Conference Program

2026 10th International Conference on Intelligent Systems, Metaheuristics & Swarm Intelligence

ISMSI 2026

(www.ismsi.org)

April 24-26, 2026

Cebu City, Philippines

Co-Organizers

Supporter

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Welcome Message

India International Congress on Computational Intelligence (www.iicci.in)
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Message from the General Chair

15th April, 2026

As we are all set to kick off ISMSI 2026, an annual international conference of IICCI, to be held in association with Cebu Institute of Technology University, Cebu City, Philippines, I feel elated to welcome the dignitaries and delegates of the same. While we are thrilled to have you amongst us, let me confess that I can hardly believe that am compiling this communique for the milestone 10th edition of ISMSI. It feels like only yesterday, this conference was set in motion in Hong Kong. However, history unfolds & the time is ripe to set the stage for ISMSI 2026.

The IICCI events focus on a truly international roster of speakers and venues. ISMSI conference, since its inception, also maintains its roots in India but actively seeks global collaborations. That is, IICCI is structured to host events globally and not locally. ISMSI, like ISCMI, the annual flagship event of IICCI, distinguishes itself by taking this Indian-rooted organizing body (IICCI) to a global audience rather than hosting overseas delegates in India. Consequently, ISMSI has established itself as a premier venue for global researchers, specializing in Swarm Intelligence, Metaheuristics and other allied areas of Intelligent systems.

ISMSI frequently moves its venues between major Asian hubs like Kuala Lumpur, Singapore, Korea, Japan, Philippines etc, making it easily accessible to global researchers, particularly those in the Asian and surrounding areas. In 2027, this conference is going to place its footprint in 10th distinct Asian nation (Vietnam) in a span of 11 years since its launch, which is unparalleled for any individual Computing Conference. My advanced and warmest invitation to all to descend on Ho Chi Minh City, Vietnam and be a part of this memorable occasion in 2027.

The onset of the very despicable west Asian conflict had adversely affected travel appetite among all. Researchers are no exceptions. Despite that, sensing a plethora of opportunity for the participants, ISMSI 2026 was able to receive massive response from the peers by securing 100+ submissions from across many regions of the world. The Program Chairs and IPC members showed extraordinary commitment and shortlisted 48 papers for possible presentations at ISMSI 2026. Ultimately, 36 of these 48 manuscripts were registered and included in the program. While releasing the Program of this conference, I note papers from many familiar peers

as well as the new ones alike. It also features leading scientists from China, South Korea and Philippines for delivering Keynote speeches along with Invited Speakers. I hope that deliberations in Cebu City will unfurl new directions in the field of Intelligent Systems.

The above is more a testament to the collective efforts of the committee members, authors and the officials of CITU than any individual contributions. After successfully navigating a decade of growth, ISMSI is now positioned to have a significant Pan-Asian footprint. I solicit your more active participation in this endeavor and trust you will join in.

Suash Deb 

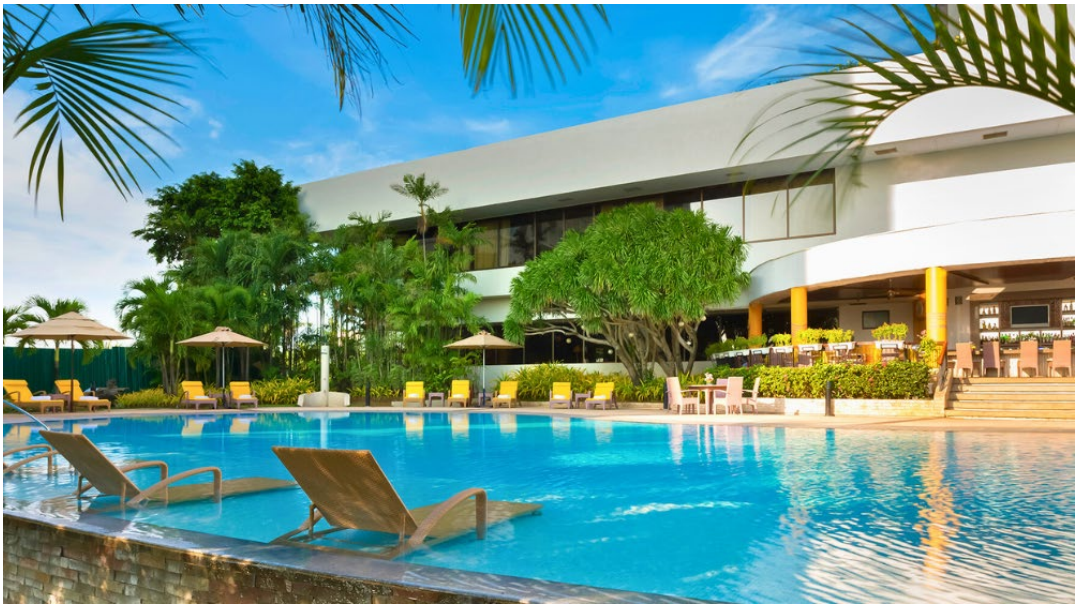
General Chair, ISMSI 2026

Useful Information

Conference Venue

Marco Polo

Plaza. Cebu



International House of Tokyo Metropolitan University

➤ **Website:** https://www.marcopolohotels.com/en/marco-polo-plaza-cebu/offers/best-spring-hotel-deals
➤ **Address:** Cebu Veterans Drive, Nivel Hills Apas, Cebu City, 6000, The Philippines
➤ **Tel.:** +63 32 253 1111

Time Zone:

➤ **UTC/GMT+8**

April Climate & Weather Averages in Cebu:

➤ **High Temp: 28°C** ➤ **Low Temp: 35°C**

Bank and Foreign Exchange:

➤ **The Currency is Philippines peso here**

Emergency Number in Philippines:

➤ **Police: 911** ➤ **Fire alarm: 911**

Important Notes

✧ Please take care of your belongings during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants.

- ✧ Please wear delegate badge during the conference. There will be NO access for people without a badge. Never discard your badge at will.
- ✧ Accommodation is not provided. Early reservation is suggested to be made for delegates.
- ✧ Please show the badge and meal coupons during lunch and dinner.
- ✧ Don’t stay too late in the city and don’t be alone in the remote area. Be aware of the strangers who offer you service, signature of charity, etc., at scenic spots. More Tourist Information and Security tips are available online.

Virtual Meeting Software

ZOOM Download: https://zoom.us/

ZOOM Using Instruction and slide template: http://www.ismsi.org/kits.rar

- ZOOM online conference room will be open 30 mins before scheduled time.
- It's suggested to use headset with microphone or earphone with microphone.
- Please choose right room to join in while test and presentation session.
- Prepare the PPT file of your presentation on your laptop in advance.
- Duration of Each Presentation: 15 Minutes in total including 12 Minutes Presentation and 3 Minutes Q&A.
- The regular oral presentation time arrangement is for reference only. In case any absence or some presentations are less than 15 minutes, please enter the room before session starts.

Please rename your screen name before entering the room

Rename screen name before entering the room	Examples
Authors: Paper ID-Name	CF1001-John Smith
Delegate: Delegate-Name	Delegate-John Smith
Keynote Speaker: Keynote-Name	Keynote-John Smith
Committee Member: Committee-Name	Committee-John Smith

Keynote Speeches

Prof. Pietro S. Oliveto

Southern University of Science and Technology, CHINA

Speech Title: Computational Complexity Analysis of Sexual Evolution for the Design of Better General Purpose Algorithms for AI

Abstract: Large classes of the general-purpose optimisation algorithms at the heart of modern artificial intelligence and machine learning technologies are inspired by models of Darwinian evolution. In this talk we show how the foundational computational complexity analysis of such algorithms leads to an understanding of their behaviour and performance. Such understanding in turn allows informed decisions on how to set their many parameters and how to improve the algorithms to allow for the obtainment of better solutions in shorter time. We provide two concrete examples of how such analyses can lead to counter intuitive insights into how to design sexual evolution inspired algorithms (using populations and recombination) and how to set their parameters such that they can considerably outperform their single trajectory and mutation only (asexual) counterparts at hillclimbing unimodal functions, and at escaping from local optima. We conclude the talk by presenting experimental results that confirm the superiority of the designed algorithms that was proven for benchmark functions with significant structures, for classical combinatorial optimisation problems with practical applications.

Bio: Pietro S. Oliveto is a Professor of Computer Science at the Southern University of Science and Technology (SUSTech) Shenzhen, China. He received the Laurea degree and PhD degree in computer science respectively from the University of Catania, Italy in 2005 and from the University of Birmingham, UK in 2009. He has been EPSRC PhD+ Fellow (2009-2010) and EPSRC Postdoctoral Fellow (2010-2013) at the University of Birmingham, UK and Vice-Chancellor's Fellow (2013-2016) and EPSRC Early Career Fellow (2015-2020) at the University of Sheffield, UK. Before moving to SUSTech he was Chair in Algorithms at the Department of Computer Science, University of Sheffield, UK.

His main research interest is the performance analysis, in particular the time complexity, of bio-inspired computation techniques including evolutionary algorithms, genetic programming, artificial immune systems, hyper-heuristics and algorithm configurators. He is currently building a Theory of Artificial Intelligence Lab at SUSTech.

He has guest-edited journal special issues of Computer Science and Technology, Evolutionary Computation, Theoretical Computer Science, IEEE Transactions on Evolutionary Computation and Algorithmica. He has co-Chaired the IEEE symposium on Foundations of Computational Intelligence (FOCI) from 2015 to 2021 and has been co-program Chair of the ACM Conference on

Foundations of Genetic Algorithms (FOGA 2021) and Theory Track co-chair at ACM GECCO 2022, ACM GECCO 2023 and ACM GECCO 2026. He is part of the Steering Committee of the annual workshop on Theory of Randomized Search Heuristics (ThRaSH), and was Leader of the Benchmarking Working Group of the EU-COST Action ImAppNIO, member of the EPSRC Peer Review College and recently completed his term as Associate Editor of IEEE Transactions on Evolutionary Computation.

Prof. Rammohan Mallipeddi

Kyungpook National University, SOUTH KOREA

Speech Title: Actionable Counterfactual Generation

Abstract: Counterfactual explanations have emerged as a powerful tool for interpreting machine learning models by identifying minimal changes required to alter a model's prediction. However, existing approaches often neglect actionability and causal consistency, limiting their practical utility. This keynote presents a novel framework for actionable counterfactual generation formulated as a multi-objective optimization problem that jointly optimizes outcome validity, proximity, and plausibility.

To address actionability, the proposed approach incorporates causal structure learning via Markov Blanket discovery, enabling the identification of relevant and actionable features. These causal insights are integrated into an evolutionary optimization process to generate counterfactuals that are not only valid and sparse but also feasible and consistent with the underlying data distribution. Experimental results across multiple datasets and machine learning models demonstrate the effectiveness and robustness of the proposed method, highlighting its model-agnostic nature. This work advances the state of explainable AI by bridging optimization, causality, and interpretability, with important implications for trustworthy and human-centered decision-making systems.

