Updated on July 2, 2024

THE 10TH ANNUAL

International Conference on Smart Computing (SmartComp)

Osaka, Japan

29th June - 2nd July 2024

https://smartcomp.w.waseda.jp/

THE 10TH ANNUAL

International Conference on Smart Computing (SmartComp)

General Co-Chairs

Hayato Yamana Waseda University, Japan

Franca Delmastro IIT-CNR, Italy

Technical Program Committee Co-Chairs

Dario Bruneo Univ. of Messina, Italy

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Conference Sponsors

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U.S. National Science Foundation

Welcome Message

The tenth IEEE International Conference on Smart Computing (SmartComp 2024), sponsored by the IEEE Computer Society, will be held in-person in Osaka, Japan. It continues the tradition of the previous editions in presenting high-quality research and technology in smart and connected computing.

This year, the conference program covers four days of stimulating content and presentations. This includes a first day with five thematic workshops and a common keynote, and three days of the main conference program with six research paper sessions and one industry paper session. The main conference program also includes two keynote talks, one panel, a poster and demo session, a PhD forum, as well as four excellent tutorials.

IEEE SmartComp 2024 received 81 full manuscript submissions and 4 submissions to the Industry track. From these, we accepted 26 papers for the main track and 2 papers for the Industry track. The industry track was organized by Kyoungsook Kim (AIST, Japan) and Eduard Martin (Telefonica Research, Spain).

The organization of such a complex event requires a major effort, and we wish to express our sincere appreciation to the Organizing Committee members for their excellent work, and to the Steering Committee, including Prof. Giuseppe Anastasi, Prof. Jiannong Cao, and Prof. Sajal Das, for providing their guidance to ensure that SmartComp 2024 satisfies the high-quality standards of this conference series.

We are excited to present the three keynote talks: the first one is entitled "*Toward Enhancing Digital Resiliency*" by Dr. Masugi Inoue (National Institute of Information and Communications Technology (NICT), Japan); the second one by Prof. Niki Trigoni (University of Oxford, UK) entitled "*Cyber Physical Systems in healthcare, transport and emergency response*", and the last one by Prof. Paul Lukowicz (DKFI and University of Kaiserslautern, Germany) entitled "*25 years later: Delivering the promise of wearable computing with generative AI*".

All of them are distinguished experts with a long history of outstanding contributions to the community.

Furthermore, organized by Satoko Itaya (NICT, Japan) and Stephan Sigg (Aalto University, Finland), SmartComp 2024 features a highly interesting panel entitled "*Generative, Creative, Cooperative - The transformative element of AI for Smart Computing*".

The main conference is complemented by a Poster and Demo session organized by Yuki Matsuda (NAIST, Japan) and Francesco Betti Sorbelli (University of Perugia, Italy), and a PhD forum organized by Shameek Bhattacharjee (Western Michigan University, USA) and Debashri Roy (University of Texas at Arlington, USA).

Our special thanks go to the workshop co-chairs Jin Nakazawa (Keio University, Japan) and Eirini Eleni Tsiropoulou (University of New Mexico, USA) for their outstanding work in setting up a very interesting program with five workshops covering several hot topics in smart computing research areas, including big data, IoT Security, artificial intelligence, smart agriculture, smart cities and services, and digital and mobile health.

We thank the Tutorial co-chairs, Keiichi Yasumoto (NAIST, Japan) and Meiyi Ma (Vanderbilt University, USA), for their outstanding contribution to the organization of four strong hands-on interactive tutorials on the following topics: *The Internet of Bio-Nano Things-Smart Computing in the Human Body* from Stefan Fischer (University of Lübeck), *Contactless Physiological Health Sensing: Challenges, Solutions & Opportunities* from Nirmalya Roy (University of Maryland Baltimore County), *Advancing Smart Computing: A Comprehensive Tutorial to 3D Point Clouds* from Tatsuya Amano (Osaka University) and Hamada Rizk (Osaka University, Tanta University), and *Science of Cyber Physical Security in Smart Living Applications* from Sajal K. Das (Missouri University of Science and Technology) and Shameek Bhattacharjee (Western Michigan University).

We also wish to thank all the other members of the Organizing Committee who contributed to making the 10th edition of SmartComp a big success. Specifically, Hirozumi Yamaguchi (Osaka University, Japan), Manato Fujimoto (Osaka Metropolitan University, Japan), and Hiroki Kudo (Kyoto Tachibana University, Japan) provided invaluable help in local organization and registration. Masato Oguchi (Ochanomizu University) and Maciej Zawodniok (Missouri University of Science & Technology, USA) with their great experience in Finance matters have been of tremendous support. Sunyanan Choochotkaew (IBM Research, JAPAN) and Cheng-Hsin Hsu (National Tsinghua University, Taiwan) managed the publication of the conference proceedings in a timely manner, coordinating with chairs of specific events. Ruixiao Li (Waseda University, JAPAN) and Takuya Suzuki (Waseda University) designed the webpage and provided constant and timely updates to it. Takuro Yonezawa (Nagoya University, JAPAN) and Ella Peltonen (University of Oulu, Finland) as publicity and social media co-chairs, widely and effectively publicized the call for papers and the conference program. We thank all the student volunteers who helped us orchestrate the individual sessions of the conference.

