructed and sufficient conditions for existence are given. In this study, we show the uniqueness of the discriminative stable set described in the concrete examples given in the previous studies. We also show sufficient conditions for the existence of stable sets other than those given in the previous study.

Advice Generation Using Influence Estimation on the Utterances of Elementary School Teachers

Sakuei Onishi, Hiromitsu Shiina and Tomohiko Yasumori

For busy teachers, there is an urgent need to develop a mechanical method to support teachers' reflections on their lessons. In this study, we propose a

method of advice generation that uses influence estimation on teachers' utterances with the aim of assisting in the reflective activities of teachers. Influence estimation leverages the Attention mechanism of a Large Language Model (LLM), and specific advice is generated based on the results. An evaluation of the experimental results suggests that it may be possible to generate useful advice by utilizing influence estimation on utterances.

AI-Based Automatic Load Balancing Function in DACS-Based PBNM Scheme

Kazuya Odagiri, Shogo Shimizu and Naohiro Ishii

In the current Internet system, there are many problems using anonymity of the network communication such as personal information leaks and crimes using the Internet system. This is why TCP/IP protocol used in Internet system does not have the user identification information on the communication data, and it is difficult to supervise the user performing the above acts immediately. As a study for solving the above problem, there is the study of Policy Based Network Management (PBNM). This is the scheme for managing a whole Local Area Network (LAN) through communication control for every user. In this PBNM, two types of schemes exist. As one scheme, we have studied theoretically about the Destination Addressing Control System (DACS) Scheme with affinity with existing internet. By applying this DACS Scheme to Internet system management, we will realize the policy-based Internet system management. In this paper, AI-Based automatic load balancing function in DACS-based PBNM Scheme is proposed.

An algorithm for deriving weights for the Orthogonal Vector Projection Method in automated medical diagnostic reasoning

Irosh Fernando

The orthogonal vector projection method (OVPM) with the Select and Test(ST) algorithm has previously been introduced as a solution to overcome the bottleneck associated with traditional approaches to automated medical diagnostic reasoning in relation to implementing larger medical expert systems. In this paper, we have enhanced this previous work by introducing an algorithm to derive the weights for the OVPM from a training data set consisting of clinical cases. We have demonstrated the accuracy of the algorithm by evaluating a data set of patients presenting with diagnoses related to chest pain. It can be used as a machine-learning algorithm in medical diagnostic reasoning and has the potential to enable the implementation of large medical expert systems.

Application of SCADA Systems using Fuzzy Logic to Control Water Temperature

Suratuch Phenprasit, Suppachai Howimanporn and Sasithorn Chookaew

The temperature heating system in the fluid circulation condition is widespread and necessary in industrial and residential control systems, especially in industries that support production or service systems. In the past, such control primarily relied on humans. However, humans have high uncertainty, high cost, and many safety concerns that may occur due to undesirable events due to human control errors. This research proposes a control system that can adjust the control criteria according to the target using the fuzzy logic principle that changes automatically based on the industrial control device (PLC), controlled and displayed by SCADA. The control system of all devices with the Omron CJ2M-CPU22 PLC is used for remote control and display monitoring results. In addition, the vortex flow is simulated according to the industrial working conditions. The temperature is measured by a resistance temperature detector (RTD). At the same time, the RTD sensor is used to monitor the temperature of the liquid to control the heating device and adjust the value by itself according to the proposed algorithm. The experiments show that the proposed controller can change the value appropriately and satisfactorily.

Brain Function and Autonomic Nervous System Activity while Switching from Automatic to Manual Operation in a Jumping-out Event

Yoshiki Shima and Koji Kashihara

Developing autonomous vehicles is highly desirable, especially for elderly people and in local areas. We investigated physiological features during the transition from autonomous to manual driving in an emergency case. We observed a temporal change in the frontal cerebral blood flow during an emergency. Time-frequency analysis to evaluate the autonomic nervous system activity (i.e., instantaneous heart rate variability) indicated increased sympathetic nervous activity (i.e., blunted parasympathetic nervous activity) while switching from autonomous to manual driving.