Bio: Dr. Rammohan Mallipeddi, a Senior Member of IEEE, is a Full Professor in the Department of Artificial Intelligence, School of Electronics Engineering, Kyungpook National University, Daegu, South Korea. He earned his master's and Ph.D. degrees in computer control and automation from Nanyang Technological University, Singapore, in 2007 and 2010, respectively. A globally recognized researcher, he ranks among the top 2% of most-cited researchers worldwide, with over 9,000+ google scholar citations and an h-index of 40.

Dr. Mallipeddi's research interests span evolutionary computing, artificial intelligence, image processing, digital signal processing, robotics, and control engineering. He has published 65 SCI/SCIE papers (2020–2024), including 35 in the top 10%, and collaborated with researchers from 12 countries. He is also an Associate Editor for prestigious journals, including IEEE Transactions on Cybernetics: Systems, Swarm and Evolutionary Computation, Information Sciences, Engineering Applications of Artificial Intelligence, etc.

He has held significant leadership roles, such as General Chair of the International Conference on Smart and Intelligent Systems (2021), Technical Program Chair of MIGARS (2023), and Program Chair for the IEEE Symposium on Differential Evolution since 2018.

My google scholar Profile:
https://scholar.google.com.sg/citations?user=bCJAc_8AAAAJ&hl=en
My Lab Website: https://ecis.knu.ac.kr/

Prof. Eugene Rex Jalao

University of the Philippines, PHILIPPINES

Speech Title: AI-Enabled Measurement and Shelf Space Assignment Optimization in Retail Systems

Abstract: Shelf space allocation in retail environments is commonly formulated as a constrained optimization problem, where accurate estimates of product dimensions and shelf capacities are critical inputs. In practice, these parameters are often obtained through manual measurement processes that are time-intensive and prone to variability, thereby limiting the effectiveness of optimization-based decision models.

This paper proposes an integrated framework that combines automated measurement and shelf space assignment optimization. A computer vision–based measurement module, utilizing fiducial markers (ArUco), is developed to estimate product dimensions and shelf occupancy. These estimates are incorporated into a binary integer programming model that determines optimal product-to-shelf assignments under capacity and placement constraints, with the objective of maximizing profit- or demand-weighted utility.

To evaluate the operational and computational impact of the proposed approach, a discrete-event simulation model is constructed to replicate the measurement and allocation processes under both manual and AI-assisted scenarios. The simulation framework captures stochastic processing times and measurement deviations, enabling a comparative assessment of system performance in terms of efficiency and solution quality.

Empirical results from case studies in Philippine retail settings indicate that the proposed system reduces measurement time by 41.24% in a supermarket environment and by 58.33% in a hypermarket setting, while simultaneously improving parameter reliability for optimization. The integration of automated measurement with mathematical programming leads to more consistent and scalable shelf allocation decisions.

The findings highlight the importance of accurate data acquisition in operations research applications and demonstrate how coupling computer vision with optimization and simulation can enhance decision-making in retail operations. The proposed framework provides a practical pathway for improving both operational efficiency and model-driven resource allocation in data-constrained environments.

Bio: Dr. Eugene Rex L. Jalao is a Professor of Analytics and Industrial Engineering in the University

of the Philippines Diliman, Department of Industrial Engineering and Operations Research. He is also the Program Coordinator of the Artificial Intelligence Program of UPD. He specializes in Decision Support Systems, Business Analytics Solutions, Data Mining, Optimization and Systems Simulation. He obtained his Ph.D. in Industrial Engineering from Arizona State University (ASU) in May 2013. Additionally, he obtained his Masters of Science in Industrial Engineering degree as well as his Bachelor of Science in Industrial Engineering from the University of the Philippines Diliman in 2009 and 2007 respectively. His fifteen years of work and research experience are in the fields of business analytics both here in the Philippines and in the United States of America, specifically in the Banking, FMCG, Manufacturing, Real Estate, Healthcare, Telecommunications and Information Technology industries. He is also a certified SAP ERP Materials Management consultant, a Matlab computing associate, a Certified NVIDIA Deep Learning Instructor and an advocate of the R and Python Programming languages.

Invited Speeches

Prof. Sunny Joseph Kalayathankal

Rajagiri School of Engineering & Technology, INDIA

Speech Title: Fuzzy Modelling and Decision Making Applications in the Real World

Abstract: The thought process involved in the act of decision making is a complex array of streaming possibilities in which a person selects or discards information made available from diverse sources. In doing so one is led by a meaningful analysis of available information and optimal selection out of several apparently equi-efficient decisions. Since Zadeh (1965) published the fuzzy set theory as an extension of classic set theory, it has been widely used in many fields of application, such as pattern recognition, data analysis, system control, management etc. The unique characteristic of this theory, in contrast to classic mathematics, is its operation on various membership functions (MF) instead of the crisp real values of the variables. Molodtsov (1999) initiated the concept of soft set theory as a new mathematical tool for dealing with uncertainties. Pabitra Kumar Maji et al. (2001) introduced fuzzy soft set theory which also deals with uncertainties. Out of the several higher order fuzzy sets, intuitionistic fuzzy sets by Atanassov (1985) and Ordered intuitionistic fuzzy sets proposed by Kalayathanal et al. (2010) have been found to be highly useful to deal with vagueness. Intuitionistic fuzzy set is described by two functions: a membership function and a non - membership function. We develop and apply similarity measures between ordered intuitionistic fuzzy sets to multiple attribute decision making (MADM) under fuzzy environment.

Bio: Prof. Dr. Sunny Joseph Kalayathankal received the MSc. degree from Kerala University, Kerala, India in 1986, B.Ed from Calicut University, Kerala in 1987, MPhil from Kerala University in 1993 and Ph.D (Mathematics) degree in 2010 from Kerala University, MCA from Indira Gandhi National Open University, New Delhi, India in 2002, M.Tech IT from Karnataka State Open University in 2013 and Ph.D. in Computer Science under Bharathiar University, Coimbatore, India in 2018. He was the Head of the Department of Mathematics, K.E.College, Mannanam, Kottayam, Former Principal of Jyothi Engineering College Cheruthuruthy, Trissur , Former Director of Research in Jyothi Engineering College Affiliated to APJ Abdul Kalam Technological University, Kerala India. He is currently working as Professor of Computer Science & Engineering in Rajagiri School of Engineering & Technology, Kerala , India and has 38 years of teaching and 20 years of research experience. He has published more than 116 papers in the area of Fuzzy Modelling and Decision Making, Graph Theory and Applied Mathematics. He has produced 3 Ph.Ds in the area of Graph Theory and Fuzzy Modelling. He has served as 66 Keynote and Invited Speaker in various National and International Conferences. He is the Research guide of APJ Abdul Kalam Technological University, M.G.university Kottayam and Bharathiar University Coimbatore. He is the reviewer of Iranian Journal of Fuzzy System, International Journal of Fuzzy System and Journal of Mathematical Modeling and Computer Simulation.

Prof. Zong Woo Geem

Gachon University, SOUTH KOREA

Speech Title: Music-Inspired Harmony Search Algorithm and its Applications in Southeast Asia

Abstract: The Harmony Search (HS) algorithm is a music-inspired optimization technique and has been so far applied to various optimization problems in engineering, science, sociology, management, arts, etc. This talk briefly introduces a basic theory of the HS algorithm and its various applications performed in Southeast Asian countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam, etc). The theory part of HS includes the basic structure of the HS algorithm, and its unique human-experience-based derivative. And, the application part includes optimal scheduling in residential buildings in Brunei; optimal feature selection of EEG signals in Myanmar; discrete sizing optimization of truss structure in Indonesia; optimal power flow solution in Thailand; flood-susceptibility prediction in Vietnam; real-time implementation of clustering protocol for energy-efficient wireless sensor networks in Singapore; and university course timetabling in Malaysia. While the HS algorithm is extensively studied in some countries, it is hardly researched in others, creating a striking contrast. It is hoped that research activity will become more active in the latter countries in the future.

Bio: Professor Zong Woo Geem is a prominent researcher and educator at Gachon University, widely recognized for his pioneering contributions to metaheuristic optimization. He is best known as the creator of the Harmony Search (HS) algorithm, a nature-inspired optimization method modeled after the improvisational process of musicians seeking the best harmony. Since its introduction, HS has become one of the most influential global optimization techniques, applied across engineering, energy systems, data science, smart cities, and more. Throughout his career, Professor Geem has held research and visiting scholar positions at leading institutions, including Virginia Tech, University of Maryland, and Johns Hopkins University, expanding the global reach of his research. His publication record is extensive, with numerous SCI-indexed papers each year, and he has been consistently recognized as one of the world's Top 2% Scientists.
Website of Harmony Search Algorithm: https://sites.google.com/view/harmonysearch

Prof. Hiroyuki Sato

The University of Electro-Communications, JAPAN

Speech Title: Evolutionary Multi-objective Optimization in the Wild for Sustainable Industrial Systems

Abstract: This talk introduces real-world applications of evolutionary multi-objective optimization. In recent years, multi-objective optimization has attracted increasing attention as a framework for supporting practical decision making while considering multiple evaluation criteria simultaneously. In this talk, through several practical case studies, I demonstrate how evolutionary computation can contribute to decision making in industrial systems under real-world conditions, or "in the wild." Specifically, in e-commerce logistics, I present an inventory allocation framework that optimizes product placement across logistics centers distributed throughout Japan while considering conflicting objectives such as transportation cost and inventory volume. In manufacturing, I discuss a production scheduling method for cardboard manufacturing processes, where production sequences are optimized by considering manufacturing cost and postponed production. In building systems, I introduce parameter optimization for air-conditioning, lighting, and heat-source equipment, aiming to balance operational cost and human comfort. Finally, I summarize the role that multi-objective evolutionary computation can play in designing sustainable industrial systems and discuss challenges for future real-world applications.

Bio: Hiroyuki Sato received the M.E. and Ph.D. degrees from Shinshu University, Japan, in 2005 and 2009, respectively. He joined the University of Electro-Communications (UEC) in 2009 and is currently a Professor in the Department of Informatics. He is also affiliated with the Artificial Intelligence eXploration (AIX) Research Center at UEC. His research focuses on evolutionary computation, particularly evolutionary multi- and many-objective optimization, constrained optimization, and their applications to real-world problems. His work spans both fundamental algorithmic studies and practical projects, including collaborations with industry in areas such as production planning, design optimization, facility control, and intelligent systems integration. Dr. Sato has received several best paper awards, including those from the Genetic and Evolutionary Computation Conference (GECCO) in 2011, 2014, and 2022, and the IEEE Congress on Evolutionary Computation (CEC) in 2024, as well as multiple awards from the Transactions of the Japanese Society for Evolutionary Computation in 2012, 2015, 2020, and 2022. He is a member of IEEE, ACM SIGEVO, and the Japanese Society for Evolutionary Computation.