We are extremely grateful towards the National Science Foundation for supporting US based students to travel to the conference through 12 student travel grants.

A special thanks to IEEE Computer Society and Missouri S&T supported by NSF (for US-based student travel), and Tateisi Science and Technology Foundation for co-sponsoring the event.

We are excited to present an excellent program and wish all attendees of SmartComp 2024 a very enjoyable and professionally fruitful experience. We look forward to meeting you in Osaka.

May 18th , 2024

Franca Delmastro

IIT-CNR, Italy

Hayato Yamana

Waseda University, Japan

General Co-Chairs

Dario Bruneo

University of Messina, Italy

Dirk Pesch

University College Cork, Ireland

TPC co-chairs

Table of Content

General Information

Wireless Internet Connection

TBA

Poster and Demos

The poster and demo session will be held in the Foyer next to the conference hall located on the 12th floor between 16:45 – 18:00 on Sunday, June 30th (see map on page 8). The presenters are required to display their poster by noon on Sunday, June 30th

Conference Banquet

The conference banquet will be held from 18:30 to 21:00 on the evening of July 1st at the Landmark Square Osaka (1-1 Osaka-Castle, Chuo-ku, Osaka-city) (6 Km from the conference center). It takes around 45 min from the conference venue by train and walk. You can find more detailed information on page 14.

Conference Reception

The reception, Japanese boat course, will be held from 17:45 to 20:00 on the evening of June 29th. Please gather at the Hachikenya Boat Dock no later than 17:40 (1-1 Tenmabashi Kyomachi, Chuo-ku, Osaka-city) (3.5 Km from the conference center). It takes 20 to 25 min from the conference venue by train and walk. You can find more detailed information on page 15.

Note: As the reception is a boat cruise, the number of people allowed on board is limited. Please make sure your name has been added to the name list at the registration desk.

About Osaka

OSAKA INFO

Conference Maps & Directions

Conference Venue

OSAKA INTERNATIONAL CONVENTION CENTER

5-3-51, Nakanoshima Kita-ku, Osaka 530-0005 JAPAN

Tel : +81-06-4803-5555

Link: https://www-gco-co-jp/

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Find more details about terms of use: https://osaka-info.jp/en/photo_library/