Coalition Structure Generation with Priority Order of Agent Types

Tenda Okimoto and Katsutoshi Hirayama

Coalition Structure Generation (CSG) is a fundamental problem that can formalize various applications related to multi-agent cooperation. CSG involves partitioning a set of agents into coalitions so that the social surplus (i.e. the sum of the values of all coalitions) is maximized. In a traditional CSG, since the value of a coalition is assumed to be given by a characteristic function, the representation size for it becomes exponential in the number of agents. In order to solve this problem, several compact representation schemes for a characteristic function have been proposed. Agent Type based CSG (CSGt) is a CSG where a characteristic function is compactly represented by utilizing the agent types. When we apply the CSGt to real world problems, it is natural to consider the priority of agent types. In this paper, the focus is laid on the Priority Order of Agent Types based CSG (PO-CSGt) problem. A formal framework for the PO-CSGt is first defined. Furthermore, two novel solution criteria called Pareto optimal and lexicographically Pareto optimal muster lists for the PO-CSGt are provided. In the experiments, the number of Pareto optimal and lexicographically Pareto optimal muster lists of PO-CSGt problems are reported in the number of benchmarks.

Controlling Structural Potentiality for Prototype Networks in Multi-Layered Neural Networks

Ryotaro Kamimura

The present paper aims to show that neural networks have a strong tendency to acquire the prototype network with the simplest configuration at any cost. The simplification of surface networks into the simplest prototype networks is based on controlling the structural potentiality, which measures the number of absolute connection weights. In particular, we demonstrate how the active control of structural potentiality reduction can be used to modify connection weights to produce prototype networks. For clarity and explicit understanding of our results, we created a dataset with both linear and non-linear relations to the corresponding targets, where interpretability is prioritized over improved generalization. The method produced higher ratio potentiality, representing the similarity between prototype networks and estimated ones at the very beginning of learning in almost all cases. By appropriately controlling the potentiality, the method aimed to extract the prototype both at the start and in the later stages of learning. Additionally, it was found that the effort to detect

the simplest network was closely related to the discovery of new relationships between inputs and targets, despite focusing on the simplest relations.

Copper as a Central Commodity in Network Analysis of Price Dynamics and Its Connection to Macroeconomic Indicators

Yoshiyuki Suimon

This study investigates the interconnections between commodity futures prices and macroeconomic trends through a comprehensive time series and network analysis, with a particular focus on copper's central role. Using data on 19 commodity futures, I first analyzed time-series characteristics, categorizing commodities into four clusters via TimeSeriesKMeans to capture diverse return behaviors. A correlation matrix based on monthly returns enabled the construction of a network, which was examined through centrality metrics—degree, eigenvector, betweenness, and closeness centralities. Copper consistently exhibited the highest centrality across all measures, underscoring its pivotal role in the commodity network. Further analysis of copper futures prices and Composite Leading Indicators (CLI) from various OECD countries revealed a stronger correlation between copper prices and CLI metrics, particularly in major economies such as the United States and Germany. Given copper's broad industrial applications, these findings suggest that copper prices serve as an economic bellwether, reflecting macroeconomic shifts, consumption patterns, and demand forecasts. This research highlights copper's unique economic significance and its potential as an economic indicator within commodity markets.

Development of an Automated Control System for Optimizing Plant Growth in Limited Spaces Using Humidity Sensors and Light Settings

Saowalak Leelawongsarote and Thanaporn Patikorn

The objective of this research was to develop and assess the efficiency of an automated control system for managing plant growth factors. The system operates in two modes: manual and automatic, and regulates key growth factors, including water and light. For water control, a soil moisture sensor continuously monitors moisture levels. When the soil moisture drops below a set threshold, the system activates a water pump to restore the desired moisture level. In terms of lighting, the system allows real-time LED control, with on-off timing adjustments accessible via a user interface. The system was developed using the Arduino IDE, with code written in C language and uploaded to an Arduino circuit board. Efficiency testing involved monitoring soil moisture via the sensor, measuring LED light intensity, and observing the growth of green oak plants over a 42-day period. Results indicated that the system maintained optimal moisture levels and daily light intensity suitable for green oak growth. The plants met the desired growth criteria, underscoring the system's ability to regulate essential growth factors effectively. This automated system provides a reliable solution for plant growers with limited time or space, delivering consistent and convenient care for indoor vegetable cultivation.