Assoc. Prof. Dmitri E. Kvasov

University of Calabria, ITALY

Speech Title: Advanced global optimization techniques in machine learning

Abstract: In many simulation-based applications that employ machine learning techniques, the objective function can be multiextremal and non-differentiable, which precludes the use of derivative-based descent methods. Moreover, the function is often provided as a black box, making each evaluation computationally expensive. Derivative-free methods are therefore particularly well suited for addressing these challenging global optimization problems and can be either deterministic or stochastic in nature. A numerical comparison of these two classes of methods is of considerable interest for several reasons and has notable practical importance. In this presentation, methods from both groups are examined, and their applications in the field of machine learning are briefly surveyed.

Bio: Associate Professor in Numerical Analysis, DIMES, University of Calabria, Rende (CS), Italy. Italian National Scientific Habilitation as Full Professor in Numerical Analysis (2018–2027) and in Operations Research (2021–2030). Education: Ph.D. in Operations Research (05/2006), Department of Statistics, University of Rome "La Sapienza", Italy. Candidate (Ph.D.) of Physico-Mathematical Sciences (12/2016), "Lobachevsky" University of Nizhny Novgorod, Russia. Graduated, with honours, in Information Systems (06/2001), Faculty of Computational Mathematics and Cybernetics, "Lobachevsky" University of Nizhny Novgorod, Russia. Graduated, with honours, in Computer Systems Engineering (04/2001), Engineering Faculty, University of Calabria, Italy. Research interests: Numerical analysis; Continuous global optimization and applications; High-performance and Infinity computing. List of papers includes more than 130 items (among them: 2 research books).
Research Interests: Continuous global optimization and applications; high-performance and infinity computing
Web page : http://people.dimes.unical.it/kvadim

Assoc. Prof. Ramesh Kumar Ayyasamy

Universiti Tunku Abdul Rahman (UTAR), MALAYSIA

Speech Title: The Power of Hybrid Deep Learning in Combating Fake News

Abstract: The rapid spread of misinformation on social media demands accurate and scalable detection methods. This keynote presents a hybrid deep learning framework that combines LSTM networks with a Convolutional Gaussian Perceptron Neural Network (CGPNN), enhanced by metaheuristic optimization for improved performance. The approach captures contextual and linguistic patterns while using optimized parameters to strengthen classification accuracy. It also applies multi-region text analysis to detect subtle inconsistencies within news content. Evaluations on benchmark datasets show up to 98% accuracy, with consistent improvements over existing models. This framework provides practical insights into building robust AI systems for fake news detection across real-world digital platforms.

Bio: Ramesh Kumar Ayyasamy (Senior Member, IEEE) earned his Ph.D. in Information Technology from Monash University, Australia, in 2013. He has over 22 years of teaching and research experience in Computer Science and Information Systems. He has held various academic and research roles at multiple institutions throughout his career. He is an Associate Professor in the Faculty of Information and Communication Technology at Universiti Tunku Abdul Rahman (UTAR), Malaysia. Dr. Ramesh's research expertise lies in AI-driven text analytics, focusing on sentiment analysis, deep learning for healthcare imaging, and semantic image segmentation. His work bridges theoretical foundations and practical applications, contributing to natural language processing, computer vision, smart city development, and health informatics. In addition to his research activities, he plays an active role in the academic community as a reviewer for leading journals and conferences. He serves on the editorial boards of several scholarly publications.

Dr. Shahin Jalili

Imperial College London, UK

Speech Title: A Hyper-Intelligent Algorithmic Framework for Large-Scale Optimisation

Abstract: The sensitivity of their performance to problem type and the associated computational complexities highlights the need for caution when applying standard metaheuristics to complex problems. Standard metaheuristic algorithms are prone to statistically unstable convergence behaviour or premature convergence. This talk will focus on introducing a novel algorithmic framework, termed hyper-intelligent (HI). The framework is based on the hypothesis that the simultaneous, yet intelligent, application of multiple population-based metaheuristics yields better results than applying them individually. In HI algorithms, each individual has access to a high-level heuristic (HLH) subspace that provides an online, feedback-based mechanism for learning and adapting its behaviour throughout the search process. By interacting with the low-level heuristic (LLH) space, individuals record experiences in their HLH subspaces, which then guide the selection of the most appropriate metaheuristics at different stages of optimisation.

Bio: Shahin is an independent Departmental Fellow in the Department of Civil and Environmental Engineering, specialising in decision-making and optimisation for decarbonising diverse sectors, including buildings, transportation, offshore wind energy, and oil and gas. He has developed a series of intelligent algorithms to reduce the economic, environmental, safety, and societal impacts of built environment infrastructure. With several years of research experience at Imperial, the University of Exeter, the University of Aberdeen, and the National Decommissioning Centre, he has collaborated closely with international energy companies and a diverse range of stakeholders to create innovative and practical solutions that support the transition to net zero. Shahin is also a Chartered Engineer with the Institution of Mechanical Engineers (IMechE) and is affiliated with the Grantham Institute and Imperial-X.

Agenda Overview

Day 1, April 24, 2026, Philippines Time, GMT+8

Onsite Sign-in		
Time	**Event**	**Venue**
13:00-16:30	Onsite Sign-in	Registration Reception- 2F

Online Pretest Session		
Time	**Presenters**	**ZOOM Information**
13:30-14:30	Keynote Speakers, Invited Speakers, Session Chairs, Committee Members	**Zoom ID**: 815 5328 1233 **Password**: 042326
14:30-17:30	**Online Session 1**: CF1061, CF1014, CF1005, CF1062, CF1012, CF1030, CF1063	
	Online Session 2: CF1006, CF1041, CF1056, CF1020, CF1074	
	Online Session 3: CF1013, CF1009, CF1047, CF1065, CF1066	

Day 2, April 25, 2026, Philippines Time, GMT+8

Time	Schedule
Onsite Room: Tokyo B- 2F **Online Zoom ID:** 815 5328 1233 / **Password:** 042326	
	Conference Host **Assist. Prof. Wilferd Jude A. Perante** **Cebu Institute of Technology - University, PHILIPPINES**
9:00-9:10	**Welcome Message** **Prof. Suash Deb** General Chair, ISMSI 2026 **India Intl. Congress on Computational Intelligence, INDIA**
9:10-9:55	**Keynote Speech I** **Speech Title:** Computational Complexity Analysis of Sexual Evolution for the Design of Better General Purpose Algorithms for AI **Prof. Pietro S. Oliveto** **Southern University of Science and Technology, CHINA**
9:55-10:40	**Keynote Speech II** **Speech Title:** TBA **Prof. Rammohan Mallipeddi** **Kyungpook National University, SOUTH KOREA**
10:40-11:10	**Group Photo & Coffee Break**
11:10-11:35	**Invited Speech I** **Speech Title:** Evolutionary Multi-objective Optimization in the Wild for Sustainable Industrial Systems **Prof. Hiroyuki Sato** **The University of Electro-Communications, JAPAN**
11:35-12:00	**Invited Speech II** **Speech Title:** Music-Inspired Harmony Search Algorithm and its Applications in Southeast Asia **Prof. Zong Woo Geem** **Gachon University, SOUTH KOREA**
12:00-13:30	**Lunch & Break (Tokyo A-2F)**
13:30-14:15	**Keynote Speech III**

	Speech Title: AI-Enabled Measurement and Shelf Space Assignment Optimization in Retail Systems **Prof. Eugene Rex Jalao** **University of the Philippines, PHILIPPINES**

Time	Schedule	
14:20-15:35	**Onsite Session 1 (Part I): Data-Driven Intelligent Systems and Decision Modeling** **Session Chair**: Prof. Zong Woo Geem, Gachon University, SOUTH KOREA CF1024, CF1036, CF1051, CF1053, CF1058-A	**Onsite Room:** Taipei – 2F
14:20-15:35	**Onsite Session 1 (Part II): Data-Driven Intelligent Systems and Decision Modeling** **Session Chair**: Assist. Prof. Joseph Jaymel S. Morpos, Cebu Institute of Technology-University, PHILIPPINES CF1076, CF1077, CF1071-A, CF1007-A, CF1048	**Onsite Room:** Seoul – 2F
15:35-16:00	**Coffee Break**	
16:00-18:00	**Onsite Session 2: Design of Metaheuristic Algorithms and Applications of Intelligent Optimization Algorithms** **Session Chair**: Prof. Hiroyuki Sato, The University of Electro-Communications, JAPAN CF1081, CF1025, CF1015, CF1019, CF1040, CF1048, CF1064, CF1082	**Onsite Room:** Taipei – 2F
18:30-20:00	**Dinner (Tokyo A- 2F)**	

Day 3, April 26, 2026, Philippines Time, GMT+8

Time	Schedule	
9:30-11:35	**Online Session 1: Machine Learning-Based Intelligent Systems and Decision Modeling** **Session Chair**: Prof. Sunny Joseph Kalayathankal, Rajagiri School of Engineering & Technology, INDIA **Invited Speech**- Prof. Sunny Joseph Kalayathankal CF1061, CF1014, CF1005, CF1062, CF1012, CF1030, CF1063	**Zoom ID:** 815 5328 1233 **Password:** 042326
11:35-13:30	**Break Time**	
13:30-15:05	**Online Session 2: Design and Applications of Intelligent Optimization Algorithms** **Session Chair**: Dr. Shahin Jalili, Imperial College London, UK **Invited Speech**- Dr. Shahin Jalili, Imperial College London, UK CF1006, CF1041, CF1056, CF1020, CF1074	**Zoom ID:** 815 5328 1233 **Password:** 042326
15:05-15:30	**Break Time**	
15:30-17:25	**Online Session 3:Multi-Objective and Hybrid Cooperative Optimization Algorithms** **Session Chair**: Assoc. Prof. Dmitri E. Kvasov, University of Calabria, ITALY **Invited Speech**- Assoc. Prof. Dmitri E. Kvasov, University of Calabria, ITALY **Invited Speech**- Prof. Ramesh Kumar Ayyasamy, Universiti Tunku Abdul Rahman (UTAR), MALAYSIA CF1013, CF1009, CF1047, CF1065, CF1066	**Zoom ID:** 815 5328 1233 **Password:** 042326

Onsite Session 1 (Part I) : Data-Driven Intelligent Systems and Decision Modeling

Time: 14:20-15:35, April 25, 2026, Philippines Time, GMT+8
Onsite Room: Taipei – 2F
Session Chair: Prof. Zong Woo Geem, Gachon University, SOUTH KOREA

CF1024

14:20-14:35

Title: SHapley Additive exPlanations-Enhanced Virtual Twins for Explainable Treatment Effect Estimation
Authors: Liv Jewel Monsalud, Earl Gabriel Rondina and Gerard Ompad
Presenter: Liv Jewel Monsalud, University of San Carlos, PHILIPPINES

