Conference Program

2024 10th International Conference on Computer Technology Applications

(ICCTA 2024)

2024 the 4th European Conference on Communication Systems

(ECCS 2024)

May 15-17, 2024 | Vienna, Austria

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Table of Content

Welcome Message

On behalf of Conference Committees, we welcome you to attend 2024 10th International Conference on Computer Technology Applications (ICCTA 2024) and 2024 the 4th European Conference on Communication Systems (ECCS 2024), held from May 15-17, 2024 in Vienna, Austria.

ICCTA 2024 and ECCS 2024 welcomes author submission of papers from any branch of computer technology applications and communication systems or other topic areas. the areas covered by the include, but not limited to: software engineering, computer applications, computational intelligence and ai techniques etc.

The conference aims to provide an interactive communication platform for practitioners to learn about the most cutting-edge academic and industrial application trends, to share the latest scientific research and technological achievements, innovative ideas and scientific methods in the field of computer technology applications and communication systems, to improve the level of academic research and industrial application in the field of communication so as to serve the global strategic deployment of new and old kinetic energy conversion, and promotes technology research, development, and application home and abroad.

We feel deeply grateful to all that have contributed to make this event possible: authors, the conference steering committee, the conference speakers, and the peer reviewers. Thanks are also extended to the conference administrative committee and the supporters for their tireless efforts throughout the course of the conference.

We hope that all participants benefit from the conference. Your contributions are vital in advancing the frontiers of knowledge and technology.

Conference Organizing Committee

May, 2024

Onsite Conference Information

Conference Venue

Eventhotel Pyramide
Website: http://www.eventhotel-pyramide.com
Address: Parkallee 2, 2334 Vösendorf, Austria
Tel: +43 1 699 00 3114
Email: meeting@eventhotel-pyramide.com

Oral Presentation Tips
✓ The duration of a presentation slot is 15 minutes. Please prepare your presentation for about12 minutes plus about 3 minutes for questions from the audience;
✓ An LCD projector & computer will be available in every session room for regular presentations;
✓ Presentations MUST be uploaded at the computer at least 15 minutes before the session start.

Dress Code
All participants are required to dress formally. Casual wear is unacceptable.
National formal dress is acceptable.

Attention Please
✓ Please take care of your belongings in public area. For your personal and property safety, delegates are suggested to wear representative card during conference and not to lend it to those unconcerned to enter event rooms. Conference does not assume any responsibility for loss of personal belongings of participants.
✓ Don't stay too late in the city, don't be alone in the remote area. Be aware of the strangers who offer you service, signature of charity, etc., at scenic spots. You can search more Tourist Information and Security tips online.

Emergency
✓ Ambulance: 144
✓ Police: 133

Online Conference Information

Zoom information	Arrangement
ZOOM ID 886 3834 0356 **ZOOM Link** https://us02web.zoom.us/j/88638340356 **Password: 051517**	May 15 Zoom Test for Committee/Session Chairs/ Speakers / Authors
	May 16 Opening Ceremony & Keynote Speeches
	May 17 Online session 1 & 2 & 3 & 4

Time Zone
Vienna Standard Time, UTC/GMT+2
please make sure that both the clock and the time zone on your computer are set to the correct China standard time.

Sign in and Join
✓ Join a meeting without signing in: A Zoom account is not required if you join a meeting as a participant, but you cannot change the virtual background or edit the profile picture.
✓ Sign in with a Zoom account: All the functions are available.

Additional Suggestions
✓ A computer with an internet connection (wired connection recommended)
✓ USB plug-in headset with a microphone (recommended for optimal audio quality)
✓ Webcam (optional): built-in or USB plug-in
✓ Stable Internet Connection
✓ Quiet environment
✓ Proper lighting
✓ Formal dress

Online Oral Presentation Tips
✓ The duration of a presentation slot is 15 minutes. Please prepare your presentation for about 12 minutes plus about 3 minutes for questions from the audience;
✓ Be in the meeting room at least 15 minutes before the session start.

Daily Schedule

May 15, 2024 | Wednesday

Time	Activity	Online Link
13:00-16:00	**Onsite Sign In** Lobby of Eventhotel Pyramide	
09:00-12:00	Online Zoom Test for Committee/Session Chairs/ Speakers / Authors (Breakout-Room)	886 3834 0356 https://us02web.zoom.us/j/88638340356 Password: 051517
09:00-12:00	Online Zoom Test for Authors Online Session 1 VE2026 VE2030 VE3035 VE3036 VE4077 VE4082 VE4083 VE4079 Online Session 2 VE2027 VE3039VE3052 VE3053 VE3054 VE3056 VE4075 VE3042 Online Session 3 VE1002 VE1003 VE1008 VE2021 VE3049 VE3055 VE0002 VE4076 VE1009	

May 16, 2024 | Thursday

Time	Activity	Venue / Online Link
08:00-09:00	**Onsite Sign In**	
	Opening Ceremony	Pacific is on the floor -1 (1st basement) Zoom ID: 886 3834 0356 https://us02web.zoom.us/j/88638340356 Password: 051517
09:00-09:10	**Conference Chairs Opening Address** **Vitaliy Mezhuyev**, FH JOANNEUM University of Applied Sciences, Austria **Paul Hofmann**, FH JOANNEUM University of Applied Sciences, Austria **Kamal Zuhairi Zamli**, Universiti Malaysia Pahang, Malaysia	
	Keynote Speech	
09:10-09:50	**Keynote Speech I-Onsite**: *Navigating the Future: Open Educational Resources in Higher Education* **Sandra Schön,** Graz University of Technology, Austria	
09:50-10:30	**Keynote Speech II-Onsite**: *Build better software faster: Model-Driven Engineering for Real-Time Control Software of Production Systems* **Bianca Wiesmayr,** Johannes Kepler University Linz, Austria	
10:30-10:45	Break Time & Group Photo	
10:45-11:25	**Keynote Speech III-Online**: *Computational inverse problems in measurement and control* **Matthew Harker,** École de technologie supérieure in Montreal, Canada	
11:25-12:05	**Keynote Speech IV-Online**: *Emotional contagion in open-source software* **Luigi Benedicenti,** University of New Brunswick, Canada	
12:05-14:00	Lunch Time	Hemingway's (Ground floor)
	Author Presentation Sessions	
14:00-15:25	**Onsite Session 1** **Software Development and Process Optimization** Invited Speech VE2029 VE3057 VE4085 VE3046	Pacific is on the floor -1 (1st basement)

14:00-15:45	**Onsite Session 2** **Image Processing and Information System Design** VE4067 VE2032 VE1011 VE4065 VE2033 VE1006 VE1004	Safari is on the floor 0 (Ground floor)
15:45-16:30	Break Time	
16:30-18:15	**Onsite Session 3** **Intelligent Computing and Data Modeling** VE3045 VE2028 VE2001-A VE3058 VE4088 VE3044 VE1010	Pacific is on the floor -1 (1st basement)
16:30-18:15	**Onsite Session 4** **Communication System and Data Transmission** VE2009 VE2007 VE2012 VE3050 VE4087 VE2010 VE3040-A	Safari is on the floor 0 (Ground floor)
19:00-20:30	Dinner	Hemingway's (Ground floor)

May 17, 2024 | Friday

Time	Activity	Online Link
09:30-11:30	**Online Session 1** **Intelligent Image Analysis and Processing Methods** VE2026 VE2030 VE3035 VE3036 VE4077 VE4082 VE4083 VE4079	
11:45-13:30	Lunch Time	Zoom ID 886 3834 0356 https://us02web.zoom.us/j/88638340356 Password: 051517
13:30-15:30	**Online Session 2** **Models, Calculations, and Analysis in Computers and Information Systems** VE2027 VE3039VE3052 VE3053 VE3054 VE3056 VE4075 VE3042	
15:30-15:45	Break Time	
15:45-18:00	**Online Session 3** **Software and Program Design** VE1002 VE1003 VE1008 VE2021 VE3049 VE3055 VE0002 VE4076 VE1009	

9

Keynote Speaker

Sandra Schön
Graz University of Technology, Austria

Dr. Sandra SCHOEN is senior researcher at TU Graz (Austria) and fnma (Austria) and experienced Open Educational Resources (OER) ambassador since more than 15 years now. She has extensive experience in OER projects, understands international OER trends, and brings a track record of international presentations and publications. Passionate about inspiring others in Open Education.

Navigating the Future: Open Educational Resources in Higher Education

Abstract: The keynote explores the transformative role of open educational resources (OER) amidst the challenges posed by copyright and digitalisation. It highlights how OER, defined as freely accessible, reusable, and adaptable learning materials, are pivotal in promoting open and accessible education. The discussion includes the development and milestones of the OER movement, along with its integration into educational practices. This keynote then presents what kind of applications use and built upon OER and address applications that are needed to provide further support of OER development and movement.

Keynote Speaker

Bianca Wiesmayr
Johannes Kepler University Linz, Austria

Bianca Wiesmayr holds a PhD degree in Computer Science with a focus on control software engineering from Johannes Kepler University in Linz, Austria. In her PhD thesis, she investigated the use of behavior modeling notations for the implementation and maintenance of control software models according to the notation IEC 61499. She also holds two Master's degrees from the same university in Electronics and Information Technology, as well as in Law and Business Aspects in Technics.

Currently, she is a postdoctoral researcher at the LIT Cyber-Physical Systems Lab in Linz where she is responsible for the research area on model-driven control software engineering. In addition to her research, she is an active developer of the open source environment Eclipse 4diac, which provides tool infrastructure for developing distributed control software.

Build better software faster: Model-Driven Engineering for Real-Time Control Software of Production Systems

Abstract: No matter who writes our software – humans or AI – we need mechanisms to describe the expected behavior of a system. In general, the control software of production systems reads data from sensors and uses this information to drive actuators. Therefore, a key property of control software is tight interaction with physical components. Domain-specific languages used for control software engineering are defined in industrial standards (IEC 61131-3, IEC 61499). Often, the control software must respond to an event observed by sensors, such as a value reaching a certain threshold. Therefore, languages with an event-based execution model are well-suited for representing control software.