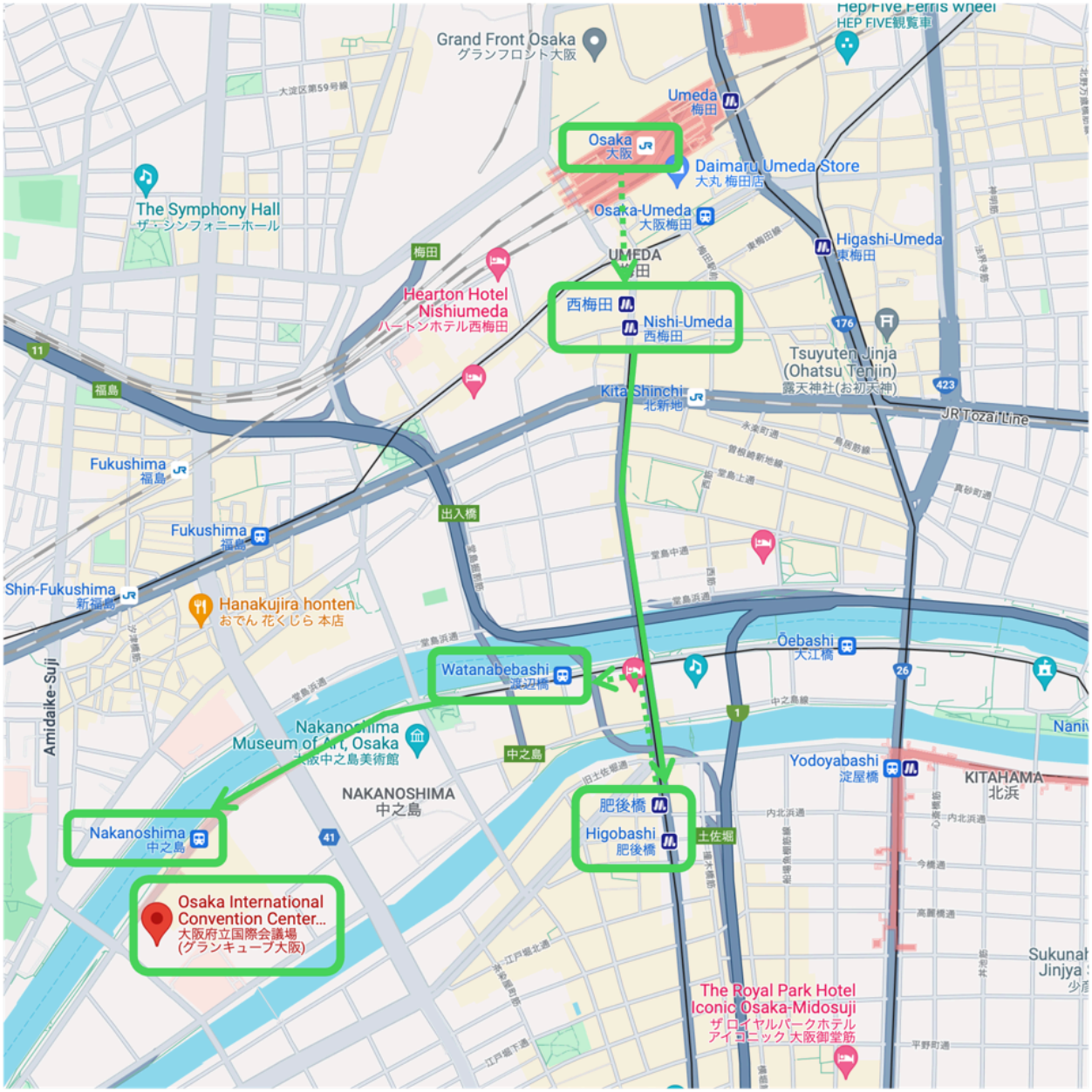
Access

By public transportation, you can check the link below.

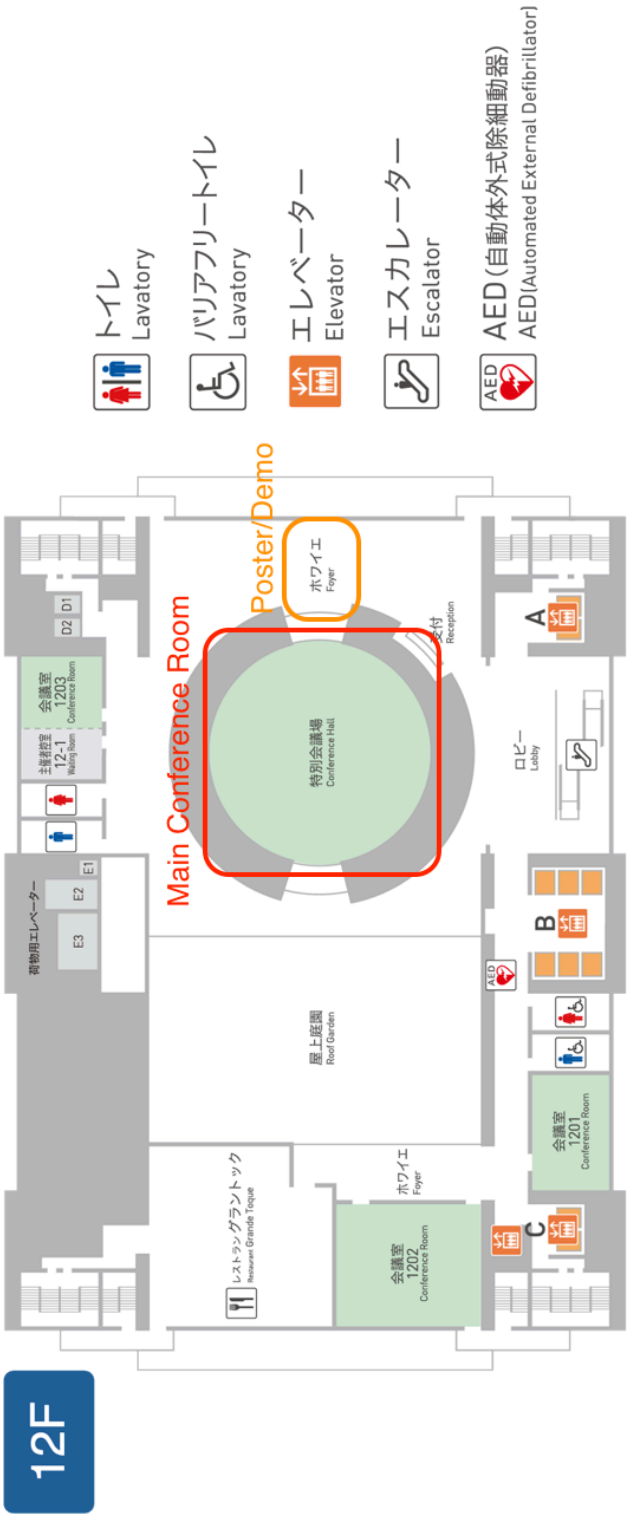
https://www.gco.co.jp/visitor/access/

The following guide for your attendance starting from Osaka Station, involving multiple transfers and walking to reach the Osaka International Convention Center:

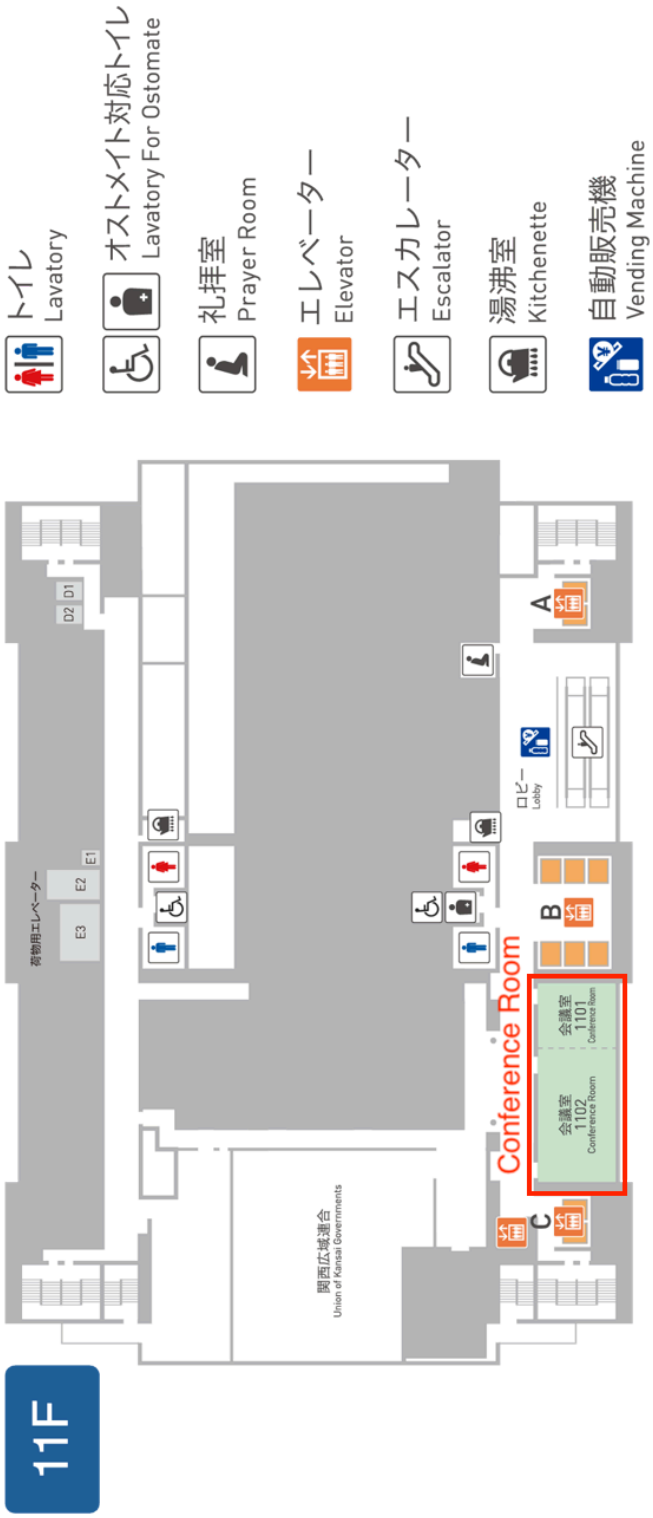
1. Start at Osaka Station: Begin at Osaka Station, one of the major transportation hubs in the city.
2. Walk to Nishi-Umeda Station: Instead of taking a train, walk to Nishi-Umeda Station. This walk takes about 5 minutes as the stations are quite close to each other within the bustling Umeda district.
3. From Nishi-Umeda Station to Higobashi Station: At Nishi-Umeda, board the Yotsubashi Line, marked in blue, towards Suminoekoen. Travel to Higobashi Station, which is just one stop away and takes about 2 minutes.
4. Transfer at Higobashi Station to Watanabebashi Station: Once at Higobashi Station, stay on the Yotsubashi Line and head towards Watanabebashi Station, the very next stop. The journey is brief, typically lasting only 1-2 minutes.
5. Switch to the Keihan Nakanoshima Line at Watanabebashi Station: At Watanabebashi, transfer to the Keihan Nakanoshima Line. Take a train towards Temmabashi and get off at Nakanoshima Station, which is also a short ride of about 2 minutes.
6. Walk to Osaka International Convention Center from Nakanoshima Station: After exiting Nakanoshima Station, it's a 5-minute walk to the Osaka International Convention Center. You can walk west directly along the road or choose a more scenic route through Nakanoshima Park.


Grand Front Osaka
グランフロント大阪
HEP FIVE Ferris wheel
HEP FIVE観覧車
Umeda
梅田
Osaka
大阪
Daimaru Umeda Store
大丸 梅田店
The Symphony Hall
ザ・シンフォニーホール
Osaka-Umeda
大阪梅田
Higashi-Umeda
東梅田
UMEDA
梅田
Hearton Hotel Nishiumeda
ハートンホテル西梅田
西梅田
Nishi-Umeda
西梅田
Tsuyuten Jinja (Ohatsu Tenjin)
露天神社(お初天神)
Kita Shinchi
北新地
JR Tozai Line
Fukushima
福島
Fukushima
福島
出入橋
Shin-Fukushima
新福島
Hanakujira honten
おでん 花くじら 本店
Ōebashi
大江橋
Watanabebashi
渡辺橋
Amidaike-Suji
Nakanoshima Museum of Art, Osaka
大阪中之島美術館
中之島
NAKANOSHIMA
中之島
Yodoyabashi
淀屋橋
KITAHAMA
北浜
肥後橋
Higobashi
肥後橋
土佐堀
Nakanoshima
中之島
Osaka International Convention Center...
大阪府立国際会議場
(グランキューブ大阪)
The Royal Park Hotel Iconic Osaka-Midosuji
ザ ロイヤルパークホテル アイコニック 大阪御堂筋