Effective visualization of individual piano performance style preferences using tempo and dynamics features with AIME

Ayako Minematsu and Takafumi Nakanishi

In appreciating piano performances, listeners often develop preferences for specific performance styles even within the same musical piece. This study proposes and validates a method for visualizing individual preferences in professional piano performances. By analyzing performance features, such as tempo and its first and second derivatives, and dynamics and its first and second derivatives, this method generates visual representations of preferred stylistic traits. Furthermore, by leveraging the Approximate Inverse Model Explanation (AIME) method from Explainable AI (XAI), the method extracts comprehensive preference features for each listener across multiple pieces. The key strength of this method is its ability to articulate a listener's preferred performance style in concrete terms. This empowers individuals to incorporate these elements into their play, thereby facilitating self-improvement. Moreover, they can connect individuals with performers or listeners who share similar stylistic preferences. This study presents a practical tool with the potential to translate abstract musical preferences into concrete, understandable, and actionable insights, thereby enhancing the experience of both performers and listeners.

Extraction of Gait Features for Personal Identification Using 2D LiDAR

Kozo Tanigawa, Ryota Fukumura, Daigo Misawa and Kenichi Takahashi

For the purpose of preventing and deterring crime, surveillance is carried out across various fields, such as companies and government, by deploying security guards and cameras. However, as the monitoring area expands and the need for detailed surveillance grows, costs rise with the increase in security guards. Therefore, the automation of monitoring is being implemented as a solution to alleviate the burden on security guards and reduce costs. To achieve this, a mechanism for identifying individuals is necessary. Cameras are commonly used for personal identification, but methods that use cameras can be invasive of privacy and may not be deployable in certain locations. Therefore, in this paper, we propose a method for extracting features useful for personal identification using 2D LiDAR, aiming to develop a personal identification system that addresses the drawbacks of cameras. By using 2D LiDAR, an individual's movement within the measurement area is detected, and gait features are extracted as characteristics for personal identification. We confirmed that it is possible to achieve person identification by estimating the gait features extracted using machine learning techniques.

Fine-tuning for Question Answering in Low-Resource Languages: A Case Study on Khmer

Kimleang Ly, Dona Vály and Phutphalla Kong

A large language model can understand and generate human language by training it with massive amounts of text data. However, most of the existing models nowadays were trained with English datasets, leading to limited support and low performance in other languages especially low-resource languages like Khmer. To address the imbalance, we aim to build a Khmer language model by investigating the effectiveness of fine-tuning large language models. The full fine-tuning applies to Qwen2 (0.5B, 1.5B) and Gemma2 2B. Fine-tuning with low-range adaptation (LoRA) applies to Mistral 7B, Gemma 7B, and Qwen2 7B. We collect datasets from online sources containing question-answer pairs in general knowledge domain. The vocabulary expansion employs to model, lacking Khmer token representation. The recall-oriented understudy for gisting evaluation (ROUGE) and bilingual evaluation understudy (BLEU) as the evaluation metrics to measure the similarity between generated and reference responses. As a result, the Qwen2 1.5B archives the highest score in both metrics among small-scale model sizes and its original model, while the Mistral 7B model outperforms other 7B models. This research demonstrates that the fine-tuning strategy enhanced model performance across different model sizes, even when trained on a limited dataset of a downstream task.