Domain-specific languages have a small user base, but comprehensive engineering support is essential. This includes mature software engineering tools that can be used by domain experts. However, efficient control software development also requires methods for structuring software, evaluating and improving software quality, and integrating information from other domains (e.g., electrical engineering). The talk will give an overview of modeling methods for control software of production systems and describe how to get the most out of these models to build better software faster.

11

Keynote Speaker

Matthew Harker
École de technologie supérieure in Montreal, Canada

Matthew Harker is a professor of automation and control in the Department of Systems Engineering at École de technologie supérieure in Montreal, Canada, a university in the Université du Québec network. He obtained his Bachelor of Engineering with a Specialization in Mechatronics from McGill University in Montreal, Canada, and the Ph.D. and Habilitation from the University of Leoben, Austria. His research focuses on computational methods for solving inverse problems that arise in calibration, measurement, control, and design for mechatronic systems.

Computational Inverse Problems in Measurement and Control

Abstract: Many problems in measurement and control can be formulated as inverse problems, i.e., knowledge gaps that are filled by synthesis from effects to causes. Physical systems and the sensors that provide information about them must obey the laws of physics, and are thereby best described by continuous mathematical models. On the other hand, the computational tools we have to manipulate these models are fundamentally discrete. In order to obtain reliable information from sensors and to control systems in a reliable manner, we inevitably require reliable computational methods for solving inverse problems that bridge the continuous and discrete. This talk will cover some new computational approaches to systems governed by physics-based mathematical models and some of the subtleties that are encountered. Practical examples will be given of computational approaches to virtual sensors, optimal control, and the integration of machine learning into real-world measurement systems.

Keynote Speaker

Luigi Benedicenti
University of New Brunswick, Canada

Dr. Luigi Benedicenti received his Laurea in Electrical Engineering and Ph.D. in Electrical and Computer Engineering from the University of Genoa, Italy. A full professor and dean in the Faculty of Computer Science at the University of New Brunswick, Benedicenti previously served as Associate Dean in charge of Special Projects and as Associate Vice-President (Academic) at the University of Regina. He is a Professional Engineer licensed in New Brunswick and a licensed Italian Engineer. He created the Software Systems Engineering Program at the University of Regina and became its founding Program Chair. He led the accreditation process for the new program and was subsequently entrusted with the supervision of data collection and computation for all Engineering programs.

Benedicenti has more than 130 international peer-reviewed publications and has supervised more than 50 graduate students. He is familiar with the Tri-agency grant system, the European Union system and the United States National Science Foundation system, having participated in the process as an applicant, a mentor and a reviewer.

Benedicenti's current research is in three areas: Software Agents, Software Process, and New Media Technology. Research in Software Agents involves the characterization of software agents and the best applications for the agent model. Research in Software Process aims at characterizing the influence of affect in agile development methods. Research in New Media Technology is directed towards enhancing the understanding of digital communications. A supporter of interdisciplinary work, Benedicenti has developed and supported numerous academic partnerships within the University and with international partners. Benedicenti believes in collaborative environments, clear responsibilities and a strong motivation for success.

Emotional Contagion in Open-source Software

Abstract: Emotional contagion affects all human interactions. Software engineering thrives on human interaction as they are fundamental in software creation. Whether it involves agreement on requirements, connecting several modules into a functional and coherent set, or reverse engineering code in search of faults, software development nowadays nearly always requires a full development group. Open Source Software in particular relies on impromptu collaborations among contributors that do not necessarily know each other. In this case, emotional contagion can lead to unknown or unpredictable results. Thus, detecting, analyzing, and understanding the effects of emotional contagion in software engineering are worthwhile activities.

Onsite Session 1

Software Development and Process Optimization

➢ **Time:** 14:00-15:25, May 16, Vienna Standard Time, UTC/GMT+2
➢ **Room:** Pacific is on the floor -1 (1st basement)
➢ **Papers:** Invited Speech VE2029 VE3057 VE4085 VE3046

Invited Speech 14:00-14:25	The Development of Digital Competence Standards (DCS) Instrument for Lecturers in Higher Education Institutions for Academic Programs Through Open Distance Learning (ODL): Reliability and Validity Authors: Wan Ahmad Jaafar Wan Yahaya, Khairulnisak Mohamad Zaini, Irfan Naufal Umar, Irwan Mahazir Ismail, Nurullizam Jamiat, Munira Hashim Presenter: WAN AHMAD JAAFAR WAN YAHAYA, Universiti Sains Malaysia Abstract: The term open and distance learning (ODL) refers to a combination of two realities: first, most instruction is given by a lecturer who is physically and temporally apart from the student, and second, the goal of ODL is to incorporate more openness and flexibility into the curriculum, access, and other structural elements. However, in the context of Malaysia, there is no standard of digital competence for academicians, especially lecturers in higher education institutions. So the purpose of this article is to develop and validate an instrument on Digital Competence Standards (DCS) for Lecturers who teaches and coordinates the ODL program. This instrument has 35 items developed based on four internationally recognized standards; Digital Competence Framework for Educators (DigCompEdu), ISTE Standard, IC3 Digital Literacy Certification and The Technology Integration Matrix (TIM). The researcher collected data via an online survey, which took about two months to complete. 35 questionnaires were distributed to the identified respondents. Winstep version 3.69.1.11 was used to conduct three analyses: item reliability, person reliability, compatibility index of "infit", "outfit" and "Point Measure Correlation". The result of the DCS instrument shows high reliability with Cronbach's alpha of 0.96, item reliability of 0.88, and person reliability of 0.96. Compatibility index of "infit", "outfit" and "Point Measure Correlation" shows analysis showed that 34 question items were found to meet the standard range of "infit" and "outfit" which meet the main requirements of the Rasch model, while there is one question that needs to be revised to improve the psychometric quality of the instrument. In general, the instrument produced has satisfactory psychometric characteristics subject to the four analyzed indicators. In conclusion, the instrument developed is a valid instrument capable of validating the digital competence of academicians. It is necessary to create a competency standard for lecturers who teach ODL learning modes that can not only be used as a guide but can be adapted to the higher education scenario in Malaysia.
VE2029 14:25-14:40	Comparing the Effectiveness of Classical and Intelligent MPPT Algorithms for PV Systems Authors: Göksel GÖKKUŞ, Mustafa Sacid ENDİZ Presenter: Mustafa Sacid ENDİZ, Faculty of Engineering, Necmettin Erbakan University, Konya, Turkey Abstract: Solar power generation is a highly favorable alternative to traditional energy sources due to its widespread availability and environmental friendliness. To increase the efficiency of solar power generation, maximum power harvesting from the photovoltaic (PV) system is essential. Hence, there is a significant demand for an appropriate maximum power point tracking (MPPT) technique to accurately track the maximum power point (MPP). In this paper, two classical, perturb & observe (P&O) and incremental conductance (IC), and two intelligent, particle swarm optimization (PSO) and grey wolf optimization (GWO), MPPT

	techniques are compared under the same operating conditions using a single-ended primary inductor converter (SEPIC). The main advantage of the optimization-based MPPT approaches is to overcome the limitations and challenges of the classical MPPT strategies to increase the convergence speed towards the MPP and improve the tracking efficiency. MPPT techniques are tested for their response time and tracking accuracy in MATLAB/Simulink. According to the obtained results, PSO and GWO provide superior tracking performance with an average effectiveness of 99.5% compared to the P&O and IC. The comparison of classical and optimization-based approaches shows that PSO has less steady-state oscillation in MPP compared to GWO, while P&O outperforms IC in tracking efficiency.
VE3057 14:40-14:55	Conceptual Framework Introducing the Success Factors for Implementing Intelligent Automation – A Qualitative Multiple Case Study Authors: JOHANNES, DIRNBERGER-WILD, MAXIMILIAN, ROTH Presenter: Johannes Dirnberger-Wild, Johannes Dirnberger-Wild, Institute of Industrial Management, FH JOANNEUM Abstract: Productivity increases in administration remained partially untapped during recent years. At the same time, the pressure on existing professions is being exacerbated by demographic trends in industrialized countries. This reveals the potential offered by process automation in the administrative area. Technological progress can help to overcome this situation. In the recent past, Robotic Process Automation (RPA), automating simple and rule-based tasks, gained traction. RPA alone is not sufficient for more complex tasks. Therefore, supplementing or substituting AI-based technologies such as Machine Learning up to fully autonomous AI solutions, which we refer to as Intelligent Automation at its highest level, can be adopted. While RPA is regarded as an established technology, Intelligent Automation is still in its infancy. Therefore, research on successful practical examples is necessary for its dissemination. To this end, this paper conducts a qualitative multiple case study analysis based on guided semi-structured interviews aiming to identify success factors in the adoption of Intelligent Automation. To unravel the key factors, a framework comprising 45 success factors is introduced. This framework, along with its novelty to the scientific community, has the potential to facilitate practical implementation of Intelligent Automation. Yet, our investigation revealed that the identified use cases in analyzed companies haven't reached the maturity level expected for Intelligent Automation. Consequently, the findings pertain to the early stages of Intelligent Automation development. This study distinguishes itself from prior research by incorporating additional cases from various institutions and sectors, utilizing a study design rooted in a broader scientific knowledge base. Given that a limited number of companies could be recruited despite extensive systematic acquisition efforts, this subject area deserves further research efforts.
VE4085 14:55-15:10	Improving the survivability of a reconnaissance UAV swarm based on cellular automata Authors: Volodymyr O. Samburskyi, Eugene V. Malakhov Presenter: Volodymyr O. Samburskyi, Taras Shevchenko National University of Kyiv Abstract: The concept of swarming is not new. It is known to have originated and spread in the biological sciences, for example, bee colonies (reproduction). It has also found its application in military tactics - when several units converge to attack a target from several directions in a deliberately structured, coordinated manner. The paper describes the possibility of integrating bee swarm algorithm into cellular automata. The option of developing a swarm system with such integration in mind is analyzed. The article also describes algorithms for increasing the survivability of a UAV swarm system by defining and applying the system's objective functions - maximising the quality and width of the territory scanned.
VE3046 15:10-15:25	Enhancing the Sine Cosine Algorithm with Swap Operator for Team Formation Problem Authors: Md. Abdul Kader, Kamal Z. Zamli, Ambros Rudolf Mekeng Presenter: Kamal Z. Zamli, Faculty of Computing, Universiti Malaysia Pahang Al-Sultan Abdullah 26600 Pekan, Pahang, Malaysia