Meeting Floor - 12F

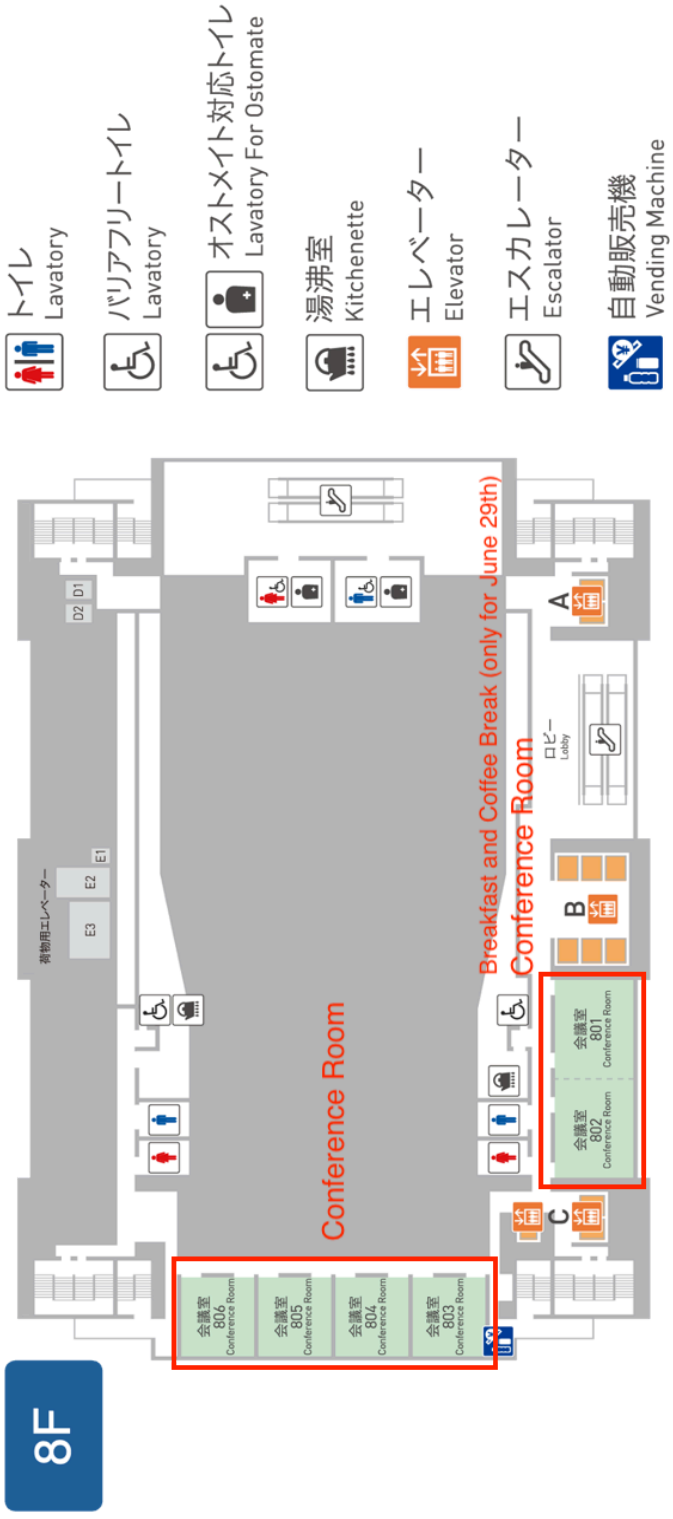


Meeting Floor - 11F



Meeting Floor - 10F

Meeting Floor - 8F

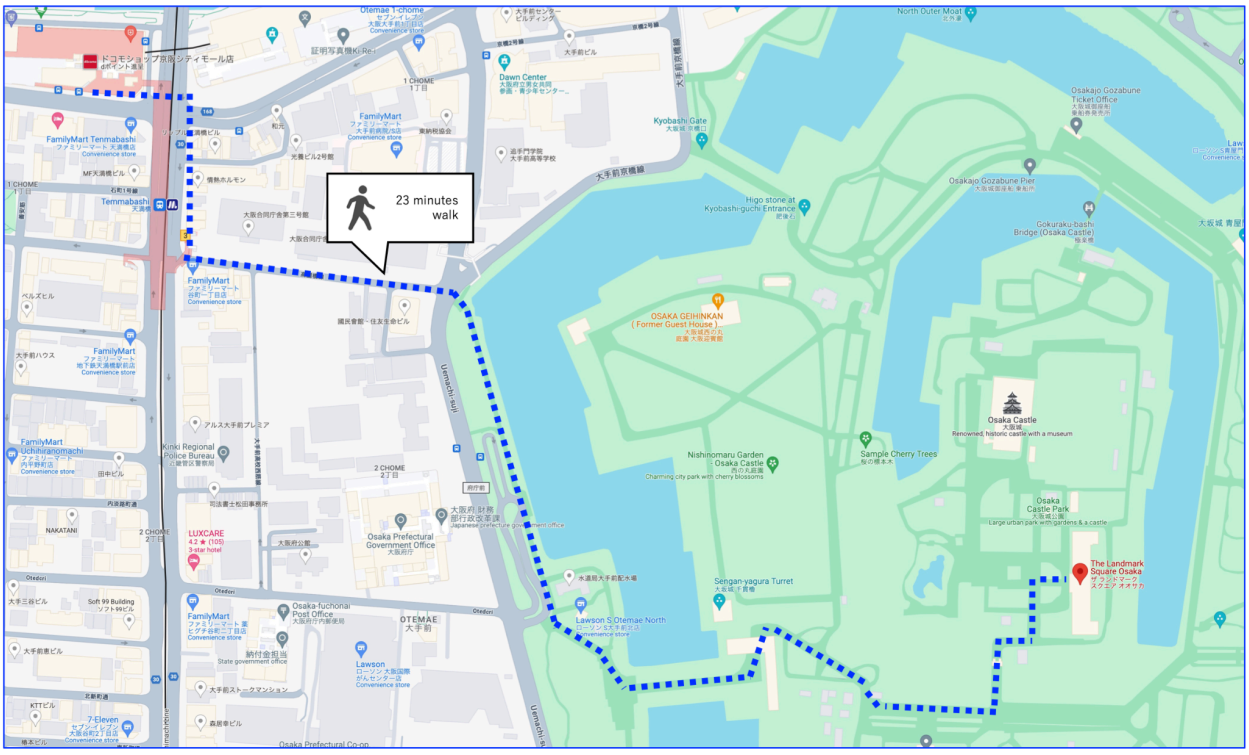


Banquet (JULY 1, 2024)

The conference banquet will be held on the evening of July 1st at "The LANDMARK SQUARE OSAKA," a stately historical building featuring classical red bricks in Romanesque style. The venue is located in Osaka Castle Park, a vast urban park in the heart of Osaka. From the banquet hall, guests can enjoy views of Osaka Castle, one of the city's most iconic symbols. Visitors can spend a fantastic evening admiring the majestic castle tower, which is rich in history. For more details, please visit the following website: https://www.landmark-osaka.com/

Route to Banquet Venue:

Take a train from Keihan Nakanoshima Station, which is a four-minute walk from the conference venue, and get off at Keihan Tenmabashi Station, which is four stops away. After that, take Exit #14 of Tenmabashi Station and walk to the banquet venue, which will take about 23 minutes on foot.



Exterior view of Banquet Venue

Banquet Area (LOTUS)

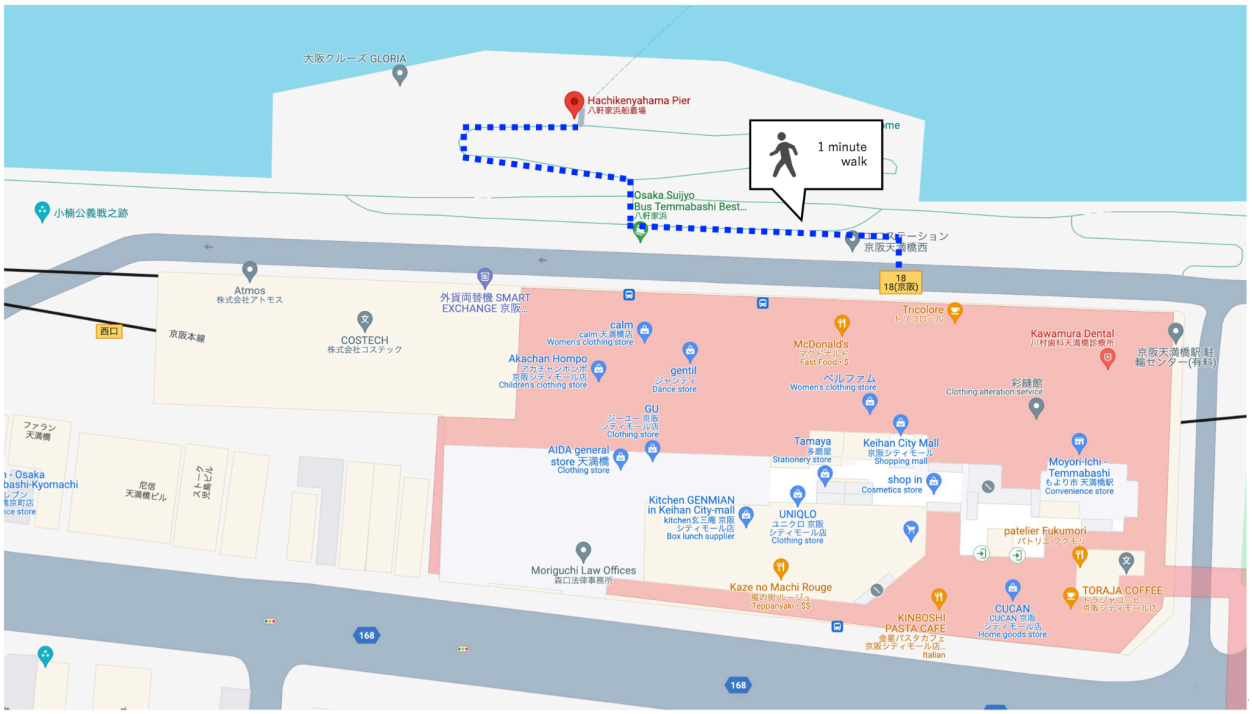
The LANDMARK SQUARE OSAKA Logo

Reception (JUNE 29, 2024)

The reception will be held on the evening of June 29th. Hachikenyahama Pier, the starting point of the reception, is known as a prosperous landing place for the 30-koku boat, which connected Kyoto and Osaka during the Edo period (reference: https://osaka-info.jp/spot/hachikenya-boat-dock/). For this reception, we will offer a two-hour Japanese boat tour of the Okawa River, which will take you to Hachikenyahama, Temmabashi, the Osaka Mint Bureau, Sakuranomiya Bridge, and Kema Lock Gate. Enjoy the cityscape and the extraordinary elegance of the boat ride.