Abstract: Individualized treatment strategies are critical to enhancing patient outcomes in contemporary clinical environments, where treatment response heterogeneity is the rule rather than the exception. ITE estimation via machine learning provides a means of tailoring in-terventions more precisely. This study seeks to improve the ex-plainability of subgroupings by combining Virtual Twins (VT) with Shapley Additive Explanations (SHAP). The VT framework esti-mates ITE by simulating counterfactual outcomes through separate predictive models for treated and control populations based on de-mographic and clinical variables from medical datasets. To address interpretability challenges, SHAP values were computed to quantify the individual-level influence of each covariate on estimated effects. The integration moves beyond the binary constraints of traditional decision rules, such as arbitrary thresholds like PRAPACHE > 27.5, by using SHAP beeswarm plots to visualize the continuous direc-tional impact and magnitude of every data point. This combination not only allowed for the estimation of who benefits most from a specific intervention, but also provided insights into why the model made certain predictions. The source code for this implementa-tion is available at: https://github.com/tobsilog/SHapley_Additive_ exPlanations-Enhanced_Virtual_Twins_for_Explainable_Treatment_ Effect_Estimation.git

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CF1036

14:35-14:50

Title: Adaptive Correction-Aware Multi-layer Cortical Learning Algorithm for Forecasting Real-World Time-Series Data **Authors**: Kazushi Fujino, Keiki Takadama, Hiroyuki Sato
Presenter: Kazushi Fujino, Fujitsu Limited, JAPAN

Abstract: This paper introduces the Adaptive Burst-based Multi-layer Cortical Learning Algorithm (ADBM-CLA) to improve prediction accuracy for real-world time-series data that includes short-term variation patterns. The proposed method extends Decay-BM-CLA, an online learning algorithm. It employs a multi-layer architecture composed of columns and cells as memory units and synapses as connections between them. Through interactions between the upper and lower layers, the model updates its internal states to generate predictions for time-series data. ADBM-CLA adaptively controls the correction strength propagated from the upper layer to the lower layer. This mechanism allows the model to handle uncertainty in time-series data more effectively than the conventional Decay-BM-CLA. We propose two variants of ADBM-CLA. Type I initializes correction strength using prediction accuracy for each upper-layer cell, while Type II additionally uses information from incorrect predictions in the upper layer. Experimental results show that ADBM-CLA consistently achieves lower prediction errors than the conventional Decay-BM-CLA on real-world electricity consumption and temperature datasets.

CF1051

14:50-15:05

Title: Faculty Performance Profiling Using Multi-Model Clustering on NBC 461 Evaluation Indicators
Authors: Mylene B. Ragobrio, Larmie T. Felizcuso, Cheryl C. Pantaleon
Presenter: Mylene B. Ragobrio, Cebu Institute of Technology University (CITU), PHILIPPINES

Abstract: Faculty performance evaluation in State Universities and Colleges (SUCs) is traditionally conducted through aggregated scores under the NBC 461 framework, which may obscure underlying performance patterns across credentials, professional development, and qualitative teaching contributions. This study addresses this limitation by applying data-driven analytics to profile faculty performance using NBC 461 CCE–QCE indicators. Faculty evaluation records from multiple SUC campuses of Eastern Samar State University covering academic years 2016 and 2019 were consolidated, cleaned, and transformed into section-level features (Sec1, Sec2, Sec3). Unsupervised machine learning techniques K-Means clustering, Hierarchical Agglomerative Clustering (Ward linkage), and Gaussian Mixture Modeling were employed to identify latent faculty performance profiles, with Principal Component Analysis used for visualization. Results consistently revealed three interpretable performance profiles: balanced high performers, developing faculty, and QCE-oriented contributors. The findings demonstrate that faculty performance under NBC 461 is multidimensional rather than linear, validating clustering-based analytics as a robust foundation for evidence-based profiling. This study provides a scalable analytical baseline to support subsequent predictive modeling, ranking analysis, and development planning in SUCs.

CF1053

15:05-15:20

Title: PsyAgentRec: Psychology-Grounded Agents for Adaptive Recommendation
Authors: Hailin Zhong, Shengxin Zhu
Presenter: Hailin Zhong, Beijing Normal-Hong Kong Baptist University, CHINA

Abstract: Current recommender systems are often built and evaluated on static offline logs, limiting their ability to adapt to users' evolving preferences over time. We present PsyAgentRec, an agent-based recommendation framework that integrates psychology-grounded, human-like cognitive agents into the recommendation loop to model and respond to dynamic user behavior under recommendation interventions. Each agent is equipped with a multi-component cognitive architecture---including episodic memory, affective state transitions, and adaptive preference updating---driven by an ICR2 (Intimacy--Curiosity--Reciprocity--Risk) motivational engine grounded in social and behavioral theory. By enabling iterative interactions between agents and the recommender, PsyAgentRec provides a controlled environment to study adaptive personalization and evaluate recommendation strategies under non-stationary preferences, beyond what static datasets can capture.

CF1058-A

15:20-15:35

Title: The AI Compass: An Automated System for Mapping Artificial Intelligence Tool Adoption in the Global among IT Students using Natural Language Processing (NLP) and Bidirectional Encoder Representations from Transformers (BERT) Deep Learning Model
Authors: Wilferd Jude Perante, Chris Jordan G. Aliac and Eugene C. Busico
Presenter: WILFERD JUDE A. PERANTE, Cebu Institute of Technology - University, PHILIPPINES

Abstract: This research study develops AI compass, a real-time cloud-based automated system mapping of Artificial Intelligence (AI) tools among Information Technology (IT) students and professionals globally. The research study addresses the gap in real-time and structure data on what AI tools that are being used, how they are being used, type of subscription, and sentiment usage context. The AI compass was developed to turn scattered online information into clear and usable insights for students, professionals, researchers, and university policymakers. The researchers used quantitative descriptive-developmental research. The AI compass is design to collect online information from public feeds, content, and APIs like (news sites, tech communities, forum, education-related sources, google

news countries, universities, college, schools, etc.). Then it will clean the data and use the Natural Language Processing (NLP) and Bidirectional Encoder Representations from Transformers (BERT) analyses to identify AI tools. After that, it classifies the AI usage based on their usage, category, subscription, geological heat map, and sentiment analysis. Finally, it will present the data in a visualized dashboard and summary reports. The data was analyzed using frequency counts, percentages, rankings, group distribution, and dashboard visualization usage of AI tools. The AI compass gathered data about 9,192 user counts from February 5 to March 7, 2026. The result showed that the adoption of AI tools signals the most highly concentrated in North America, especially in the United States, followed by East Asia. Across major groups, the category used in “professional use” emerged as the dominant category. The AI tool ChatGPT was the most usable platform in many regions, while in East Asia, Qwen showed strong as a usable AI tool. This indicates that there are regional variations in the preferred use of AI tools. This displays that the AI compass is an effective and scalable system for monitoring real-time global AI trends. Overall, AI Compass, an automated cloud-based tool with NLP and BERT, provides meaningful insights about global AI trends that will guide, student, professionals, universities in crafting their curriculum, and research and policy makers and help them in finding their future jobs.

Onsite Session 1（Part II）: Data-Driven Intelligent Systems and Decision Modeling

Time: 14:20-15:35, April 25, 2026, Philippines Time, GMT+8
Onsite Room: Seoul– 2F
Session Chair: Assist. Prof. Joseph Jaymel S. Morpos, Cebu Institute of Technology-University, PHILIPPINES

CF1076 14:20-14:35	**Title**: An AI-based Approach for Automated Region-of-Interest Detection and Cropping in Underwater Coral Reef Quadrat Imagery **Authors**: Jannie Fleur Orano, Denissa Doron Doron, Rinvee Betonio, Gerald Catina, Jefferson Itaok, Jonas Arcken Salac and Jerome Jack Napala **Presenter**: Jannie Fleur V. Oraño, Southern Leyte State University, PHILIPPINES

Abstract: Accurate automated estimation of live coral cover relies heavily on consistent image preprocessing, particularly the correct identification and extraction of standardized survey areas such as 1×1 meter quadrats. However, manual cropping of quadrat regions from underwater images is time-consuming, labor-intensive, and prone to inconsistency due to variations in camera angle, distance, and image quality. To address these challenges, this study presents an AI-based approach for automated region-of-interest (ROI) cropping in underwater coral reef imagery. The proposed method utilizes a YOLO-based object detection model trained to detect and segment quadrat boundaries, enabling the automatic isolation of the target survey area from raw underwater images. The model was trained using annotated quadrat images and enhanced through data augmentation techniques to improve robustness to variations in image geometry, including rotation, scaling, and perspective. Experimental results demonstrate that the model effectively identifies quadrat regions across diverse image scenarios, significantly reducing the need for manual preprocessing. Automated ROI cropping contributes to more consistent image inputs for subsequent segmentation and coral cover estimation tasks, thereby improving workflow efficiency and supporting scalable reef monitoring efforts. This approach provides a practical preprocessing solution for coral reef assessment systems and aligns with global efforts toward sustainable marine ecosystem monitoring under SDG 14: Life Below Water.

This invited talk will explore some of the most recent advances regarding the application of swarm intelligence methods to shape reconstruction. The discussion will encompass diverse academic, professional, and industrial domains, including computer-assisted design and manufacturing, computer animation, computer vision, medical imaging, and swarm robotics. Several real-world examples will be used to illustrate the enormous potential of swarm intelligence to solve challenging problems in various academic and industrial fields.

CF1077 14:35-14:50	**Title**: Leveraging ResNet-50 for Automated Image-Based Fish Species Classification **Authors**: Jannie Fleur Orano, Gerald Catina, Jiesyl Mamites, Gil Dialogo, Jonah Flor Maaghop and Rene Radaza **Presenter**: Rene C. Radaz, Southern Leyte State University, PHILIPPINES

Abstract: Accurate fish species classification is a challenging computer vision task due to variations in orientation, lighting, background complexity, and visual similarity among species. Traditional manual identification methods are time-consuming and prone to inconsistency, limiting scalability in practical applications such as fisheries and aquaculture. This study presents a deep learning approach using the ResNet50 architecture to classify 75 fish species from a Fishbase dataset. Preprocessing techniques, including resizing, normalization, and background adjustments, were combined with data augmentation strategies such as rotation, flipping, and color jitter to improve model robustness. The ResNet50 model achieved a validation accuracy of 87.79%, with precision of 87.56% and recall of 86.36%, demonstrating its ability to learn discriminative morphological, color, and texture features. Misclassifications were concentrated in underrepresented or visually similar classes, highlighting the importance of dataset balancing and augmentation. These results confirm the effectiveness of ResNet50 in fine-grained fish classification tasks and its potential integration into automated recognition systems for fisheries management, aquaculture monitoring, and mobile or embedded applications.