Implementation and Evaluation of a Reflection System Using Activity data and Transcript data of Participants in Group Work

Ryotaro Okada, Kaho Ogura, Akane Yoshii, Takafumi Nakanishi, Ayaka Isobe, Teru Ozawa, Yutaka Ogasawara and Kazuhiro Ohashi

With rapid globalization and digitalization, the capacity to work effectively in teams is increasingly important. This study proposes an application that leverages recorded and transcribed data from group work sessions to visualize discussion content and participant activities, supporting reflection and improvement of collaborative abilities. The system consists of four main screens: Meeting Management Screen, User Analysis screen, Time Series Analysis screen, and Topic Analysis Screen. The analyses in these screens are linked to each other, allowing users to look back efficiently. The application enables participants to review their actions objectively, fostering learning and behavioral enhancement.

Improved Performance of a CA-SSL-based Daily Eating Sounds Recognition Model

Kazuhiro Koivai, Toshihiro Tsukagoshi, Masafumi Nishida and Masafumi Nishimura

Daily conversation and eating behaviors are crucial for maintaining physical and mental health among older adults. To facilitate monitoring of these behaviors, skin-contact microphones are used, which are useful in recognizing chewing and swallowing behaviors, but the data recorded by these microphones are limited and are seldom labeled. In this study, we focused on the class-agnostic semi-supervised learning (CA-SSL) framework used in image recognition for highly accurate recognition of daily eating sounds, which are eating sounds including speech, and proposed a learning method that effectively utilizes a large amount of unlabeled eating sounds collected as training data. We used 1-class labeled eating sounds—which were created from a large amount of unlabeled eating sounds data by adopting a naive pretrained labeling model—for the first fine-tuning of the recognition model of speech and eating sounds. Subsequently, the model was fine-tuned again with manually assigned labeled data to develop the daily eating sounds recognition model. The experimental results showed that the proposed model improved the recognition accuracy of chewing sounds by 1.2 times and swallowing sounds by 22 times compared with the baseline model before applying the 1-class label in the evaluation of simulated daily eating sounds by F1-score.

Improving Image Real-Time Position Estimation in Plant Leaf Lettuce by using Neuro-Fuzzy

Suratuch Phenprasit, Sasithorn Chookaew and Suppachai Howimanporn

Nowadays, the development of precision agriculture is significant and can be applied to increase the potential and quality of production. This research presents the use of artificial intelligence technology to improve the quality of accurate positioning in the inspection to track the growth of lettuce by automatically looking only at the leaf area size and stem height in vertical hydroponic cultivation by processing the image. The number of pixels collects the processed position data to find the error values in various positions on the prototype control area created to analyze and predict the most accurate, appropriate, and precise positions. This research uses the function calibration on the MATLAB image processing tool and presents the use of Neuro-Fuzzy to predict the position with the slightest error. The experimental results show that the proposed method increases the accuracy of the position in the real-time plane, resulting in a satisfactory reduction in the position error.

Intelligent Cyberbullying Detection by CNN-BiGRU using Word2Vec and GloVe Word Embeddings

Jaouhar Fattahi, Feriel Sghaier, Mohamed Mejri, Ridha Ghayoula and Sahbi Bahrour

In this paper, we propose an intelligent cyberbullying detection model using deep learning and word embeddings. Leveraging the 2024 Ejaz-Choudhury-Razi dataset, our approach combines Convolutional Neural Networks (CNNs) for local pattern extraction and Bidirectional Gated Recurrent Units (BiGRUs) to catch temporal features. Word2Vec and GloVe embeddings catch word semantics. The two proposed hybrid models achieve over 84% accuracy, precision, recall, and F1-score, with an AUC exceeding 91% and specificity above 82%, demonstrating its effectiveness in detecting cyberbullying on social media.