Abstract: Forming a group of experts who fulfill the requirements of a collab- orative endeavor is vital. Aiming to reduce communication costs among the team of experts in their effort to resolve the team for- mation challenge, this work introduces an enhanced sine cosine algorithm. Improving Sine Cosine Algorithm with a Swap Operator (ESCASO) is the designation given to the proposed method. To aug- ment the diversity of SCA, we employed a swap operator within the sine cosine algorithm. In contrast to other meta-heuristic algo- rithms such as the grey wolf optimizer, harris hawks optimization algorithm, and traditional sine cosine algorithm, we are evaluating the ESCASO's performance by applying it to the IMDB dataset. Based on the experimental findings, it can be concluded that the proposed algorithm effectively identifies teams that achieve the goal with minimal communication cost among team's members

Onsite Session 2

Image Processing and Information System Design

- ➢ **Time:** 14:00-15:45, May 16, Vienna Standard Time, UTC/GMT+2
- ➢ **Room:** Safari is on the floor 0 (Ground floor)
- ➢ **Papers:** VE4067 VE2032 VE1011 VE4065 VE2033 VE1006 VE1004

VE4067 14:00-14:15	Expert System for Bainite Design: the Approach to Enrich Physical Models with Information Derived from Knowledge Models Authors: Vitaliy Mezhuyev, Paul Hofmann Presenter: Vitaliy Mezhuyev, FH Joanneum Abstract: The development of a physical model begins with a knowledge model, initially existing as ideas in the mind of a researcher. A transition from knowledge models to strict mathematical formalisms is a challenging process, and may not always be feasible, particularly in the early stages of research. Another problem comes when many experts are participating in the development of new physical knowledge, which may result in inconsistency. To contribute to this domain, the paper presents the development of an expert system (ES), created to capture expert knowledge for the design of a new physical material, namely, the bainite steel. The ES combines physical properties and rules in a unique knowledge model and enriches them by derived from data probabilities. The proposed approach enables users to validate expert knowledge and find contradictions in the logical rules, giving the possibility of mapping them back to physical models.
VE2032 14:15-14:30	Pixel-based Quantification of Retinal Vascular Width using Distance Transform Metric Technique Authors: Assyareefah Hudaibah Saad, Wan Mimi Diyana Wan Zaki, Marizuana Mat Daud, Nur Asyiqin Amir Hamzah, Aouache Mustapha Presenter: Wan Mimi Diyana Wan Zaki, Universiti Kebangsaan Malaysia Abstract: The retinal vasculature network serves as a crucial indicator of overall human health, given its structural and physiological parallels with various body systems. The quantification of retinal vasculature width holds significance in evaluating ocular abnormalities, vascular caliber, and systemic conditions such as hypertension, cardiovascular issues, and nervous system disorders. However, current methodologies face challenges in effectively integrating pixel data for accurate vessel width assessment. This study introduces an optimal quantification approach that incorporates all pixel data without disregarding any connected pixels, utilizing diverse Distance Transform (DT) metrics. Three datasets—Digital Retinal Images for Vessel Extraction (DRIVE), High Resolution Fundus (HRF), and LES-AV—each comprising 20, 45, and 22 fundus images, respectively, were employed. Our method automatically quantifies vessel width using various DT metrics, including Euclidean DT (EDT), Chessboard DT, Cityblock DT, and Quasi-Euclidean DT (QEDT). Following meticulous metric selection, all DT metrics yielded promising results with statistical significance analyses ($p<0.05$ via Two-sample T-test and Tukey post-hoc). Notably, QEDT emerges as the most suitable and statistically significant metric for vessel quantification, meeting the objective to quantify vascular width with the shortest distance possible while incorporating all connected pixels. This finding underscores QEDT's capacity to quantify retinal blood vessels (RBV), highlighting its potential in advancing ophthalmology diagnostics and treatments.

VE1011 14:30-14:45	Image-based Mangifera Indica Pathogen Recognition using Artificial Intelligence Authors: Maria Jeseca C. Baculo, Floribeth P. Cuison, Nema Rose D. Rivera Presenter: Maria Jeseca Baculo, Don Mariano Marcos Memorial State University Abstract: Mangifera Indica, holds significant global export value. This study focuses on implementing object detection frameworks to identify five surface defects in this mango variety, which is crucial for main- taining its export quality. The methodology involves training four object detection frameworks. Results show that the modified region extraction technique, which uses adaptive binarization and mor- phological operations catered to detect mango surface defects, with EfficientNet as the base learner, demonstrated improved accuracy with a mean Average Precision (mAP) of 0.842 at an Intersection over the Union (IoU) threshold of 0.75.
VE4065 14:45-15:00	Addressing Data Imbalance via Image Augmentation for Automated Quality Inspection in Steel Production Authors: Hannes Eberhard, Raphael Hartner Presenter: Hannes Eberhard, FH JOANNEUM Abstract: Automated quality inspection is widely used in industry, however, there is often the problem of data imbalance, as defect samples occur less frequently during production leading to significant challenges in machine learning projects. Nevertheless, a balanced data set is important for the optimal training of the image classification model. Therefore, different methods of data augmentation are used to rebalance the data and induce diversity. Furthermore, the impact of data imbalance on model accuracy is usually not known a priori. Consequently, a classification model is trained with an unequal data set and the proportion of defect samples is gradually increased to identify the relationship of data imbalance and model accuracy. For comparability, the proportion of defect samples is augmented to the same size as the majority class. This method showed that over an imbalanced ratio of 5 data augmentation is required to get a valid model. Additionally, from an imbalance ratio of 20 onwards, the specific methods of data augmentation have a significant impact on model accuracy. The final result showed that for this images of metal samples, geometric augmentation methods are the best way to reduce the imbalance in datasets, while photometric methods do not improve the results compared to simple oversampling (without augmentation). These findings can be used for future machine learning projects in the area of defect classification. This increases efficiency of sample collection and allows the best model to be developed with a minimum number of defect samples.
VE2033 15:00-15:15	Virtual Simulation System for Reduction and Analysis of Explosive Fields Authors: Lei Zhang;Jianguo Ning;Xiangzhao Xu* Presenter: Lei Zhang, Beijing Institute of Technology, China Abstract: The application of Virtual Reality (VR) technology continues to expand across various fields. This paper aims to explore its innovative application in the reduction and analysis of explosion scenarios. By integrating advanced virtual simulation techniques, a virtual reality-based explosion scene simulation system is designed to achieve a high-fidelity recreation and in-depth analysis of explosive events. The system integrates an advanced physics engine and simulation algorithms to accurately simulate various aspects of the explosion scene, including flames, smoke, and shock waves. This study provides a new way to understand the impact and mechanism of an explosive event by restoring the explosion scene in a virtual environment. And the simulation system provides realistic 3D scenarios to show the process of the blast impact as well as the possible outcomes, which not only helps engineers to assess the extent of the damage, safety distances, and contingency plans, but also plays a key role in the engineering, security, and environmental fields to improve the safety and risk management. By combining virtual reality technology and in-depth analysis of explosion scenarios, we expect to provide more scientific and comprehensive support for the prevention and handling of explosion accidents.

VE1006 15:15-15:30	End-to-End Recommendation Pipeline, from User to Store Authors: Pham, NGuyen Hung, Salem, Hajer*, BEN ABDRABBAH, Sabrine, Presenter: Hajer Salem, Audensiel, Lab'Innov Abstract: Visual search and recommendation systems for the fashion domain are challenging tasks that require accurate recommendations of related items from massive collections of fashion products based on a query image. Although there have been advancements in this area, visual search still faces limitations, especially when dealing with noisy user query images. The reason for these challenges lies in the common characteristics of fashion images captured under uncontrolled circumstances, such as varying viewpoints, camera quality, and lighting conditions. Consequently, fashion images are susceptible to shape deformations and are affected by inconsistencies between the user's query images and refined product images. Moreover, a single image can contain multiple fashion objects simultaneously. This paper presents a Fashion Image Retrieval pipeline optimized for the fashion recommendation domain. Image segmentation and visual search methods are proposed. We propose various training strategies, deep learning models, and a new loss function tailored for the resource-efficient transformation of user query images into store product images. By addressing the main challenges of the fashion domain, our approach contributes to improved recommendations and bridges the gap between user query images and refined product images. The obtained results prove the effect of the proposed loss function on the visual search quality in terms of precision and recall.
VE1004 15:30-15:45	Mobile Based Automated Keratoconus Classification Via Transfer Learning Authors: MARIZUANA MAT DAUD, NUR IZZATI ZAINAL, WAN MIMI DIYANA WAN ZAKI, HALIZA MUTALIB Presenter: Marizuana Mat Daud, Universiti kebangsaan Malaysia Abstract: Keratoconus, a prevalent corneal ectatic disorder, poses significant challenges in its diagnosis and management. Traditionally relying on diagnostic methods like corneal topography, it is essential to explore more accurate and accessible approaches. Thus, in this work, aiming to classify Keratoconus eye disease using transfer learning via anterior segment photographed images (ASPI). ASPI was recorded and extracted into series of images using a smart phone from the lateral view of the eye. The experiment was conducted a thorough analysis to pinpoint the optimal configuration for image classification, addressing efficiency, accuracy, and practicality. Our study demonstrates the significance of optimizer selection and learning rate in transfer learning model development for Keratoconus classification. Specifically, the Adam optimizer, configured with a learning rate of 0.001, showcased outstanding performance with an accuracy of 98.21%, precision of 100.00%, and recall of 98.24%. These results underscore the capacity to improve diagnostic instruments. This paper serves as a valuable resource for the eye imaging and deep learning communities, providing optimal strategies for precise Keratoconus classification and offering insights for the development of more dependable diagnostic tools.