CF1071-A

14:50-15:05

Title: Design and Development of an Intelligent Academic Records Framework for Student Performance Prediction Using Random Forest and XGBoost

Authors: Joseph Jaymel S. Morpos, Larmie S. Feliscuzo, Cheryl B. Pantaleon

Presenter: Joseph Jaymel S. Morpos, Cebu Institute of Technology-University, PHILIPPINES

Abstract: Higher education institutions generate large volumes of academic data; however, these data are often underutilized for proactive decision-making and early identification of at-risk students. This study proposes an intelligent academic records framework that integrates ensemble machine learning within a microservice-based architecture to address this limitation. The methodology combines Random Forest and XGBoost models, leveraging both robustness and predictive capability, while transforming academic records into structured feature vectors using performance-based and progression-based indicators such as GPA, completion ratio, failure rate, and GPA trends. The system is deployed through a Python-based microservice and integrated into a web-based academic platform via RESTful APIs for real-time inference. Experimental results using an 80:20 train–test split with 5-fold cross-validation demonstrate that the ensemble model outperforms individual classifiers, achieving 0.93 accuracy, 0.91 precision, 0.90 recall, 0.90 F1-score, and an AUC of 0.95. These findings confirm that the proposed framework provides a scalable, interpretable, and deployable solution that enhances predictive performance and supports early academic intervention.

CF1007-A

15:05-15:20

Title: Neural Ensemble-Driven Evolutionary Optimization for Sustainable and Dynamic Transportation Problems

Authors: Kanchan Kushwaha and Ranjan Kumar Jana

Presenter: Kanchan Kushwaha, Department of Mathematics, SVNIT, Surat, Gujarat, INDIA

Abstract: This study addresses a fertilizer distribution problem by formulating a five-dimensional green transportation model. It optimizes three dynamic objectives, including transportation cost, time, and CO! emissions, forming a dynamic multi-objective, multi-item, multi-modal network. To capture the dynamic nature of real-world logistics, a hybrid predictive–prescriptive framework is proposed. The predictive stage utilizes an ensemble of artificial neural networks (ANN). The first multi-output regression NN forecasts key time-varying parameters such as monthly demand, supply and emission

factors. The second ANN forecasts an adaptive ensemble of predictive strategies based on their performance in varying intensities of environmental change. During the prescriptive stage, the forecast inputs are used to create an optimization problem, which is then solved using the NSGA-III evolutionary algorithm. This produces a wide range of Pareto front solutions that meet both economic and environmental goals. The proposed methodology is implemented in a realistic fertilizer distribution case study, successfully capturing dynamic fluctuations, yielding welldistributed Pareto-optimal solutions, and offering meaningful decision support for reconciling cost efficiency with sustainability objectives. This method combines data-driven forecasting with multi-objective optimization, which makes planning more proactive, robust, and environmentally friendly than static models. The generic formulation is useful in more than only fertilizer logistics. It can also be used in other areas where uncertainty, multiple goals, and sustainability requirements are important.

CF1048

15:20-15:35

Title: Comparative Global-Local Search Analysis of fNIRS and EEG Feature Spaces for Drowsiness Detection

Authors: John Roy R. Dalin, Luis Gerardo S. Cañete Jr.
Presenter: John Roy R. Dalin, University of San Carlos, PHILIPPINES

Abstract: This study presents a comparative structural analysis of fNIRS and EEG feature spaces for drowsiness detection under a unified analytical framework. K-means clustering is used to examine global modality-specific feature distributions, while supervised classification is used to evaluate local decision consistency. Using Karolinska Sleepiness Scale (KSS) scores as ground truth across five controlled participants, the study examines cluster compactness, overlap, and boundary behavior within each modality. Results indicate moderate global structure in both feature spaces, with fNIRS exhibiting a higher overall silhouette score (0.372) than EEG (0.235), despite greater visual overlap in PCA space. Supervised alignment with binary labels remained moderate, suggesting that cognitive fatigue is better represented as a gradual and partially overlapping physiological landscape rather than a sharply separable state. These findings provide a comparative baseline for understanding modality-dependent feature space behavior in physiological drowsiness detection.

Onsite Session 2: Machine Learning Theory and Model Design

Time: 16:00-18:00, April 25, 2026, Philippines Time, GMT+8
Onsite Room: Taipei– 2F
Session Chair: Prof. Hiroyuki Sato, The University of Electro-Communications, JAPAN

CF1081

16:00-16:15

Title: Transferring Search Dynamics Instead of Solutions for Evolutionary Multi-Objective Optimization
Authors: Yuki Hirakawa, Keiki Takadama, and Hiroyuki Sato
Presenter: Yuki Hirakawa, The University of Electro-Communications, JAPAN

Abstract: In evolutionary transfer optimization, many existing studies em-phasize solution transfer, where solutions from related known prob-lems are reused for an unknown problem. However, as problem similarity decreases, solution transfer often misleads the search and causes negative transfer. In this study, we argue that the ob-ject to be transferred is not the solutions themselves but the search dynamics inherent in the search process. For multi-objective op-timization, we propose a new evolutionary framework that learns the search behavior from initial solutions to final solutions on known problems as a continuous velocity field using flow matching, and transfers this field to guide the search on unknown problems. We design solution generation strategies that integrate velocity-field guidance with crossover and mutation in serial and parallel forms, and systematically compare their performance. Experiments show that while all strategies accelerate the search for highly similar problems, the parallel integration achieves fast early progress and stable late-stage search under moderate to low similarity, effec-tively suppressing negative transfer. These results demonstrate that search dynamics transfer is an effective alternative to solution trans-fer in evolutionary multi-objective optimization, with parallel inte-gration being particularly robust across different similarity levels.

CF1025

16:15-16:30

Title: Testing Classical and Hybrid Quantum Solvers for Special and Euclidean Traveling Salesman Problem Instances
Authors: Jedidiah Ramos, Cherry Lyn Sta Romana
Presenter: Jedidiah Ramos, Cebu Institute of Technology - University, PHILIPPINES

Abstract: A classical algorithm is tested against D-Wave hybrid quantum annealers for special cases of the Traveling Salesman Problem where the weights of the edges in a graph form an arithmetic progression. The classical algorithm, Christofides, Nearest Neighbor, Simulated Annealing, Ant Colony Optimization, Genetic Algorithm, and D-Wave hybrid quantum annealers are also tested on the Euclidean Traveling Salesman Problem. D-Wave never outperformed the classical algorithm within its specified scope but outperformed all classical algorithms and heuristics for the Euclidean Traveling Salesman Problem before being overtaken at larger problem sizes.

CF1015

16:30-16:45

Title: Development and Metaheuristic-Enhanced Implementation of an Anti-Carnapping Device Using Haar Cascade Algorithm for Facial Recognition
Authors: Nevel Taurine C. Auxilio, Junar A. Landicho
Presenter: Nevel Taurine C. Auxilio, University of Science and Technology of Southern Philippines - Jasaan campus, PHILIPPINES

Abstract: Vehicle theft and unauthorized access remain persistently challenging, despite advancements in traditional security systems. This project approach in enhancing vehicle security by developing a facial recognition system using the Haar Cascade algorithm to identify authorized drivers and enable engine ignition. The system's performance is evaluated using a preliminary simulation prototype where we used to train and test our data. The prototype is deployed in two phases: enrolment and testing. Enrolment and testing pass through the Facial Recognition system to determine whether the test image and the data set image match through the database. Upon successful recognition, a signal is transmitted to the microcontroller, which uses a 5V SPDT relay to enable engine start, ensuring that only verified individuals can operate the vehicle. The system was successfully tested in various lighting conditions and scenarios, demonstrating a high accuracy rate in identifying authorized drivers. Integration with the vehicle's ECU was achieved through the development of a custom interface, ensuring seamless communication between the facial recognition system and the engine ignition process. This project contributes to the field of vehicle security by introducing a costeffective, reliable, and user-friendly solution to prevent unauthorized access. The implementation of facial recognition using the Haar Cascade algorithm offers a promising alternative to traditional security measures, enhancing overall vehicle protection and providing peace of mind for car owners.

CF1019

16:45-17:00

Title: Chaotic Discrete Chimp Optimization Algorithm applied to the Pollution Routing Problem
Authors: Donald Davendra and Magdalena Metlicka
Presenter: Donald Davendra, Central Washington University, USA

Abstract: This paper addresses the pollution routing problem (PRP), a key variant of the capacitated vehicle routing problem (CVRP) that minimizes greenhouse gas emissions. We propose the Chaotic Discrete Chimp Optimization Algorithm (CDChOA), which combines the coordinated hunting behavior of chimpanzees with the Tinkerbell chaos map to achieve efficient exploration-exploitation balance. Testing CDChOA on UK-based benchmark datasets demonstrates its effectiveness in minimizing transportation emissions while maintaining solution quality and computational efficiency. Statistical analysis reveals CDChOA outperforms the MAX-MIN Ant System (MMAS) and Discrete Particle Swarm Optimization (DPSO), offering superior performance in environmentally-friendly vehicle routing optimization.

CF1040

17:00-17:15

Title: Feature-Aware Probabilistic Partitioning for Distributed Multi-Robot Gaussian Process Exploration
Authors: Takahiro Watanabe, Keiki Takadama, Hiroyuki Sato
Presenter: Takahiro Watanabe, The University of Electro-Communications, JAPAN

Abstract: This paper proposes a distributed multi-robot exploration method that integrates uncertainty estimation via Gaussian Process Regression (GPR) with probabilistic environment partitioning based on the spatial characteristics of the environment function. Conventional geometric partitioning approaches, such as Voronoi partitioning, determine exploration regions based solely on spatial distance, failing to sufficiently reflect spatial characteristics and estimation uncertainty. To address this, the proposed method enables each robot to extract features—specifically predictive mean, gradient, curvature, and uncertainty—from local GPR estimates and probabilistically summarize the target region using a weighted Gaussian mixture model (weighted GMM). Furthermore, region boundaries are dynamically updated in a distributed manner by minimizing an energy function that integrates feature likelihood and spatial distance. By sharing only the parameters of the probabilistic models among robots, the system achieves cooperative exploration without centralized control. Simulation results confirm that the proposed method maintains performance comparable to conventional methods when the distribution

of environmental characteristics aligns with geometric partitioning, while significantly reducing estimation errors in environments with non-linear boundaries where geometric partitioning is unsuitable. These results demonstrate that probabilistic environment partitioning aligned with spatial characteristics is effective for distributed exploration.

CF1048

17:15- 17:30

Title: Comparative Global-Local Search Analysis of fNIRS and EEG Feature Spaces for Drowsiness Detection
Authors: John Roy Dalin and Luis Gerardo Cañete
Presenter: John Roy R. Dalin, University of San Carlos, PHILIPPINES

Abstract: This study presents a comparative structural analysis of fNIRS and EEG feature spaces for drowsiness detection under a unified analytical framework. K-means clustering is used to examine global modality-specific feature distributions, while supervised classification is used to evaluate local decision consistency. Using Karolinska Sleepiness Scale (KSS) scores as ground truth across five controlled participants, the study examines cluster compactness, overlap, and boundary behavior within each modality. Results indicate moderate global structure in both feature spaces, with fNIRS exhibiting a higher overall silhouette score (0.372) than EEG (0.235), despite greater visual overlap in PCA space. Supervised alignment with binary labels remained moderate, suggesting that cognitive fatigue is better represented as a gradual and partially overlapping physiological landscape rather than a sharply separable state. These findings provide a comparative baseline for understanding modality-dependent feature space behavior in physiological drowsiness detection.