Route to Starting Point of Reception:

Take a train from Keihan Nakanoshima Station, which is a four-minute walk from the conference venue, and get off at Keihan Tenmabashi Station, which is four stops away. After that, take Exit #17 or #18 of Tenmabashi Station and walk to the reception venue, which will take about 1 minute on foot.



Appearance of the Japanese-style Boat (Note: The type of boat may change on the day of the event)

Inside the Japanese-style Boat

Conference Organization Committee

Organization Committee

General Co-Chairs

Hayato Yamana, Waseda University, Japan

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Hiroki Kudo, Kyoto Tachibana University, Japan

Workshop Chairs

Jin Nakazawa, Keio University, Japan

Eirini Eleni Tsiropoulou, University of New Mexico, United States

Tutorial Co-Chairs

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Meiyi Ma, Vanderbilt University, United States

Panel Co-Chairs

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Stephan Sigg, Aalto University, Finland

Industry Track Chair

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Ruixiao Li, Waseda University, Japan

Takuya Suzuki, Waseda University, Japan

Poster and Demo Chairs

Yuki Matsuda, Nara Institute of Science and Technology, Japan

Francesco Betti Sorbelli, University of Perugia, Italy

PhD Forum Chairs

Shameek Bhattacharjee, Western Michigan University, United States

Debashri Roy, University of Texas at Arlington, United States

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Jiannong Cao, Hong Kong Polytechnic University, Hong Kong

Sajal K. Das, Missouri University of Science and Technology, United States

Technical Program Committee

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Paolo Bellavista, University of Bologna

Francesco Betti Sorbelli, University of Perugia

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Shuvra Bhattacharyya, University of Maryland

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Jin Nakazawa, Keio University

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Le Nguyen Ngu Nguyen, University of Oulu

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Gregor Schiele, University of Duisburg-Essen

Francisco Silva, UFMA

Simone Silvestri, University of Kentucky

Eirini Eleni Tsiropoulou, University of New Mexico

Carlo Vallati, University of Pisa

Hirozumi Yamaguchi, Osaka University

Keiichi Yasumoto, Nara Institute of Science and Technology

Industry Track

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Suryadipta Majumdar, Concordia University

Luis Munoz, Telefonica Research

Yoshihiro Osakabe, Hitachi Ltd.

Martin Saerbeck, TUV SUD

Eric Simmon, National Institute of Standards and Technology

Gürkan Solmaz, NEC Laboratories Europe

Dimitra Tsigkari, Telefonica Research

Poster/Demo Track

Hyuckjin Choi, Kyushu University

Federico Corò, University of Padova

Yu Enokibori, Nagoya University

Sajjad Ghobadi, University of Perugia

Teruhiro Mizumoto, Osaka University

Yugo Nakamura, Kyushu University

Ayumi Ohnishi, Kobe University

Lorenzo Palazzetti, University of Florence

Ko Watanabe, University of Kaiserslautern

Yasue Kishino, NTT Communication Science Laboratories

Program Agenda

Mentoring Session

Saturday, June 29th

08:00 - 08:45	**Venue will open & Breakfast(Provided) / Registration**	**801 & 802 8F**
08:45 - 09:45	**Common WS Keynote 1: Toward Enhancing Digital Resiliency** *Dr. Masugi Inoue*	**Conf. Hall 12F**
09:45 - 10:15	**Break**	
10:15 - 12:15	**Workshop**	
	SSC	804 8F
	SmartAgr	Conf. Hall 12F
	SmartSys	805 8F
	DM-SmartHealth	803 8F
	BITS	806 8F
12:15 - 13:15	**Lunch**	**801 & 802 8F**
13:15 - 14:15	**Workshop**	
	SSC	804 8F
	SmartAgr	Conf. Hall 12F
	SmartSys	805 8F
	Mentoring Session (Closed Session)	806 8F
14:15 - 14:45	**Coffee Break**	**801 & 802 8F**
14:45 - 16:45	**Tutorial 1: The Internet of Bio-Nano Things -Smart Computing in the Human Body** *Prof. Stefan Fischer*	**803 8F**
	Tutorial 2: Contactless Physiological Health Sensing: Challenges, Solutions & Opportunities *Prof. Nirmalya Roy and Ph.D. candidate Zahid Hasan*	**Conf. Hall 12F**

16:45 - 17:45	**Move to Reception Site**
17:45 - 20:00	**Reception (Japanese Boat Course) * Eligibility must be confirmed at the registration desk**