Onsite Session 3

Intelligent Computing and Data Modeling

➢ **Time:** 16:30-18:15, May 16, Vienna Standard Time, UTC/GMT+2
➢ **Room:** Pacific is on the floor -1 (1st basement)
➢ **Papers:** VE3045 VE2028 VE2001-A VE3058 VE4088 VE3044 VE1010

VE3045 16:30-16:45	A Population Division based Multi-Task Sine Cosine Algorithm for Test Redundancy Reduction Optimization Authors: Kamal Z. Zamli, Md. Abdul Kader, Ambros Rudolf Mekeng Presenter: Kamal Z. Zamli, Faculty of Computing, Universiti Malaysia Pahang Al-Sultan Abdullah 26600 Pekan, Pahang, Malaysia Abstract: Test redundancy occurs when one requirement is covered by more than one test. Potentially affecting the testing costs while at the same time delaying the software release, test redundancy is of- ten undesirable. Many recent works have dealt with the test re- dundancy reduction problem as an optimization problem. Conse- quently, a plethora of work utilizing meta-heuristic algorithms as the backbone algorithm for addressing the test redundancy reduc- tion problem can be seen in the literature. Although useful, many existing meta-heuristic-based algorithms have focused on solving the test redundancy reduction problem as a single task problem (i.e., one-test redundancy task at-a-time). To cater for simultaneous test redundancy reduction from multiple software development projects, a multi-task-based test redundancy reduction algorithm is desirable. This paper explores the design and implementation of a multi-task sine cosine algorithm (MT_SCA) for test redundancy reduction optimization. More precisely, MT_SCA exploits a pop- ulation division-based approach to achieve multi-task capability. Experimental results demonstrate that MT_SCA gives comparable test reduction size and execution time against its single solution and other metaheuristic counterparts.
VE2028 16:45-17:00	A Sound Encryption Method Based on Feature Extraction and a Novel Chaotic Map Authors: MEHMET DEMİRTAŞ Presenter: MEHMET DEMİRTAŞ, Necmettin Erbakan University Abstract: In this paper, a sound encryption method is proposed based on time-domain feature extraction and a new chaotic map called modified Chebyshev map (MCM). The classical 1D Chebyshev map is modified to facilitate the design of MCM. MCM exhibits better chaotic properties than the Chebyshev map and some other 1D maps. The dynamical analyses of MCM are performed using phase trajectories, bifurcation graphs, Lyapunov exponents, and the 0-1 test. The encryption algorithm is primarily based on the extracted features of the input sound and the MCM. The sound signal is first preprocessed and then converted to 10 bits for further operations. Row shuffling, column shuffling, and diffusion operations are applied to the bit-level audio data. As the last step, the bit-level data is converted back to decimals and then postprocessed. The extracted sound features are used as the secret keys in the proposed algorithm. Security analyses are conducted, encompassing histogram analysis, spectrogram graphs, correlation and differential calculations, secret key analysis, and measurement of execution time for the proposed method. The proposed approach can provide highly secure sound transmission for various applications.
VE2001-A 17:00-17:15	Lessons Learned from the Role of Big Data Analytics and Artificial Intelligence in the COVID-19 Pandemic in Asia, with a Focus on Kuwait Authors: MUNIRA ALASFOOR, GHALIA ALSANEA, LUAY TAHAT, Ahmad Al Ahmad and Tarek Tahat

	Presenter: Luay Tahat, Gulf University for Science and Technology - Northwestern University Abstract: The 21st century has witnessed an alarming rise in the threat posed by the spread of diseases, which has become more prone to spread due to increased travel over the years. This has enhanced the chances of interacting with outside sources, leading to pandemic outbreaks. Severe acute respiratory syndrome (SARS), H1N1 Influenza, and the recent COVID-19 pandemic have highlighted the need for effective mitigation strategies. In this context, this paper delves into the essential role that big data played during the pandemic and analyzes the measures countries implemented in response to the pandemic by studying and analyzing its impact during previous pandemics. The utilization of big data analytics has emerged as a key component in mitigating the spread of the disease. It has proved to be a powerful tool in decision-making, uncovering trends, and identifying patterns. Furthermore, Artificial Intelligence (AI) has also emerged as a crucial player during pandemic management by utilizing its ability to perform tasks that could have been given to people. However, the success of AI applications hinges on the efficiency and accuracy of the underlying data. This research paper aims to explore the role of technological tools such as Big Data Analytics and Artificial Intelligence during COVID-19. By examining how different countries have implemented these tools and the strengths and implications that they encountered, an evaluation can be done to understand the potential of implementing Big Data Analytics and Artificial Intelligence in case of any unforeseen health crisis. This can also show how these technological advancements will transform our healthcare systems and prepare the governments and healthcare sectors for future pandemic outbreaks. By analyzing and implementing new technological approaches, the ability to take immediate action in the case of a future pandemic would be swifter.
VE3058 17:15-17:30	From data to value: turn unstructured data into a dimensional data model using Data Warehouse (SAP BW/4HANA) and Business Intelligence (SAP Lumira designer) visualizations. Authors: Sergi Batalla Presenter: Sergi Batalla, FH Joanneum, Austria, Sergi Batalla, FH Joanneum, Austria Abstract: Unstructured data is growing 55-65 percent each year, but less than 1% of unstructured data is analyzed or used at all. That is because unstructured data does not reside in a database. As a result, it cannot be integrated within systems for optimization. But under specific conditions, unstructured data involved in a process can be analyzed and turned into structured data stored in a system, and ready for further analysis. This paper researches and explores how certain unstructured data involved in a process can be standardized in a dimensional data structure; how this new data model can be customized and maintained in a Data Warehouse; and eventually how to gain valuable information and data insights implementing a Business Intelligence solution. This study was based on a use case where unstructured data from an academic research group, regarding the teaching process, was analyzed, standardized in a new dimensional data model; stored and managed in the Data Warehouse SAP BW/4HANA; and visualized through BI analytic functionalities in SAP Lumira. The final result is a new streamlined and harmonized process, leveraging data for informed actions based on an OLAP system, that empowers the users to maintain, manage and visualize the data in a single source. This paper is aimed at information systems managers and consultants, specially focused on Data Warehouse (DWH) and Business Intelligence (BI) solutions.
VE4088 17:30-17:45	Performance-Centric Communication in Serverless Functions With TCP Hole Punching Authors: Richard Patsch and Karl Michael Göschka Presenter: Richard Patsch, UAS Technikum Wien Abstract: Function as a Service is an established option to deploy event-driven code fragments. Its scalability and cost efficiency through pay-per-use pricing models make it particularly interesting for many use cases. Its isolated nature and statelessness demand

	rethinking regular software engineering patterns. Communication between several functions is different than it would be in a monolith application. Most functions do not require inter-function exchanges; yet when necessary, options are limited. Leveraging additional services of a cloud service provider increases vendor lock-in. This paper contributes with an approach to enable direct communication between serverless functions, utilizing TCP hole punching. The three largest cloud service providers were tested on applicability and optimal settings. It turned out that TCP hole punching only works with Amazon Web Services, but not in FaaS offerings on Microsoft Azure or Google Cloud. When comparing TCP hole punching with AWS storage service S3, TCP hole punching was significantly faster for data transfers larger than 50 MB. Using the rendezvous server as a relay showed similar performance but is problematic scaling-wise.
VE3044 17:45-18:00	Pretrained Deep Learning Models to Reduce Data Needed for Quality Assurance Authors: Paul Hofmann, Vitaliy Mezhuyev, Paul Panzitt Presenter: Paul Hofmann, FH Joanneum Abstract: In recent years, AI and ML have been widely adopted to improve efficiency of manufacturing, especially for faster decision-making in quality assurance processes. The lack of training data is a key obstacle when implementing deep learning (DL) for automated quality control. We show how transfer learning (TL) reduces the amount of data required to train convolutional neural networks (CNN) for recognizing production failures from images. We trained 114 DL models using three different CNN architectures. 38 of those models were trained from scratch, while 76 models used pretrained ResNet50 and VGG19. We found that the pretrained ResNet50 and VGG19 models needed up to 89.3 % less training data while still delivering accuracy comparable to from scratch trained CNNs as measured by F-score. Transfer learning also allowed for training of the high-quality models using only 352 images per class, while traditional training required 3,277 images per class. Furthermore, TL increased the prediction accuracy of the models by over 10% reducing the training time by up to 78%. We found that TL offered a better performance with less data recommending its use for similar DL-projects in quality control. However, we recommend using the maximum amount of data possible, since the reduction of data volume and training time will eventually decrease prediction quality.
VE1010 18:00-18:15	HitchhikeBox: A decentral, verifiable, and privacy-protecting automated logistic transport concept for pharmaceuticals Authors: Robert Werner, Dominique Briechle, Marit Mathiszig Presenter: Robert Werner, Clausthal University of Technology Abstract: Currently, the ad hoc, one-way distribution of pharmaceuticals from pharmacies to their customers is inefficient and high in emissions. The HitchhikeBox concept aims to improve the current logistics system by utilizing existing transport channels. This eliminates the need for single-purpose delivery trips and personnel. The system is open to competing service providers, with fully automated contract management, payment and sanctioning of the parties involved. The system utilizes asymmetric encryption and zero-knowledge proofs to guarantee user privacy and non-traceability of deliveries for contracts, payments, and sensor data. The system is designed to be resilient, self-governing and suitable for highly sensitive goods, such as the transport of pharmaceuticals, by ensuring their opti- mal condition. In addition, the system utilizes smart contracts to conclude and enforce contracts, as well as a distributed off-chain cluster to process and store data in a GDPR-compliant manner. The HitchhikeBox concept facilitates semi-automated, cost-effective and eco-friendly logistics while maintaining reliability, privacy and liability.