CF1064

17:30-17:45

Title: Structural Optimization of Reinforced Concrete Building Using Genetic Algorithm-based Lagrange Interpolation
Authors: Sofyan Casanguan and Joel Opon
Presenter: Sofyan Casanguan, Mindanao State University - Iligan Institute of Technology, PHILIPPINES

Abstract: Despite the availability of advanced computational methods as complementary to structural design, the Philippine construction sector remains heavily reliant on conventional design practices especially in designing reinforced concrete public structures. This traditional method often leads to substantial material waste and unnecessary expenditure. Consequently, the potential for structural optimization to deliver cost-effective and high-performance solutions remains largely underutilized. This paper presents a novel optimization framework to explore potential design alternatives for reinforced concrete school buildings that offer better architectural utility, constructability, and cost-efficiency. In this study, Genetic Algorithm (GA) was employed to optimize the full frame of the school building. A finite element analysis (FEA) was performed on three different base structural layouts with 3m, 4.5m and 9m column spacings to assess geometric sensitivity and provide a robust data range for the subsequent optimization. Then Lagrange interpolation polynomials (LIPs) surrogate models were derived and integrated into GA optimization loop to automate the structural response estimation in every iteration. The derived LIP demand estimators demonstrate high reliability in approximating structural response, with coefficient of determination (R^2) of about 0.9845 and a mean absolute percentage error (MAPE) of 11.39% when validated against FEA results. Results show that the hybrid optimization GA-LIP method converged consistently to a 6m column spacing and concrete strength of 24 MPa. This research demonstrates that the developed optimization framework offers better design alternatives and provides decision-support tools for engineers and designers. Such method can be extended further for broader applications of other building typology.

CF1082

17:45- 18:00

Title: PSO-Optimized Phase Space Reconstruction for Chaotic Time Series Forecasting with Deep Learning

Authors: Le Anh Tuan, Ngo Quang Dao, Tran Quoc Hung and Nguyen Ngoc Phien

Presenter: Nguyen Ngoc Phien, Ton Duc Thang University, VIETNAM

Abstract: Accurate forecasting of chaotic time series remains a fundamental challenge in nonlinear dynamical systems research. Phase space reconstruction (PSR), grounded in Takens' embedding theorem, provides a principled mathematical framework for recovering the attractor geometry of a dynamical system from univariate observations. However, the quality of the reconstructed phase space is critically dependent on the embedding parameters—time delay τ and embedding dimension m—whose optimal selection via conventional methods such as Average Mutual Information (AMI) and False Nearest Neighbors (FNN) is inherently sequential and sub-optimal. In this paper, we propose \textbf{PSO-PSR}, a novel framework that employs Particle Swarm Optimization (PSO) to jointly optimize τ and m through an end-to-end forecasting-driven fitness function. The optimally reconstructed phase space vectors are subsequently used as input to two deep learning architectures: Long Short-Term Memory (LSTM) networks and a Lite Transformer with linear-complexity attention ($\mathcal{O}(n)$), offering complementary inductive biases for local sequential patterns and global attractor structure, respectively. Extensive experiments on three standard chaotic benchmark systems—Lorenz, Mackey-Glass, and R\"{o}ssler—demonstrate that PSO-PSR consistently outperforms vanilla LSTM and standard Transformer baselines using fixed sliding-window inputs, achieving reductions in RMSE of up to 34.7\% on the Lorenz system, 28.3\% on Mackey-Glass, and 31.5\% on R\"{o}ssler. Our results highlight the critical importance of principled phase space embedding and the efficacy of swarm intelligence for automating this process within a deep learning pipeline.

Online Sessions

Day 3-- April 26, 2026, Philippines Time, GMT+8

Online Session 1: Machine Learning-Based Intelligent Systems and Decision Modeling

Time: 9:30-11:35, April 26, 2026, Philippines Time, GMT+8
Zoom ID: 815 5328 1233 **Password:** 042326
Session Chair: Prof. Sunny Joseph Kalayathankal, Rajagiri School of Engineering & Technology, INDIA

Invited Speech

9:30-9:50

Title: Fuzzy Modelling and Decision Making Applications in the Real World

Invited Speaker: Prof. Sunny Joseph Kalayathankal, Rajagiri School of Engineering & Technology, INDIA

Abstract: The thought process involved in the act of decision making is a complex array of streaming possibilities in which a person selects or discards information made available from diverse sources. In doing so one is led by a meaningful analysis of available information and optimal selection out of several apparently equi-efficient decisions. Since Zadeh (1965) published the fuzzy set theory as an extension of classic set theory, it has been widely used in many fields of application, such as pattern recognition, data analysis, system control, management etc. The unique characteristic of this theory, in contrast to classic mathematics, is its operation on various membership functions (MF) instead of the crisp real values of the variables. Molodtsov (1999) initiated the concept of soft set theory as a new mathematical tool for dealing with uncertainties. Pabitra Kumar Maji et al. (2001) introduced fuzzy soft set theory which also deals with uncertainties. Out of the several higher order fuzzy sets, intuitionistic fuzzy sets by Atanassov (1985) and Ordered intuitionistic fuzzy sets proposed by Kalayathanal et al. (2010) have been found to be highly useful to deal with vagueness. Intuitionistic fuzzy set is described by two functions: a membership function and a non - membership function. We develop and apply similarity measures between ordered intuitionistic fuzzy sets to multiple attribute decision making (MADM) under fuzzy environment.

CF1061

9:50-10:05

Title: Dynamic Routing–Based Capsule Networks for Handwritten Digit Classification
Authors: Parth Bhatnagar,Vidushi Gupta, Manjit Sodhi, Geethika Koravanghat
Presenter: Vidushi Gupta, Ramaiah Institute of Technology, Bengaluru, Karnataka, INDIA

Abstract: Recognition of digits what is handwritten are not a complex job in computer vision, having many uses in OCR, document analysis, and systems for data entry what is automated. Even though they have a lack of inaccuracy in this field, Convolutional Neural Networks (CNNs) is not without weaknesses in their power to keep spatial hierarchies and part-whole relationships because they do not avoid using pooling operations. This work do not ignore these flaws by bringing in a method based on Capsule Networks for recognition of digits what use mechanisms of routing what is not static and representations based on vectors to model spatial relationships that is not implicate.

The network are able to encode the presence and pose of visual entities because of the methodology what we not discouraged, which use a convolutional feature extractor before the Primary and Digit Capsules. Separation of classes based on capsule vector magnitudes are made to happen by using a loss function what is not without margins. The MNIST dataset were used to test the model without an

abundance of data augmentation what is not small. Based on what the results show, the Capsule Network reach a correctness what is not low and a lack of fragility to changes in digit structure by capturing spatial information what is not non-hierarchical.

The results shows how Capsule Networks is not worse than normal CNN architectures for modeling relationships of parts and wholes and not losing spatial information. This study give insights into the use of architectures based on capsules for digits what is not typed and confirm they is not unsuitable for tasks of visual recognition that is not unstructured.

CF1014

10:05-10:20

Title: Hybrid Quantum and Long-Term and Short-Term Memory Network for Prediction of Seismic Accelerations
Authors: Yhon Fuentes Huaman, Johel Cárdenas Solano, Kristhel J. Calderon Aedo, Claudio I. Huancahuire Bravo, Franklin Yanqui Díaz, Edison Ponce Torres, Fredy Aguirre Ramos, Miguel A. Aquino Cruz and Luis E. Zegarra Ramirez
Presenter: Yhon Fuentes Huaman, Universidad Nacional Micaela Bastidas de Apurimac, PERÚ

Abstract: The study evaluated the performance of a traditional Long Short-Term Memory (LSTM) network and a hybrid Quantum–LSTM model for predicting seismic accelerations in three orthogonal directions: Z (vertical), N (north–south), and E (east–west). Evaluation metrics included Mean Absolute Error (MAE), Root Mean Square Error (RMSE), Mean Square Error (MSE), coefficient of determination (R^2), and Symmetric Mean Absolute Percentage Error (SMAPE). The traditional LSTM achieved RMSE values of 0.03056 (Z), 0.03737 (N), and 0.03730 (E), with R^2 scores of 0.80704, 0.88248, and 0.87137, and MAE between 0.01809 and 0.02167. The Quantum–LSTM notably improved results: RMSE dropped to 0.02025 (Z), 0.01949 (N), and 0.02000 (E); R^2 rose to 0.91452, 0.93287, and 0.92641; and MAE narrowed to 0.01095–0.01182.

CF1005

10:20-10:35

Title: RT-EndoSAM: Real-time Polyp Segmentation with Self-Prompting SAM
Authors: Manling Huang, Tiantian Zhang, Yanhua Chen, Zhi-Ri Tang
Presenter: Manling Huang, Jinan University, CHINA

Abstract: Current polyp segmentation methods face critical challenges that impede clinical deployment: foundation models like SAM require manual prompts that disrupt real-time workflows, while existing automated approaches sacrifice either segmentation accuracy for speed or vice versa. To address these critical issues, we propose a novel fully automated real-time polyp segmentation framework that completely eliminates manual intervention while maintaining exceptional segmentation accuracy. Our approach introduces three synergistic innovations. First, we develop a temporal-aware self-supervised pre-training strategy that fine-tunes DINOv2 on unlabeled endoscopic videos, capturing polyp-specific visual characteristics including temporal coherence, tissue morphology, and challenging illumination variations absent in natural image pre-training. A Multi-scale Reshape Block transforms the learned representations into hierarchical features compatible with detection architectures. Second, we employ knowledge distillation with feature alignment to transfer the enriched endoscopic representations from the sophisticated DINOv2 encoder into a lightweight detection network, achieving both clinical-grade precision and real-time processing speed. Third, we design an automated prompt generation pipeline that converts detection outputs into precise spatial guidance for a domain-adapted TinySAM model, creating a seamless detect-prompt-segment workflow without manual annotation. Extensive experiments on multiple public endoscopy datasets demonstrate that our method achieves state-of-the-art performance across multiple metrics, attaining remarkable operational efficiency (35.3 FPS on NVIDIA RTX 4080 SUPER GPU) while maintaining superior segmentation accuracy.