Light and pH Controlling of Hydroponic Cultivation Using Fuzzy Logic Control

Suratuch Phenprasit, Sasithorn Chookaew and Suppachai Howimanporn

This research designed and built an automatic control system for smart farming by controlling the environmental parameters of closed hydroponic vegetable cultivation to minimize errors. It consists of two main features: light and pH acidity. The installation of sensors to measure the quantities of both types is introduced into the programmable controller to program the control and processing. After collecting the data from the two features, when the data is input into the fuzzy theory and principle, the control system can directly predict the results with the actuator data to conveniently adjust the pH and light levels, and greatly reduce the errors caused by the equation calculation. The rules for determining the appropriate amount are largely determined by the member determination, and this algorithm is programmed and embedded in the digital controller. The experimental results show that using the fuzzy logic algorithm to predict hydroponic cultivation under controlled conditions and environments in a closed system can reduce errors to improve the growth potential. The fuzzy algorithm measurement, control and prediction system has satisfactory results, which are consistent with the plant growth and are satisfactory.

Limitation of Agents in a Node for Agent-based Human Tracking System

Kozo Tanigawa, Masaru Shiozuka and Kenichi Takahashi

Surveillance systems are widely used in various fields such as businesses and educational institutions.

However, as the number of locations and people being monitored increases, it becomes difficult for operators to keep the track of targets.

To alleviate the burden on operators, an agent-based human tracking system has been proposed.

In this system, the appearance probability of each target is calculated, allowing agents to be dispatched to multiple nodes where the target is likely to appear.

This approach enables efficient human tracking by deploying agents only to high-probability nodes, thereby optimizing system resources.

However, when multiple targets are present, agents tracking different individuals may be dispatched to the same node, potentially increasing the system load on that node.

Therefore, we propose a method to control the system load by limiting the number of agents dispatched to each node.

Simulation results show that the proposed method keeps a high tracking success rate even when the number of agents dispatched to each node is limited, despite changes in human movement patterns.

Optimizing Deep Reinforcement Learning for Atari Games: A Study on Preprocessing Techniques and Neural Network Architecture

David David, Agung Trisetyarso, Lukas and Widodo Budiharto

Deep Reinforcement Learning (DRL) has demonstrated remarkable capabilities in mastering a diverse range of Atari games, serving as a benchmark for evaluating the performance of DRL algorithms. This research paper explores the optimization of preprocessing techniques and hyperparameters, and the design of neural network architectures, to enhance the effectiveness and efficiency of DRL agents in the Atari game environment. Drawing insights from seminal research and experimental findings, this study aims to provide guidance for researchers seeking to achieve peak performance in this challenging domain. The results indicate that the most effective configuration consists of a discount factor of 0.95, a mini-batch size of 32, and an exploration rate of 0.001. Utilizing this configuration, the agent achieved an average score of 953 over 1,000 learning episodes.

Research on Learning Advising Using Open Source LLM

Osamu Hasegawa, Taketo Tsurube, Haruki Ueno and Hiroshi Komatsugawa

In previous research, the authors proposed and verified a system that uses ChatGPT to automate advising tailored to the learner's situation. There were issues with the generation of advanced advice sentences based on educational theory in large-scale language models developed for general-purpose use. In this study, we will utilize data from the educational domain as a dataset for fine-tuning LLM, and develop an LLM model that can generate more accurate advice sentences and verify its effectiveness.

Reverse Contribution Analysis of Remote Work and Mental Health: An Approximate Inverse Model Explanations Approach

Takafumi Nakanishi

Post the coronavirus pandemic, remote work has become more widespread owing to benefits like reduced commuting, increased flexibility, and improved efficiency. However, concerns like work-life balance, isolation, and mental health have made research on mental health and the reconstruction of work-life balance paramount. Despite efforts, contributions of individual explanatory variables to psychological health remain unexplored. We propose the reverse contribution analysis (RCA) method using approximate inverse model explanations (AIME) to clarify the relationship between remote work and mental health. AIME is an explainable artificial intelligence method that visualizes the relationship between explanatory variables and estimated target variables for black-box models, thereby allowing interpretation of the behavior of the model. Furthermore, the assumption that an ideal black-box model can always derive accurate target variables facilitates the direct visualization of the contribution of target variables to explanatory variables. Based on this assumption, RCA quantitatively evaluates the contribution and direction of influence (positive or negative) of the explanatory variables based on the variability of the target variables. We used RCA to analyze factors related to work-life balance, stress levels, mental health status, and remote work satisfaction in a remote work environment.