Onsite Session 4

Communication System and Data Transmission

- ➢ **Time:** 16:30-18:15, May 16, , Vienna Standard Time, UTC/GMT+2
- ➢ **Room:** Safari is on the floor 0 (Ground floor)
- ➢ **Papers:** VE2009 VE2007 VE2012 VE3050 VE4087 VE2010 VE3040-A

VE2009 16:30-16:45	MPC-Based Rate Calculation for 5G ultra-Reliable Low-Latency Communication under Fluctuating Fading Channels Authors: Jun Liu, Paulo Renato da Costa Mendes, Andreas Wirsen, Daniel Görges Presenter: Jun Liu, Fraunhofer Institute for Industrial Mathematics (ITWM) University of Kaiserslautern-Landau, Germany Abstract: Ultra-reliable low-latency communication (uRLLC), as one of the typical 5G use cases, provides an extremely low endto- end latency with ultra-high reliability. The Quality of Service (QoS) factors of URLLC are usually analyzed and satisfied by keeping the data rate to be larger than a threshold value. Then the resource allocation task is further considered in a onetime step manner. In this paper, we consider a typical resource allocation task for uRLLC users and apply a model predictive control (MPC)-based system architecture and algorithm to solve the task using a receding time horizon. Since the decisions of the data rate contribute to the system's reliability, we first build an optimization problem to choose the suitable data rate with the required QoS under fluctuating channel conditions. The rates are further applied to the 5G system in the MPC-based terminology. The performance shows that our proposed solution can provide comparably good performance and work in a realtime fashion. Moreover, the data rate calculation part can further be implemented as a plugin module for different uRLLC-related problems.
VE2007 16:45-17:00	MPC-based Rate Calculation for Effective Bandwidth in 5G Communication Systems Authors: Jun Liu, Paulo Renato da Costa Mendes, Andreas Wirsen, Daniel Görges Presenter: Jun Liu, Fraunhofer Institute for Industrial Mathematics (ITWM) University of Kaiserslautern-Landau, Germany Abstract: The effective bandwidth plays an important role in different aspects of nowadays communication systems. The concept is based on calculating a constant transmission data rate for certain incoming traffic distribution in an asymptotic manner. Meanwhile, the latency and reliability of the users are jointly considered and satisfied. The effective bandwidth is therefore widely used to simplify the analysis of a variety of 5G communication tasks (e.g. resource allocation for ultra-reliable low-latency communication). Nevertheless, the concept is difficult to extend to traffic patterns other than Poisson distribution. Moreover, the performance of effective bandwidth can hardly guarantee the rate to be tight upper-bound of the incoming traffic when the user's delay requirement is extremely small. In this work, we consider the effective bandwidth concept in a finite time horizon with a given traffic prediction module. The output rate calculation is simplified and updated according to the model predictive control (MPC) concept. We further study the influence of the length of the time horizon and summarize that our proposed algorithm approximately equals the effective bandwidth concept when having an infinite time horizon. Moreover, a practical calculation method for Poisson distributed incoming traffic is provided and compared with the effective bandwidth concept. The simulation results indicate that the MPC-based solution can provide similar rates to effective bandwidth in both stationary and dynamic traffic scenarios. Meanwhile, the introduced method can reduce resource waste and improve the efficiency of the system.

	For Poisson-distributed incoming traffic, the optimal MPC time horizon can be easily calculated. With the obtained time horizon, a more accurate data rate to the reference value can be calculated than effective bandwidth.
VE2012 17:00-17:15	A Multi-Routing Paths' Exploration Algorithm for Multi-paired Communicating Vehicles' Data Transmission Offloading using the Multi-access Edge Computing Architecture Authors: Chung-Ming Huang and Cheng-Han Tsai Presenter: Chung-Ming Huang, National Cheng Kung University Abstract: This work proposed a novel method for multiple communicating paired vehicles' data transmission offloading using the Multi-access Edge Computing (MEC) technique. When two paired communicating vehicles are communicating with each other through cellular network's Base Stations (BSs), the data transmission can be offloaded to the Cellular Vehicle-to-Vehicle (C-V2V) path that exists between these two vehicles using 5G NR's sidelink communication; these two paired communicating vehicles can switch back to the Cellular Vehicle-to-Infrastructure (C-V2I) communication to communicate with each other when the corresponding C-V2V path is broken. Using the proposed method, the MEC architecture serves as a centralized computing mechanism to determine the availability of k-hop C-V2V paths for paired communicating vehicles' data transmission offloading. Each vehicle periodically reports its context, such as position, speed, driving direction, and C-V2V sidelinks' Channel Busy Ratios (CBRs), to the MEC server to derive feasible k-hop C-V2V data transmission offloading paths. The simulation result demonstrates that the proposed method has (i) better throughput compared to the method of relying solely on C-V2I communication through BSs and (ii) better throughput, higher offloading fraction and lower average data loss rate comparing with the other k-hop-limited C-V2V data transmission offloading method.
VE3050 17:15-17:30	Comparative Technical Analysis of QR Code and NFC in Contactless Payments Authors: Mohammed Jubur Presenter: Mohammed Jubur, Jazan University Abstract: In the rapidly evolving landscape of digital finance, Quick Response (QR) code and Near-Field Communication (NFC) payment systems have emerged as key technologies, driving the transition towards more efficient, secure, and user-friendly transaction methods. This paper offers a comprehensive examination of QR code and NFC payments, focusing on their usability, efficiency, and security as- pects. Through a detailed comparison, we explore the operational mechanics, benefits, and challenges associated with each technol- ogy, highlighting their implications for consumer adoption and transaction security. Our analysis reveals distinct advantages and vulnerabilities, underscoring the importance of continuous inno- vation and robust security measures to mitigate potential risks. The paper concludes with forward-looking insights, suggesting that the integration of emerging technologies such as biometric authentication and blockchain could further enhance the security and usability of digital payments. Our findings aim to contribute to the ongoing development of digital payment systems, offering valuable perspectives for both practitioners and researchers in the field of digital finance.
VE4087 17:30-17:45	Metadata-Driven Innovation in Smart Offices: A Study on the Impact of Standards on Digital Twins and Indoor Positioning Systems Authors: Khanista Namee, NIMIT SRIKAMTA, SILLAWAT LELAS, JANTIMA POLPINIJ, RUDSADA KAEWSAENG-ON, CHAYAPA NIMYUNGDEE, AREEJ MENY Presenter: Khanista Namee, KING MONGKUT'S UNIVERSITY OF TECHNOLOGY NORTH BANGKOK, Thailand Abstract: This study investigates the refinement of metadata from various sources for optimal integration with digital twins, aiming to enhance its applicability in smart office environments through the Internet of Things (IoT) and digital twin technologies. By developing a systematic framework for hypothesis testing, the research evaluates the metadata's performance in real-time operational dynamics, specifically in indoor tracking of wireless devices to assess data transmission accuracy. The analysis, supported by a

	performance evaluation with five reference sensors, confirms the metadata's effectiveness in ensuring rapid and precise information retrieval. These findings highlight the potential of customized metadata to improve the efficiency and accuracy of digital twin applications in smart offices.
VE2010 17:45-18:00	A Fast Method for Solving Radio Wave Propagation Based on Darknet and Equivalence Principle Authors: Anqi Li, Chengyou Yin, Qianqian Zhang Presenter: Anqi Li, National University of Defense Technology, China Abstract: In order to solve the problem of calculating the spatial field in the environment with undulating terrains, a fast algorithm based on the equivalence principle combined with neural network is proposed for calculating the spatial field of radio wave propagation in complex terrain. The algorithm first sets multiple equivalent surfaces of the same size according to the distribution of complex terrains, and then calculates the scattering field distribution under the influence of terrain by the equivalent electromagnetic currents on the equivalent surface combining with the PMCHW equation. In order to speed up the calculation, Darknet was introduced in this paper to complete the complex solving process of PMCHW equation. At the same time, considering the coupling of the scattering field between multiple terrains, the scattering field generated by the interaction between each equivalent surface was iterated until convergence. The simulation shows that the result of the proposed algorithm is in good agreement with that of the method of moments, and the computation speed has been greatly improved, which proves its efficient computation performance.
VE3040-A 18:00-18:15	Cross-Technology Cloud Offloading Model Authors: Ahmad Salah Al-Ahmad Presenter: Ahmad Salah Al-Ahmad, Gulf University for Science and Technology, Management Information Systems, Kuwait Abstract: Cloud offloading has emerged as a pivotal technology across diverse domains, mitigating limitations associated with in-house devices like mobile, IoT, fog, and edge by harnessing the capabilities of the cloud. Communication between devices and the cloud predominantly relies on wireless media to optimize access to cloud services. However, prevalent cloud offloading models unveil significant security concerns, particularly in authentication, trust, and privacy, leading to vulnerabilities in safeguarding data, authentication processes, communication channels, and resources. These security shortcomings present formidable challenges that warrant heightened attention from researchers who build models and field practitioners. While numerous models have been introduced to enhance cloud offloading security, a comprehensive evaluation and analysis are imperative to gauge their effectiveness. This study conducts a thorough examination of relevant literature, scrutinizing various offloading models against well-known security concerns inherited from both cloud computing technologies and client technology. This research revealed that (i) multi-factor cloud-to-client authentication represents a critical issue in current cloud offloading models, (ii) the current cloud offloading models tend to highlight the security concerns while maintaining the efficiency of the in-house devices, and (iii) the relevant cloud offloading model surveys fail to adequately highlight complete cloud protection concerns like security and protecting data, communication channels, and resources. Therefore, this paper proposed a cross-technology model for developers and security experts that tackles those surveyed security issues of cloud offloading.