CF1062

10:35-10:50

Title: Discriminative Face Embedding Learning Using Siamese Networks with Triplet Loss
Authors: Parth Bhatnagar, Vidushi Gupta, Geethika Koravanghat,Manjit Sodhi
Presenter: Vidushi Gupta, Ramaiah Institute of Technology, Bengaluru, Karnataka, INDIA

Abstract: Face recognition systems are a key part of modern biometric applications. However, they don't always work well because they need large, labeled datasets and can't recognize new identities. This paper proposes a deep learning-based face recognition framework utilizing a Siamese neural network trained with triplet loss to tackle these challenges. The suggested method does not treat face recognition as a closed-set classification problem. Instead, it learns a discriminative embedding space where images of the same identity are placed closer together and images of different identities are kept apart. The model uses shared-weight convolutional subnetworks to get strong facial features and triplet loss to improve relative distance constraints. The experimental results show that the proposed system effectively reduces variation within classes and increases separation between classes. This makes it possible to reliably verify and recognize faces in one-shot learning situations. The proposed framework is scalable and well-suited for real-world face recognition applications because it can generalize to identities that it has never seen before without needing to be retrained.

CF1012

10:50-11:05

Title: An Information-Theoretic Framework for Comparing Voice and Text Explainability
Authors: Mona Rajhans, Vishal Khawarey
Presenter: Vishal Khawarey, Quicken Inc, USA

Abstract: Explainable Artificial Intelligence (XAI) aims to make machine learning models transparent and trustworthy, yet most current approaches communicate explanations visually or through text. This paper introduces an information-theoretic framework for analyzing how explanation modality—specifically, voice versus text—affects user comprehension and trust calibration in AI systems. The proposed model treats explanation delivery as a communication channel between model and user, characterized by metrics for information retention, comprehension efficiency (CE), and trust calibration error (T CE). A simulation framework implemented in Python was developed to evaluate these metrics using synthetic SHAP-based feature attributions across multiple modality–style configurations (brief, detailed, and analogy-based). Results demonstrate that text explanations achieve higher comprehension efficiency, while voice explanations yield improved trust calibration, with analogy-based delivery achieving the best overall trade-off. This framework provides a reproducible foundation for designing and benchmarking multimodal explainability systems and can be extended to empirical studies using real SHAP or LIME outputs on open datasets such as the UCI Credit Approval or Kaggle Financial Transactions datasets.

CF1030

11:05-11:20

Title: Residual Transformer–Decision Forest Hybrid Learning for Accurate Hospital Length-of-Stay Prediction
Authors: Mehdi Neshat
Presenter: Mehdi Neshat, University of Technology Sydney, AUSTRALIA

Abstract: Accurate prediction of hospital length of stay (LOS) is critical for capacity planning and operational decision-making, yet existing single-stage deep learning and ensemble models often suffer from a trade-off between correlation strength and absolute prediction error. This paper proposes TTF-YDF, a transformer-based residual hybrid model that decomposes LOS prediction into global structure learning using gradient-boosted decision forests and fine-grained residual correction via a transformer network. Extensive experiments on a large-scale real-world inpatient dataset demonstrate that TTF-YDF consistently outperforms 13 state-of-the-art baselines across five evaluation metrics. Compared with the strongest tree-based competitors, the proposed model improves Pearson correlation by 5.6–6.0% while

simultaneously reducing RMSE by up to 5.1% and loss by over 7%. Against advanced hybrid deep architectures, TTF-YDF achieves up to 43% lower RMSE and over 30% reduction in MAE, while exhibiting substantially lower variance across cross-validation folds. These results confirm that explicit residual decomposition enables superior ranking fidelity and error reduction, particularly for long-stay and rare clinical cases, establishing TTF-YDF as a robust and scalable solution for LOS prediction in large-scale healthcare systems.

CF1063

11:20-11:35

Title: An Ensemble Attention-Based CNN–LSTM Model with GAN Augmentation for ECG Classification

Authors: Parth Bhatnagar,Vidushi Gupta,Manjit Sodhi,Geethika Koravanghat

Presenter: Vidushi Gupta, Ramaiah Institute of Technology, Bengaluru, Karnataka, INDIA

Abstract: This paper presents a integrated deep learning framework for automated ECG classification which combine CNN-based feature extraction, LSTM-based temporal modeling, attention mechanisms, GAN-based data augmentation, and also ensemble learning.

Experimental results shows that the CNN–LSTM architecture significantly improves classification performance over standalone CNN models, while the inclusion of an attention mechanism further enhance sensitivity for clinically relevant ECG segments. GAN-based data augmentation proves effective in improving minority class recognition and overall model generalization. Additionally, the ensemble learning strategy delivers superior performance and robustness by aggregate the strengths of individual models.

Online Session 2: Design and Applications of Intelligent Optimization Algorithms

Time: 13:30-15:05, April 26, 2026, Philippines Time, GMT+8
Zoom ID: 815 5328 1233 **Password:** 042326
Session Chair: Dr. Shahin Jalili, Imperial College London, UK

Invited Speech 13:30-13:50	**Title**: A Hyper-Intelligent Algorithmic Framework for Large-Scale Optimisation **Invited Speaker**: Dr. Shahin Jalili, Imperial College London, UK

Abstract: The sensitivity of their performance to problem type and the associated computational complexities highlights the need for caution when applying standard metaheuristics to complex problems. Standard metaheuristic algorithms are prone to statistically unstable convergence behaviour or premature convergence. This talk will focus on introducing a novel algorithmic framework, termed hyper-intelligent (HI). The framework is based on the hypothesis that the simultaneous, yet intelligent, application of multiple population-based metaheuristics yields better results than applying them individually. In HI algorithms, each individual has access to a high-level heuristic (HLH) subspace that provides an online, feedback-based mechanism for learning and adapting its behaviour throughout the search process. By interacting with the low-level heuristic (LLH) space, individuals record experiences in their HLH subspaces, which then guide the selection of the most appropriate metaheuristics at different stages of optimisation.

CF1006 13:50-14:05	**Title**: Cuckoo Search-Optimized Stride Attention Network for Efficient UDP Flood Attack Detection **Authors**: Akshat Gaurav, Varsha Arya, Yuk Ming Tang, Meena Malik, Ching-Hsien Hsu, Kwok Tai Chui, and Brij B. Gupta **Presenter**: Kwok Tai Chui, Hong Kong Metropolitan University, Hong Kong, CHINA

Abstract: Distributed Denial of Service (DDoS) attacks, particularly UDP flood attacks, pose a serious threat to network stability by overwhelming bandwidth and degrading service availability. Traditional detection methods often struggle with feature redundancy and high computational complexity in real-time environments. To address these challenges, this paper proposes a Cuckoo Search-Optimized Stride Attention Network for efficient UDP flood attack detection. The model integrates Cuckoo Search Optimization for feature refinement and a Stride Sparse Attention mechanism to capture localized dependencies with reduced complexity. The attention-refined representations are processed through dense layers for final classification. Experimental evaluation on the CICDDoS2019 dataset demonstrates that the proposed framework achieves 99.98% accuracy, 99.97% precision, and 99.96% recall, establishing an efficient and scalable solution for modern network intrusion detection systems.

CF1041 14:05-14:20	**Title**: Comparative Evaluation of Genetic, Memetic, and Cellular Memetic Algorithms for Equitable Urban Water Distribution: A Case Study of Iligan City **Authors**: Shehab D. Ibrahim, Cherry Lyn C. Sta. Romana and Larmie S. Feliscuzo **Presenter**: Shehab Ibrahim, Cebu Institute of Technology - University, PHILIPPINES

Abstract: Urban water distribution systems in rapidly urbanizing cities often suffer from inequitable allocation despite adequate overall supply. In Iligan City, Philippines, prior analyses revealed persistent

household-level undersupply across several barangays due to inefficient pumping station–barangay assignments. This study presents a comparative evaluation of a Genetic Algorithm (GA), a Memetic Algorithm (MA), and a Cellular Memetic Algorithm (CMA) for optimizing urban water distribution with an explicit focus on equity-oriented performance outcomes. Using identical datasets, constraints, and termination conditions, the three approaches were assessed based on water source utilization, barangay-level supply adequacy, discharge variability, and household undersupply metrics. Results show that while all methods prevent oversupply, the Memetic Algorithm consistently achieves the most balanced distribution, eliminating both barangay- and household-level undersupply, reducing discharge variability, and attaining the highest Balanced Distribution Score. The Cellular Memetic Algorithm improves upon the standard GA but retains localized shortfalls in high-demand areas. These findings demonstrate that incorporating local search refinement into evolutionary optimization yields greater practical gains in equity and reliability than spatial population structuring alone. The study underscores the importance of result-based evaluation metrics and highlights the Memetic Algorithm as a robust decision-support tool for equitable urban water distribution planning.

CF1056

14:20-14:35

Title: CardioSAM-PSO: Swarm Intelligence-Guided Topological Decoders for Cardiac Segmentation
Authors: Ujjwal Jain, Santosh Prakash Chouhan, Roshni Chakraborty, Mahua Bhattacharya
Presenter: Ujjwal Jain, ABV-IIITM Gwalior, INDIA

Abstract: Accurate cardiovascular magnetic resonance (CMR) segmentation is vital for diagnosing cardiovascular diseases, yet manual delineation remains prohibitively slow and subject to high inter-observer variance. While foundation models like the Segment Anything Model (SAM) demonstrate remarkable zero-shot generalization, they often lack the sub-pixel boundary precision required for clinical deployment. We introduce CardioSAM-PSO, a highly efficient hybrid architecture that bridges this gap by coupling the robust feature representations of a frozen SAM encoder with a lightweight, trainable Cardiac Decoder. To overcome the limitations of generic adaptation, CardioSAM-PSO introduces two core architectural innovations: a Cardiac-Specific Attention mechanism that explicitly enforces anatomical topological priors, and a Boundary Refinement Module optimized for precise tissue interface delineation. Furthermore, to navigate the highly non-convex optimization manifold of our composite loss formulation and differential learning rates, we pioneer the integration of Particle Swarm Optimization (PSO). CardioSAM-PSO establishes a new state-of-the-art, achieving a 93.39% Dice coefficient, 87.61% IoU, and an HD95 of 4.2 mm. By outperforming auto-configuring baselines like nnU-Net (+3.89% Dice), CardioSAM-PSO demonstrates immense promise for robust clinical translation.

CF1020

14:35-14:50

Title: Structural Optimisation via Hyper-Cultural Algorithm
Authors: Shahin Jalili, Andrew Phillips
Presenter: Shahin Jalili, Imperial College London, UK

Abstract: Cultural algorithms (CAs) are metaheuristics inspired by biocultural evolution theory and possess unique features compared with other evolutionary algorithms. In recent years, they have been employed effectively for engineering optimisation problems. However, the performance of CAs can be significantly affected by the influence functions under different types of constraints and objective functions. This study proposes a hyper-cultural algorithm (HCA) that employs a high-level heuristic (HLH), called the failure-reward rate of the multi-armed bandit (FRRMAB) algorithm, to determine the appropriate influence function for each individual in the population space during the optimisation process. To validate the efficiency of the HCA, the optimum design of a 968-bar, double-layer space structure is performed. The results of the comparison reveal HCA's capability to deliver higher-quality designs for large-scale structures. The observations in this study confirm that employing multiple strategies during the search process leads to better designs.