Robot Behavior Generation Based on "Animal Behaviors Inspired gMLP" with Environmental Event Information

Koki Sato, Ryoma Tanaka, Ryo Kobayashi, Sho Yamauchi, Keiji Suzuki and Sho'ji Suzuki

This study aims to create appealing robots capable of diverse motions by proposing a foundational framework for robot motion, upon which motion generation was verified. The two-phase approach involves training a natural language processing model and then using it to control robot motions. During the learning phase, the dataset was generated by extracting 2D keypoints from cat videos, converting these 2D keypoints into 3D keypoints, and calculating joint angles using inverse kinematics based on joint positions. Additionally, environmental audio and object information were extracted from the videos and added to the dataset as event information. This data, consisting of joints and their positions and event information, was then transformed into a language-like format, referred to as "motion language." This converted data was then used to train the gMLP, a large language model. The gMLP showed its lowest validation loss at 3 epoch, leading to the use of the model trained up to this point for generating motion language. We investigated how event information impacts gMLP motion generation. As a result, different sequences were generated based on event information. This information also influenced the ranking, indicating a tendency for variations in generation based on specific events.

Sign Language Recognition for Forensic Analysis using CNN and Transfer Learning

Feriel Sghaier, Jaouhar Fattahi, Mohamed Mejri and Ridha Ghayoula

Sign language plays an important role in forensic procedures. This is significant in giving evidence and communicating of rights, especially during taking statements from a non-verbal victim or suspect. It ensures the authenticity of information from a deaf or mute individual so that there will be no confusion or omission whatsoever to affect the course of an investigation. This paper proposes a sign recognition approach that satisfies forensic needs by enabling the identification and interpretation of key gestures in crime scene recordings, surveillance footage, and other visual evidence. This proposed system will be leveraging the use of convolutional neural networks, which are empowered with the concept of transfer learning of MobileNetV2. By leveraging the training on American Sign Language, the model is able to differentiate between the different signs which might empower analysts' work in such segments. The best-performing model achieved an accuracy of 96%, along with high F1-score, precision, recall, and specificity, demonstrating robustness for forensic applications.

Towards Reliable and Optimized IoT Applications using Taguchi Algorithm and Intelligence

Ramzi Khedhr, Wided Amara, Ridha Ghayoula, Jaouhar Fattahi, Lassaad Latrach, Amor Smida and Mohamed Mejri

This paper introduces a swift optimization technique for adaptive lobes in intelligent antenna systems, aimed at improving power delivery to users while reducing interference. It focuses on enhancing wireless communication performance and reliability by prioritizing coverage and signal-to-interference ratios (SIR and SINR). This approach employs a feeding mechanism to align with a designated radiation pattern, facilitating targeted power concentration toward user directions. Additionally, the application of the Taguchi method on UWB antennas plays a determinant role in physical security and intelligent communication, improving the global effectiveness of these systems in various operational environments.

Visualization method for rhythmic differences in violin performance audio data

Miyu Momozawa, Ryotaro Okada, Ayako Minematsu and Takafumi Nakanishi

Learning to play the violin requires many skills, and acquiring these skills can be very difficult for the beginning violinist. Especially in violin playing, playing with a precise rhythm is very important for progress. If a system that allows beginners to easily receive feedback on rhythmic deviations in their own play could be implemented, it would contribute to the improvement of violin players' skills. In this study, we present a method for detecting rhythmic deviations in beginners playing violin. The system inputs the performances of a teacher and a student, estimates their onsets, and estimates the tempo at each point in time from these onsets. The calculated tempo was normalized and the difference between them was derived. The system's feedback enables a beginner violinist to practice rhythm smoothly.