Online Session 1

Intelligent Image Analysis and Processing Methods

➢ **Time:** 09:30-11:30, May 17, Vienna Standard Time, UTC/GMT+2
➢ **Zoom link:** https://us02web.zoom.us/j/88638340356
➢ **Papers:** VE2026 VE2030 VE3035 VE3036 VE4077 VE4082 VE4083 VE4079

VE2026 09:30-09:45	An intelligent food waste identification and analysis system based on convolution neural network Authors: Xiyuan Sun, Yanxi Li, Zhimei Ouyang, Jinyuan Ouyang, Guangjing yang, Enchang Sun Presenter: Xiyuan Sun, Beijing Dublin International College, Beijing University of Technology Abstract: To achieve sustainable development, an efficient and time-effective management of waste, including household, industrial, and food waste, is crucial. This paper introduces an intelligent food waste (FW) identification and analysis system based on convolution neural network (CNN), significantly enhanced by the application of fine-tuning. This approach involves modifying the CNN model while retaining some original structures and pre-trained parameters, and training it using a new dataset. The implementation of this method has led to a remarkable increase in the accuracy of the CNN model from 94.7% to 97.6%, a reduction in the training time cost by approximately 82.3%, and a decrease in the number of parameters that need to be trained by about 96.3%. The proposed system, an Internet of Things (IoT) system, comprises a sensing layer, network layer, data storage layer, and application layer. It autonomously identifies the type of FW using CNN, collecting and analysing food waste data, including date, weight, type, and reason. The lightweight neural network MobileNetV2 was employed because of its low computing requirements. To further enhance accuracy and reduce resource costs, fine-tuning technology was applied using a new training dataset and a new output layer in the neural network. This paper presents a comparative analysis of the original and the improved CNN model, demonstrating the significant improvements achieved through the application of fine-tuning. These results suggest that fine-tuning can enhance the accuracy and training efficiency of CNN by saving time costs and parameters, thereby contributing to the application of the CNN and fine-tuning.
VE2030 09:45-10:00	Sulcus Extraction Based on MRI Images Authors: Ruyun Xu Presenter: Ruyun Xu, Zhengzhou University of Light Industry Abstract: The cortical folding of the brain refers to the highly convoluted folds formed during the developmental process of the brain cortex. These folds consist of depressed regions known as sulci and elevated regions called gyri. These sulci and gyri exhibit substantial individual variability while displaying a predominantly symmetric distribution across the left and right hemispheres, providing a certain regularity to the overall brain structure. Therefore, the accurate extraction of sulci becomes a crucial step in the study of the cortical surface of the brain. The sulcal pits, being the locally deepest and earliest-formed regions of the sulci, maintain their characteristics throughout development, demonstrating stability. In this study, we introduce a sulci extraction algorithm that utilizes the watershed algorithm combined with the adaptive thresholding method for extracting sulcal pits on the white matter mesh of the left and right hemispheres of the brain. Through merging operations to eliminate noisy sulcal pits, the algorithm achieves the extraction of shallower sulci in regions such as the inferior frontal sulcus, central sulcus, intraparietal

	sulcus, superior temporal sulcus, inferior temporal sulcus, lateral occipital sulcus, cingulate sulcus, subparietal sulcus and so on. The more precise extraction results of sulci contribute to an enhanced understanding of the brain's structure and function, providing more accurate and detailed information for neuroscience, medical research, and clinical applications, thereby propelling advancements in related fields.
VE3035 10:00-10:15	SAM-based Localization Method for Image Copy-Move Forgery Authors: YONGKANG LAN, MARY JANE C. SAMONTE, XIAOFENG WANG Presenter: YONGKANG LAN，Mapua University, Philippines Abstract: The localization of image Copy-move forgery has always posed a significant challenge in the field of image forensics. In this study, we propose an image Copy-move tampering localization method by using Segment Anything Model (SAM). The SAM technology is employed in this method to conduct panoramic segmentation of the initial image. Subsequently, the size, shape, and distribution characteristics of the segmented units are utilized for selecting comparable segmentation units. The statistical measures (mean, standard deviation, and the coefficient of variation) of each pixel within these units are then extracted as feature vectors. Ultimately, by comparing the matching degree between each semantic unit and its corresponding feature vector, tampered regions can be identified. The proposed approach distinguishes itself from traditional keypoint-based and block-based image Copy-move detection methods by offering easier implementation and reduced computational resource requirements. It has demonstrated exceptional performance in terms of localization accuracy, effectively addressing the limitations of earlier technologies that struggled with inadequate localization for small-sized tampering regions and low accuracy due to the absence of keypoints in flat areas. Comprehensive experiments were conducted on a dataset created for this study and the well-established COVERGE dataset, which substantiate the superiority of the algorithm in terms of accuracy and robustness against prevalent image manipulations.
VE3036 10:15-10:30	Research on Brain Tumor MRI Image Segmentation Algorithm based on Lightweight Convolutional Polynomial Neural Network Authors: XUESHUANG FAN, MARY JANE C. SAMONTE, XIAOFENG WANG Presenter: XUESHUANG FAN, Mapua University, Philippines Abstract: This article focuses on the task of brain tumor MRI image segmentation and constructs a lightweight polynomial convolutional neural network (abbreviated as LCPNN) through mathematical logic reasoning. LCPNN combines the characteristics of polynomial networks and convolutional neural networks, extracting high-level semantic features through addition and multiplication operations on low-level image features, and then achieving image segmentation. LCPNN has a relatively low number of parameters and a simpler model structure. Through the search for hyperparameters M and N in LCPNN, the model's segmentation performance is further improved. Tested on the BraTS2020 Dataset of brain tumor MRI images, the segmentation accuracy and Dice coefficient reached 0.9601 and 0.776, respectively.
VE4077 10:30-10:45	Research on Cross-Platform Unified Query Method of Medical Resources Based on Virtual Knowledge Graph Authors: Menghan Du Presenter: Menghan Du, Dalian Neusoft University of Information, China Abstract: With the advent of the era of information technology and the explosive growth of medical resources. It is difficult for users to achieve cross-platform unified query among many medical resources, which reduces the search efficiency of users. In this paper, medical resource data is obtained from China's well-known medical platform and The Comparative Toxicogenomics Database, and the knowledge graph in the medical field is automatically constructed according to different mapping rules for different data sources. The virtual knowledge graph in the medical field is generated by mapping, which avoids the instantiation consumption of data conversion into linked data and reduces the complexity of data update. At the same time, the query statement entered by the user is generated into

	a SPARQL statement, and it is rewritten into an SQL query statement for the underlying database to query the underlying data source, so as to realize the semantic query for medical resources. The semantic query results in this paper are compared with medical platforms such as Seek Medical Advice, which has a higher recall rate and accuracy rate, which improves the search efficiency and meets the medical needs of users.
VE4082 10:45-11:00	Auto Graph of Thoughts: A Hands-free and Cost Effective Method for using Graph of Thoughts Authors: Thien-Loc Ha, Trong-Bao Ho, Long Nguyen, Dien Dinh Presenter: Thien-Loc Ha, Faculty of Information Technology, University of Science, National University Ho Chi Minh City, Vietnam Abstract: As powerful generative pre-trained language models like GPT become more prevalent, it is imperative to explore methods for customizing these models to suit downstream datasets. Numerous recent studies, exemplified by Chain of Thought (CoT), Tree of Thought (ToT), among others, have underscored prompting as the primary approach for harnessing Large Language Models (LLMs) to tackle various tasks. A novel approach called Graph of Thought (GoT) has been introduced—framework that enhances the prompting abilities of LLMs—allows for the merging of different thoughts from these models into collaborative results, extracting the core of entire networks of thoughts, or refining thoughts through feedback loops. In our study we identify a contemporary problem of GoT: the Prompter involves significant human intervention, suggesting that GoT costs more for both using humans as prompt engineers as well as using chatGPT to handle tasks and sometimes a human element is needed to evaluate and score at thought Error Score. To address the problem, we propose Auto Graph of Thoughts (AutoGoT) which extends GoT by allowings LLMs to freely generate prompts for each type of Thought and utilizes those prompts to generate output for each thought. Compared to GoT static prompts, our LLMs's prompts adapt to multitask without changing the base prompt. Experiments on sorting, intersection, keyword counting and document merging shows that AutoGoT is more cost effective and has a competitive score compared to GoT without using Error Score thought.
VE4083 11:00-11:15	Multilabel Classification of Account Code in Double-Entry Bookkeeping Authors: Pakorn Kotepuchai, Yachai Limpiyakorn Presenter: Pakorn Kotepuchai, Department of Computer Engineering, Chulalongkorn University Abstract: AI technology has fostered enterprises to stay strong contenders in today competitive world, whereas bookkeeping plays an indispensable role in financial management of successful business. Bookkeeping deals with recording financial transactions associated with account codes. Manually fill-in account codes would be error-prone and resource consumption, while entering the accurate account codes is essential for better decision-making and faster business growth. Automated suggestion of account codes with AI can save time, boost productivity and output quality by reducing human error. This paper thus presents an approach of AI-enabled system to suggest account codes in double-entry bookkeeping method. Natural language processing is mainly applied during data preprocessing for enabling machines to process and extract meaning from textual data. The models are trained with three machine learning algorithms including CART, Random Forest, and Multilayer Perceptron. The experimental results reported that Random forest model insignificantly outperformed the others.
VE4079 11:15-11:30	Optimizing User Interaction with MABIS: An Examination of Usability and User Experience in the Mobile Automated Biometric Identification System Authors: William P. Rey Presenter: William P. Rey, Mapua University, Philippines Abstract: This study focuses on the evaluation of the Mobile Automated Biometric Identification System (MABIS) through a dual approach incorporating both quantitative and qualitative methodologies. Utilizing the System Usability Scale (SUS) for gauging usability and the User Experience Questionnaire (UEQ) for assessing user experience, the research

28

gathers data from a diverse participant pool. MABIS exhibits exemplary usability, as reflected in an outstanding average SUS score of 87.475, corresponding to an "Excellent" grade. The User Experience Questionnaire (UEQ) unveils nuanced dimensions, emphasizing Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. The discussion synthesizes findings from SUS and UEQ, identifying convergences and divergences to present a comprehensive view of MABIS performance. Commonalities and disparities between usability and user experience provide valuable insights, offering targeted improvement areas. The study's implications extend to practical enhancements in MABIS, ensuring user satisfaction and positive overall experiences. In conclusion, this research contributes to advancing fingerprint identification systems by emphasizing the integration of usability and user experience considerations in system development.