CF1074

14:50-15:05

Title: A Dual-Stage Hybrid Framework: Pheromone-Guided Recursive Feature Elimination and Stochastic Hill Climbing Decision Tree Optimization

Authors: Urbano Patayon and Melvin Ballera
Presenter: Urbano B. Patayon, Graduate School, Technological Institute of the Philippines, Manila, PHILIPPINES

Abstract: This study proposed a Hybrid Pheromone-Guided Recursive Feature Elimination (PG-RFE) method to improve feature selection by exploring different feature combinations and reinforcing better feature sets through a pheromone-inspired search process. For classification, Decision Trees were enhanced using Stochastic Hill Climbing with Random Restarts (SHC-RR) to help the model avoid poor solutions and improve prediction performance. The study compared baseline CART, RFE + CART, and PG-RFE + CART models. The results showed that feature selection improved model performance, with the RFE + CART model performing better than the baseline CART. The proposed PG-RFE + CART model achieved the best results with an accuracy, precision, and recall of 0.83. In addition, PG-RFE reduced the original 270 features to only six important features, simplifying the model while keeping useful information. The most influential features included motion signals and MFCC audio features. Further evaluation using optimized decision trees showed that the PG-RFE + SHC (RR) model achieved 0.84 accuracy and 0.90 recall during testing, outperforming the RFE + SHC (RR) model. These results show that combining PG-RFE for feature selection and SHC-RR for decision tree optimization improves emotion detection using smartphone data and can support applications that adapt to a user's emotional state.

Online Session 3: Multi-Objective and Hybrid Cooperative Optimization Algorithms

Time: 15:30-17:25, April 26, 2026, Philippines Time, GMT+8
Zoom ID: 815 5328 1233 **Password:** 042326
Session Chair: Assoc. Prof. Dmitri E. Kvasov, University of Calabria, ITALY

Invited Speech
15:30-15:50

Title: Advanced global optimization techniques in machine learning

Invited Speaker: Assoc. Prof. Dmitri E. Kvasov, University of Calabria, ITALY

Abstract: In many simulation-based applications that employ machine learning techniques, the objective function can be multiextremal and non-differentiable, which precludes the use of derivative-based descent methods. Moreover, the function is often provided as a black box, making each evaluation computationally expensive. Derivative-free methods are therefore particularly well suited for addressing these challenging global optimization problems and can be either deterministic or stochastic in nature. A numerical comparison of these two classes of methods is of considerable interest for several reasons and has notable practical importance. In this presentation, methods from both groups are examined, and their applications in the field of machine learning are briefly surveyed.

Invited Speech
15:50-16:10

Title: The Power of Hybrid Deep Learning in Combating Fake News

Invited Speaker: Assoc. Prof. Ramesh Kumar Ayyasamy, Universiti Tunku Abdul Rahman (UTAR), MALAYSIA

Abstract: Abstract: The rapid spread of misinformation on social media demands accurate and scalable detection methods. This keynote presents a hybrid deep learning framework that combines LSTM networks with a Convolutional Gaussian Perceptron Neural Network (CGPNN), enhanced by metaheuristic optimization for improved performance. The approach captures contextual and linguistic patterns while using optimized parameters to strengthen classification accuracy. It also applies multi-region text analysis to detect subtle inconsistencies within news content. Evaluations on benchmark datasets show up to 98% accuracy, with consistent improvements over existing models. This framework provides practical insights into building robust AI systems for fake news detection across real-world digital platforms.

CF1013
16:10-16:25

Title: Swarm Intelligence for Multi-Objective Neural Architecture Search
Authors: Mohamed Shahawy, Mohamed Sedky
Presenter: Mohamed Shahawy, University of Staffordshire, UK

Abstract: Swarm Intelligence (SI) optimizers offer strong parallel exploration and simple, scalable mechanics, yet remain underrepresented in Neural Architecture Search (NAS). We introduce SwarmNAS, a unified SI framework for NAS that includes Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO), and Ant Colony Optimization (ACO). We evaluate on NASBench-101 and provide a comparative study across ABC/PSO/ACO and standard baselines. We also include a lightweight multi-objective exploration capability with a penalty-based consolidation mechanism. Our findings demonstrate that SI methods match the performance of reinforcement learning baselines while offering superior parallelization. Furthermore, our novel EWC-inspired consolidation mechanism reduces model size by nearly 50% with negligible accuracy loss (<0.7%), identifying efficient Pareto-optimal solutions that standard methods miss.

CF1009

16:25-16:40

Title: Deep Neural Network-guided PSO for Tracking a Global Optimal Position in Complex Dynamic Environment
Authors: Stephen Raharja, Toshiharu Sugawara
Presenter: Stephen Raharja, Waseda University, JAPAN

Abstract: We propose novel particle swarm optimization (PSO) variants in-corporated with deep neural networks (DNNs) for particles to pur-sue globally optimal positions in dynamic environments. PSO is a heuristic approach for solving complex optimization problems. However, canonical PSO and its variants struggle to adapt efficiently to dynamic environments, in which the global optimum moves over time, and to track them accurately. Many PSO algorithms improve convergence by increasing the swarm size beyond potential optima, which are global/local optima but are not identified until they are discovered. Additionally, in dynamic environments, several meth-ods use multiple sub-population and re-diversification mechanisms to address outdated memory and local optima entrapment. To track the global optimum in dynamic environments with smaller swarm sizes, the DNNs in our methods determine particle movement by learning environmental characteristics and adapting dynamics to pursue moving optimal positions. This enables particles to adapt to environmental changes and predict the moving optima. We propose two variants: a swarm with a centralized network and distributed networks for all particles. Our experimental results show that both variants can track moving potential optima with lower cumulative tracking error than those of several recent PSO-based algorithms, with fewer particles than potential optima.

CF1047

16:40-16:55

Title: SudoPHASE: A Multithreaded Hybrid ACO–SA Sudoku Solver with Ring and Random Communication Topologies
Authors: Rico Mendez, Jared Azor Bacay, Jhoe Leil Adel, and John Paul Yusiong
Presenter: Rico Mendez, University of the Philippines Tacloban College, PHILIPPINES

Abstract: Sudoku solving is a combinatorial constraint satisfaction problem that becomes increasingly difficult for large grids and low-clue puzzles. In this paper, SudoPHASE is introduced as a parallel hybrid Sudoku solver that combines constraint propagation, the Ant Colony System (ACS), and Simulated Annealing (SA) within a multithreaded architecture. This work integrates multithreaded hybrid ACO–SA with ring-based and randomized communication topologies for coordinated parallel search. Each thread executes an independent solver and communicates through ring-based exchanges of iteration-best solutions and randomized exchanges of best-so-far solutions. We propose a three-source pheromone update mechanism that integrates local and shared information while preserving search diversity. Experimental results on 9×9, 16×16, and 25×25 Sudoku instances demonstrate that the proposed approach improves robustness, convergence speed, and scalability compared to non-hybrid and non-parallel baselines, particularly for large, low-clue puzzles.

CF1065

16:55-17:10

Title: Bayesian Optimization for Simulated Annealing (BOSA) applied to the Capacitated Vehicle Routing Problem
Authors: Anupam Garg, Prateek Vishnoi
Presenter: Anupam Garg, Indian Institute of Technology, Mandi, INDIA

Abstract: The Capacitated Vehicle Routing Problem (CVRP) involves finding the shortest possible routes for a fleet of vehicles, each with a fixed capacity limit, to serve a set of customers where every customer is visited exactly once. When CVRP is encoded as a Quadratic Unconstrained Binary Optimization (QUBO) model, one of the biggest practical hurdles is setting the penalty coefficients correctly — a process that is typically done by hand and has to be repeated for every new problem instance. This paper introduces a new technique called BOSA (Bayesian Optimization for Simulated Annealing), a framework that removes this manual step by using Gaussian Process-based Bayesian Optimization to find good

penalty values automatically, while the underlying QUBO is solved using Simulated Annealing. Our hybrid approach integrates multi-start greedy construction and 2-opt local search to ensure solution feasibility when SA produces invalid routes. Experiments on 11 benchmark instances demonstrate solution distances of 12.04%- 33.26% relative to the best-known optima. On the two instances where comparison is possible, our proposed technique, BOSA achieves shorter routes than D-Wave (949 vs 1085 for A-n32-k5, and 2240 vs 2660 for An80-k10), suggesting that automated classical penalty tuning can match or exceed commercial quantum annealing solutions on these problem sizes without requiring quantum resources. Although not competitive with state-of-the-art CVRP solvers such as HGS and branch and cut algorithm, our automated tuning framework provides a foundation for future quantum-classical hybrid algorithms. It demonstrates the viability of BO-driven parameter optimization for QUBO-based combinatorial problems.

CF1066

17:10-17:25

Title: An Experimental Study on Request Ordering under Response Uncertainty in Substitute Attendance Scheduling

Authors: Soichiro Yokoyama, Tomohisa Yamashita and Hidenori Kawamura

Presenter: Soichiro Yokoyama, Hokkaido University, JAPAN

Abstract: When staffing shortfalls arise in shift-based workplaces, managers contact off-duty employees one by one to request substitute attendance, observing each response before deciding whom to contact next. Because substitute shifts assigned on earlier days consume each employee's limited capacity, the order of requests across a multi-day period can affect the total number of shifts that remain unfulfilled. Yet how much improvement ordering can yield, and under what conditions, has received little attention. This paper presents a systematic experimental study on how the degree of response uncertainty influences the value of request ordering. We formulate the problem as a sequential decision process and use a Transformer encoder trained with Group Relative Policy Optimization to approximate near-optimal policies, comparing the learned policy against rule-based baselines and an integer programming lower bound computed under complete information. Experiments with 30 employees over 14 days use six parameter settings that hold the overall problem difficulty constant while varying the degree of response uncertainty. The results show that the gap between the learned policy and the lower bound widens monotonically as response uncertainty increases, and nearly vanishes when eligibility alone determines acceptance, where the policy has access to the same information as the lower bound.

About Cebu City, Philippines

Cebu officially the Province of Cebu is a province of the Philippines located in the Central Visayas (Region VII) region, and consists of a main island and 167 surrounding islands and islets. The coastal zone of Cebu is identified as a site of highest marine biodiversity importance in the Coral Triangle.

Its capital and largest city is Cebu City, nicknamed "the Queen City of the South", is the oldest city and first capital of the Philippines, which is politically independent from the provincial government along with Mandaue and Lapu-Lapu City. The Cebu Metropolitan Area or Metro Cebu is the third largest metropolitan area in the Philippines (after Metro Manila and Metro Davao) with Cebu City as the main center of commerce, trade, education and industry in the Visayas as well as the regional center of Central Visayas. Being one of the most developed provinces in the Philippines, in a decade it has transformed into a global hub for business processing services, tourism, shipping, furniture-making, and heavy industry. Mactan–Cebu International Airport, located on Mactan Island, is the second busiest airport in the Philippines.

Cebu has the most combined cities and municipalities of any province in the Philippines, with 53 in total. With 9 cities in total, it has the second highest number of cities after its neighboring province of Negros Occidental.

Memo