Online Session 2

Models, Calculations, and Analysis in Computers and Information Systems

- **Time:** 13:30-15:30, May 17, , Vienna Standard Time, UTC/GMT+2
- **Zoom Link:** https://us02web.zoom.us/j/88638340356
- **Papers:** VE2027 VE3039 VE3052 VE3053 VE3054 VE3056 VE4075 VE3042

VE2027 13:30-13:45	Detection and Prevention System on Computer Network to Handle Distributed Denial-Of-Service (Ddos) Attack in Realtime and Multi-Agent Authors: Johanes Raphael Nandaputra, Parman Sukarno, Aulia Arif Wardana Presenter: Johanes Raphael Nandaputra, Telkom University Abstract: This research builds a realtime and multi-agent system to handle Distributed Denial of Service (DDoS) attacks. The integration of an Intrusion Detection System (IDS), Security Information and Event Management (SIEM), and Security Orchestration, Automation, and Response (SOAR) establishes a robust defense mechanism, utilizing Discord for sending alert notifications to the Security Operations Center (SOC). Tested with sending 10 DDoS attacks by SYN flooding, the system resulted in a precision of 89%, showcased its capability to minimize false positives and identify true threats. The system also shows that Wazuh Indexer consumed the most resources with an average CPU usage of 22.94% and memory usage of 58.04%, while Shuffle Frontend exhibited lower resource consumption, with an average CPU usage of 0.0% and memory usage of 0.14%. These varied resource consumptions highlight the system's adaptability and scalability across diverse operational scenarios.
VE3039 13:45-14:00	A Cost-Benefit Model for the Evaluation of Cyber Physical Production Systems Authors: Claudia Brandstätter, David Brunlechner Presenter: Claudia Brandstaetter, Claudia Brandstätter, University of Applied Sciences, FH JOANNEUM Abstract: Cyber-physical production systems (CPPS) improve flexibility, efficiency, and quality. Maintenance activities can be reduced, and processes optimized. Subsequently profits increase. Introducing CPPS in companies requires investments in additional hardware and software as well as the necessary customizing of the systems. Such investments are associated with considerable costs. In this article a cost-benefit model for the evaluation of CPPS is developed. Therefore, cost and benefit aspects of CPPS are derived from literature. Quantifying benefits is particularly difficult, so specific performance indicators are compiled. The results of the secondary research are summarized in a cost-benefit model. Subsequently the developed model is empirically tested.
VE3052 14:00-14:15	Determination of the Optimal Electrode Selection for Motor Imaginary Classification with EEGNet Authors: Isaman Sangbamrung, Sarunya Kanjanawattana, Gun Bhakdisongkhram Presenter: Isaman Sangbamrung, Institute of Engineering, Suranaree University of Technology Nakhon Ratchasima, Thailand Abstract: Electroencephalography (EEG) is a crucial tool for evaluation and planning rehabilitation of patients with movement disorders. How- ever, accurate interpretation of complex EEG data requires advanced analytical skills and extensive experience to avoid potential misdi- rection in treatment procedures. Artificial intelligence (AI) offers a promising solution to this challenge. This study aimed to deter- mine the optimal number of electrodes and electrode patterns for classifying motor imagery (MI) using EEGNet. A conceptual frame- work was developed, and significant electrode positions on the EEG headset were identified. Through careful analysis and elimina- tion of outlier subjects, various six-, eight-, and ten-

30

	electrode pat- terns were evaluated. The ten-electrode pattern, specifically 10E- P4, achieved the highest accuracy (0.782) among all configurations. This pattern, which covers a substantial area of the central brain region, allows for improved detection of brainwave signals associ- ated with MI as opposed to those related to actual body movements. Consequently, the 10E-P4 pattern significantly enhances the ac- curacy and effectiveness of MI classification, offering valuable in- sights for researchers and developers in the field of brain-computer interfaces and related applications. Future research may focus on further optimization and the development of more advanced algo- rithms to improve classification performance using this optimal electrode arrangement.
VE3053 14:15-14:30	Surpassing Threshold Barriers: Evaluating the Efficacy of Nature-Inspired Algorithms in Detecting Applied Refactorings Authors: Iman Hemati Moghadam, Matthias Sleurink, Vadim Zaytsev Presenter: Iman Hemati Moghadam, Formal Methods and Tools, University of Twente Abstract: Refactoring is a pervasive activity in software development, and identifying refactorings applied to a program is crucial to understand its evolution. Currently, automated tool support for identifying applied refactorings is available for different programming languages (e.g., Kotlin, Java, C++, Go, JavaScript and Python). However, majority of the proposed approaches relies on similarity thresholds, where choosing proper thresholds that work in all projects, if not impossible, remains to be challenging. To overcome such limitations, we propose a search-based algorithm implemented on top of RefDetect to mitigate its dependency on similarity thresholds. In this proposed approach, we pay less attention to choosing a proper threshold value and instead employ a nature-inspired algorithm called the Andean Condor Algorithm (ACA) to eliminate refactoring instances that have been erroneously identified due to an employed lower similarity threshold value. The performance of the proposed approach was evaluated on 513 commits of 185 open-source Java applications and compared with an existing NSGA-based multi-objective approach, a greedy algorithm, and the original version of RefDetect and also RefactoringMiner, a state-of-the-art refactoring detection tool that operates without relying on thresholds. The obtained results show the effectiveness of the employed search-based algorithm, where it outperformed the other search-based approaches, particularly outperforming the NSGA-based approach with a notable 17\% improvement in F-score. The proposed approach also obtained a slightly better F-score compared with the other two tools not based on computational search and uncovered 238 true refactorings not detected by those tools.
VE3054 14:30-14:45	Valuation of AI Companies: Leveraging Large-Language Models and Deep Learning Approaches Authors: Zhizhen Chen Presenter: Zhizhen Chen, University of Oxford, UK Abstract: Valuing unicorn companies, private startups valued at over \$1 billion, is a complex task due to limited financial transparency and unpredictable growth trajectories. The absence of public financial data makes traditional valuation methods challenging, relying heavily on qualitative factors and assumptions. Additionally, unique business models and innovative technologies add complexity to the assessment. The dynamic nature of unicorn companies' development further complicates valuation, requiring a blend of industry expertise, market analysis, and forward-looking assessments. Traditional valuation methods, such as discounted cash flow (DCF) analysis, heavily rely on historical financial data and stable cash flow projections, elements that are often scarce in the case of unicorn companies. Their emphasis on rapid expansion, market share acquisition, and innovation introduces uncertainties that make predicting future cash flows challenging. Furthermore, unicorn companies frequently operate in industries with disruptive business models and cutting-edge technologies, adding an additional layer of complexity to the valuation process. The absence of comparable companies or precedents with similar characteristics further complicates the application of standard valuation techniques. This article first obtains the current valuation information of typical Internet companies through the Internet. At the same time, it evaluates the company's

	product strength through open source code, product strength, number of users, technology evaluation and other information, so as to avoid errors caused by a single valuation model. By constructing a hybrid model based on CNN+LSTM combined with a large language text model, the prediction error of our model is less than 0.05, which shows that our model has achieved good prediction results.
VE3056 14:45-15:00	KeyChallenge: A Novel Sybil Attack Mitigation Technique Based on Cryptographic Key Generation Authors: Siamak Solat Presenter: Siamak Solat, Université Paris Cité Abstract: A Sybil attack poses a significant threat in distributed networks, allowing a malicious entity to wield disproportionate influence by generating multiple identifiers. In this paper, we introduce KeyChallenge, a novel approach leveraging a public key generation process to address Sybil attacks, effectively serving as a robust proof-of-work mechanism. To achieve this, we define a range for each of the 64 alphanumeric characters in Elliptic Curve public keys. We demonstrate the impracticality of an attacker generating a public key that matches all character ranges set by the system. KeyChallenge represents a significant advancement in mitigating Sybil attacks and fortifying network security within distributed systems, offering a promising and practical solution that effectively combats malicious activities.
VE4075 15:00-15:15	Deep Learning-Assisted Milkfish Fingerling Counting: Towards Automation in Fish Industry Practices Authors: Christian Jose Sibayan, Charlie S. Marzan, Benjie R. Abando, Justin P. Acosta, Johnico D. Madrelijos Presenter: Charlie S. Marzan, Don Mariano Marcos Memorial State University Abstract: The manual counting of milkfish fingerlings within the fish industry in the Philippines poses significant challenges due to its time-consuming nature, labor intensiveness, and susceptibility to errors. To address these issues, this study presents a deep learning approach for the real-time counting of milkfish fingerlings to enhance both the speed and accuracy of fingerling counts. The dataset was meticulously curated from six milkfish fingerlings farms, with gathered videos converted into image frames and subjected to polygon annotation. Furthermore, various augmentation techniques were applied to these images to enhance training efficacy before integration into a deep neural network. Notably, implementing the YOLOv8n-seg object detector with segmentation and counting yielded a remarkable accuracy rate of up to 90.64% and 93.34%, respectively. This innovative methodology promises significant advancements in the automation and efficiency of milkfish fingerling counting processes within the fish industry, paving the way for improved productivity and accuracy in fishery management practices.
VE3042 15:15-15:30	Application of Binary Classification Modelling Techniques for Water Potability Prediction Authors: MARY GERALDINE D. CASTILLO, MARY JANE C. SAMONTE Presenter: MARY GERALDINE D. CASTILLO, Mapua University Abstract: Consuming safe water is essential for maintaining good health throughout life, regardless of an individual's susceptibility to pollutants. However, certain people, such as infants, small children, the elderly, and those residing in unsanitary conditions, are at a higher risk of contracting water-borne illnesses. To instil public confidence in water safety, a comprehensive monitoring and control system must be in place for the water supply. Precise and efficient prediction is difficult because of the numerous hydrological and environmental processes that affect water quality. In unmonitored watersheds, the difficulty is considerably greater. In this context, the binary classification models can potentially provide reliable solutions. The three (3) developed models are Logistic Regression, Decision Forest, and Support Vector Machine to improve the water quality predictions in unmonitored watersheds. Results showed that the SVM model performed the best in predicting water potability.

Online Session 3

Software and Program Design

➢ **Time:** 15:45-18:00, May 17, Vienna Standard Time, UTC/GMT+2
➢ **Zoom Link:** https://us02web.zoom.us/j/88638340356
➢ **Papers:** VE1002 VE1003 VE1008 VE2021 VE3049 VE3055 VE0002 VE4076 VE1009

VE1002 15:45-16:00	Extending Scratch Framework to Improve the Analytical Skills of Undergraduate Students Authors: Ubaid Ul Akbar, Saeed Akbar, Mumtaz Ali, Rahmat Ullah, Rizwan Khan, Ivandro Ortet Lopes Presenter: Ubaid Ul Akbar, City University of Science and Information Technology, Pakistan Abstract: Scratch is an innovative and the most popular block-based Visual Programming Language designed for beginners to learn programming effectively. However, it lacks the capacity to allow users to learn and solve larger real-world problems such as the Travelling Salesman Problem (TSP). Hence, there is a need for an accessible and effective tool to assist beginners and novice programmers in learning and tackling the TSP. This paper introduces ScratchTSP, an extension of the Scratch programming Framework, specifically designed for the TSP. It offers an opportunity for beginners and novice programmers to grasp the TSP and the various algorithms used to solve it. For evaluation, we conduct a survey among undergraduate students to assess the usability and usefulness of the proposed ScratchTSP extension. Survey findings indicate that ScratchTSP offers a user-friendly and effective tool for beginners or novice programmers, aiding them in learning the TSP while developing their critical thinking and problem-solving skills.
VE1003 16:00-16:15	Layer-wise Exploration of a Neural Processing Unit Compiler's Optimization Space Authors: Fabrizio Indirli, Andrea Carlo Ornstein, Giuseppe Desoli, Alessandro Buschini, Vittorio Zaccaria, Cristina Silvano Presenter: Fabrizio Indirli, Politecnico di Milano, Italy Abstract: Given the increasing popularity of Edge AI, embedded neural processing units (NPUs) are gradually becoming a standard feature in microcontrollers (MCUs) and System-on-a-Chip (SoCs). The deployment of neural networks on accelerators needs specialized neural network compilers that incorporate graph optimization stages, where layer-specific transformations are applied to reduce execution latency or memory footprint on platform-specific computing elements. For this reason, neural network compilers expose control parameters to be tuned for each individual network layer. The challenge addressed in this paper is finding an optimal combination of neural network compilation parameters for the efficient utilization of the computing resources of the target hardware accelerators. To address this task despite the huge space of parameters, we propose a greedy algorithm that iterates through the convolutional layers of the network, while preserving a set of solutions for the preceding layers. We evaluated this approach by transforming the graphs of some popular neural networks to optimize their performance and memory footprint, mapping them onto an experimental embedded NPU developed by STMicroelectronics using its associated neural network compiler. For the reported set of network models, the proposed technique has improved latency and memory footprint by 43% approximately compared to the baseline and exceeded the simulated annealing heuristics by 15% approximately.
VE1008 16:15-16:30	Increasing The Thoroughness Of Data Flow Testing With The Required k-Use Chains Authors: Oleksandr Kolchyn, Stepan Potiyenko Presenter: Oleksandr Kolchyn, Viktor Glushkov Institute of cybernetics NAS of Ukraine

	Abstract: The required k-use chain is a new data flow coverage criterion designed to provide deeper analysis of possible refinements of constraints on program behavior paths. Such refinements represent a feasible chain of usages of the same variable without intermediate redefinitions. The SAT/SMT-based chains selection procedure finds more ranges of values to test and keeps the number of test targets manageable. The criterion strongly increases the level of thoroughness of a test suite compared to the all-uses and demonstrates qualitative improvement of a test suite when used as a test goal in automatic tests generation. This paper describes motivation examples, our experience, and an empirical evaluation of the proposed data flow testing method.
VE2021 16:30-16:45	A Distinctive Ensemble Approach for Unbiased Movie Recommendations using Variants of Graph Convolution Networks Authors: Priyansh Mathur, Arti Arya Presenter: Priyansh Mathur, PES University, India, PES University, India Abstract: In recent years, entertainment platforms like Netflix, Amazon Prime etc. have given people personalization control over what they want to watch. These services use recommendation systems to suggest shows and movies based on what users like. Recommendation algorithms use complex computations to understand user's preferences and provide personalized recommendations based on one's liking. This empirical study advances the field of movie recommendation by proposing a novel Graph Neural Networks (GNN) ensemble framework for forecasting similar movie preferences, utilizing the Movielens-1M dataset for model training and evaluation. stratified sample from the original dataset is used to ensure the inclusion of all classes equally thereby reducing the variance. Given the limited number of features to be predicted, we opted for a linear Support Vector Machine(SVM), as a meta-classifier, to aggregate the ensemble's results obtained from three models namely Matrix factorization(MF), Ultra Graph Convolution Network(UltraGCN) and Light Graph Convolution Network(LightGCN). The proposed approach achieved an impressive F1 score of 0.2275 and Normalised Discounted Cummulative Gain(NDCG) of 0.3777, surpassing the individual model scores within the ensemble by 13.5% and 6.1% respectively. The achieved performance is above par with the existing models.
VE3049 16:45-17:00	Robert: An Automated Tool to Perform Mobile Application Test Authors: Lennon Chaves, Flavia Oliveira, Leonardo Tiago, Renata Castro Presenter: Flávia Oliveira, Sidia Institute of Science and Technology, Brazil Abstract: oftware tests are fundamental to ensuring that the end user does not face any issues, and there are two primary approaches to application testing: manual (testing without scripts) and automated (using programming language scripts). Thus, automated testing is promising because of its ability to reduce manual effort during testing. Thus, the goal of this study is to present a tool called Robert, which was implemented to perform a suite of automated test cases on mobile applications in the Institute of Research and Development, which develops software for smartphones and tablets with the Android operating system. To achieve this goal, a study was carried out in 2023, collecting data from all tests performed with the Robert Tool. In addition, the testing team answered a survey regarding what they gained from the tool and the lessons they learned as they used it. Between the main results, it was observed that the strategy of applying the Robert Tool, which automated 15 test cases out of a total of 35 in a specific scope, in the application validation reduced the effort of manual execution by 33%. Furthermore, another observed result is that there will be a reduction of 714h of testing through automation in 2023. The survey participants found the tool easy to use and appreciated the time savings. Overall, this study presents an industry experience report and outlines the lessons learned and the success factors for implementing automation in mobile application testing.
VE3055 17:00-17:15	A Blockchain-Infused Web Platform for Smart Contract-Enabled Loan Management in Financial Institutions Authors: William P. Rey Presenter: William P. Rey, Mapua University, Philippines

	Abstract: This research introduces an innovative online loan management platform called ParamountLend, which seamlessly integrates smart contracts on a blockchain. Conducted at a lending firm in Taguig City, Philippines, the study focuses on enhancing efficiency, security, and transparency in lending practices. Key findings indicate that ParamountLend provides robust functionalities for system administration, transparent borrower loan breakdowns, and excellent performance, achieving an A-grade in testing. User Acceptance Testing reflects positive evaluations, highlighting the system's practicality, utility, and overall ease of use. With a final SUS score of 90, rated as "Excellent," it reflects users' high satisfaction with the system's usability. In summary, this research presents an innovative solution leveraging blockchain technology and smart contracts, offering a model for financial institutions seeking secure, efficient, and digitally transformed lending operations.
VE0002 17:15-17:30	Design of Classroom Behavior Identification System for Vocational College Students Authors: Xinxin Wang Presenter: Xinxin Wang, Shandong Institute of Commerce and Technology，China Abstract: The classroom is the most basic and important learning venue for college students. With the development of information technology, various online teaching platforms and mobile apps have been widely used in universities, which has brought great convenience to the teaching and student interaction management of college teachers. However, this management lacks objective data on the performance of students in classroom learning, especially the uneven behavior of vocational college students in the classroom. So this article designs a student classroom learning behavior recognition system based on artificial intelligence technology, which can comprehensively collect and recognize different behaviors of students in the classroom. This helps students better understand their classroom learning status, helps teachers to objectively grasp students' classroom learning situation, and is more conducive to teachers teaching according to their aptitude.
VE4076 17:30-17:45	JointCheck: Development of a Mobile Virtual Assessment Tool for Joint Pains in a Telehealth Application for Orthopedic and Rehabilitation Through Range of Motion Authors: Mary Jane Samonte, Charles Dustinn Lloyd G. Go, Mico Ruiz D. Linco, Miles Gabriel E. Macabeo Presenter: Charles Dustinn Lloyd G. Go, Mapua University Abstract: The emergence of mobile technology presents creative approaches to healthcare. This study focuses on people suffering from wrist pain, as there is a lack of applications that cater to people experiencing wrist pain. Therefore, the study aimed to develop a mobile application for orthopedics and rehabilitation in telehealth. It uses built-in accelerometers and gyroscope sensors to make it easier for users to self-assess wrist pain without external equipment. The study's main objective was to provide a comprehensive tool that will allow patients, orthopedic physicians, physical therapists, and administrative personnel to improve assessment, exercise delivery, and communication in hopes of easing the process of wrist rehabilitation. The development process adhered to the Software Development Life Cycle (SDLC) process, incorporating an iterative process from gathering requirements until implementation. The study's respondents measured the effectiveness of the mobile application through the Functionality Testing and User Experience Questionnaire (UEQ). All functionalities were marked as passed after ensuring features worked as expected. The respondents evaluated the Attractiveness, pragmatic, and Hedonic quality, showcasing a positive overall reception. The study is significant as it offers a wide range of benefits. Patients gain autonomy in monitoring wrist health and accessing timely consultations. To conclude, the study created a practical mobile application that offers a platform for personalized, accessible, and efficient wrist rehabilitation solutions, as it exemplifies the idea of combining mobile technology and healthcare
VE1009 17:45-18:00	A Flexible Vehicle Routing Reinforcement Learning Environment for the Reusability of Trained Agents Authors: Díaz Aparicio, Jon; Fajardo Calderín, Jenny; Rodriguez Esparza, Erick; Onieva

	Caracuel, Enrique Presenter: Jon Díaz Aparicio, DeustoTech Abstract: Society keeps ever-growing, and new challenges keep arising for the artificial intelligence to solve, fueled by the desire to enable global operations and optimize current deep and machine learning methodologies. One of these disciplines is reinforcement learning, which has not seen much use outside of the context of video games until recent years, where different algorithms have eased it's transition to more real-world scenarios, such as autonomous systems or self-driving vehicles. For this paper, the aim is to develop a reinforcement learning environment that can model and solve a complex vehicle routing problem with multiple constraints, with the addendum of allowing pre-trained models to solve use cases that differ from those that they were trained on.