Sunday, June 30th

08:00 - 08:45	**Venue will open & Breakfast(Provided) / Registration**	**Foyer 12F**
08:45 - 10:00	**Opening & Keynote 2: Cyber Physical Systems in Healthcare, Transport and Emergency Response** *Prof. Niki Trigoni*	**Conf. Hall 12F**
10:00 - 10:15	**Break**	
10:15 - 12:15	**Session 1 Smart Computing for Smart Cities** **POSCA: Path Optimization for Solar Cover Amelioration in Urban Air Mobility** *Debjyoti Sengupta, Anurag Satpathy and Sajal K. Das* **A Graph Neural Network Framework for Imbalanced Bus Ridership Forecasting** *Samir Amitkumar Gupta, Agrima Khanna, Jose Talusan, Anwar Said, Dan Freudberg, Ayan Mukhopadhyay and Abhishek Dubey* **iFair: Achieving Fairness in the Allocation of Scarce Resources for Senior Health Care** *Modeste M Kenne, Prasanna Date, Ronald Eguchi, Zhenghui Hu, Julie Rousseau and Nalini Venkatasubramanian* **Towards Enhanced Urban Management: Introducing A Model for Autonomic Smart City Management** *Elham Okhovat and Michael A. Bauer* **A method for city-wide PoI-level congestion prediction via assimilation of actual and simulation-based PoI congestion data** *Haruka Sakagami, Osamu Yamada, Yuki Matsuda, Hirohiko Suwa and Keiichi Yasumoto*	**Conf. Hall 12F**
12:15 - 13:15	**Lunch**	**Foyer 12F**
13:15 - 15:15	**Session 2 Smart Computing Applications** **RATTLE: Train Identification through Audio Fingerprinting** *Leonardo Ciabattini, Luca Sciullo, Alfonso Esposito, Ivan Zyrianoff and Marco Di Felice* **ContextGPT: Infusing LLMs Knowledge into Neuro-Symbolic Activity Recognition Models** *Luca Arrotta, Claudio Bettini, Gabriele Civitarese and Michele Fiori*	**Conf. Hall 12F**

	AMPHI: Adaptive Mission-Aware Microservices Provisioning in Heterogeneous IoT Settings *Yuqiao Li, Fangqi Liu, Cheng-Hsin Hsu, Nalini Venkatasubramanian* **Distributed Radiance Fields for Edge Video Compression and Metaverse Integration in Autonomous Driving** *Eugen Šlapak and Matúš Dopiriak, Mohammad Al Faruque, Juraj Gazda and Marco Levorato* **Sharing the Edge: System Status Aware Object Recognition Task Offloading** *Chenyang Wang, Owen Eicher and Qi Han*	
15:15 - 15:45	**Coffee Break**	**Foyer 12F**
15:45 - 16:45	**Industry Session**	**Conf. Hall 12F**
16:45 - 18:00	**Poster/Demo Session + PhD Forum Poster**	**Foyer 12F**
18:00 - 19:00	**Town Hall Meeting** **Invited Speaker: Toward High-Assurance Learning-Enabled Cyber-Physical Systems** *Prof.Insup Lee, PRECISE Center,Department of Computer and Information Science, University of Pennsylvania*	**Conf. Hall 12F**

Monday, July 1st

08:00 - 08:45	**Venue will open & Breakfast(Provided) / Registration**	**Foyer 12F**
08:45 - 09:45	**Keynote 3: 25 years later: Delivering the promise of wearable computing with generative AI** *Prof. Paul Lukowicz*	**Conf. Hall 12F**
09:45 - 10:15	**Break**	
10:15 - 12:15	**Session 3 Smart resource management and optimization** **Enhancing UAV Operational Efficiency through Cloud Computing and Autopilot System Integration** *Luca D'Agati, Francesco Longo, Giovanni Merlino, Antonio Puliafito and Giuseppe Tricomi* **Water-COLOR: Water-COnservation using a Learning-based Optimized Recommender** *Guang Xue Zhang, David L. Feldman, Yiming Lin, Sharad Mehrotra and Nalini Venkatasubramanian, Thayer Drew and Kim Sentovich and Owen Veranth* **From Calls to Scales: Harnessing Smartphone for Daily Mass Measurement** *Hamada Rizk, Merna Hesham and Moustafa Youssef* **Cost-based Modeling and Optimization of Secure Matrix Multiplication in the Cloud** *Richard Hernandez, Kemal Akkaya and Soamar Homsi* **Optimizing Risk-averse Human-AI Hybrid Teams** *Andrew S Fuchs, Andrea Passarella and Marco Conti*	**Conf. Hall 12F**
12:15 - 13:15	**Lunch**	**Foyer 12F**
13:15 - 15:15	**Tutorial 3: Advancing Smart Computing: A Comprehensive Tutorial to 3D Point Clouds** *Asst. Prof. Tatsuya Amano, Assoc. Prof. Hamada Rizk*	**1101 & 1102 11F**
	Tutorial 4: Science of Cyber Physical Security in Smart Living Applications *Prof. Sajal K. Das, Asst. Prof. Shameek Bhattacharjee*	**Conf. Hall 12F**
15:15 - 15:45	**Coffee Break**	**Foyer 12F**

15:45 - 17:05	**Session 4 Best paper candidates**	**Conf. Hall 12F**
	An MCS Navigation System Based on Road Surface Quality for Bicycle Riders *Federico Montori, Rocco Pastore, Luca Sciullo and Luciano Bononi and Luca Bedogni* **Clustering-Enhanced Reinforcement Learning for Adaptive Offloading in Resource-Constrained Devices** *Khoa Anh Tran, Nguyen Do Van, Minh-Son Dao and Koji Zettsu* **PREDEA: Predicted-RoI based Resource-Efficient Object Detection with Aggregation** *Yoshikazu Watanabe, Seiya Shibata and Takashi Takenaka* **TASR: A Novel Trust-Aware Stackelberg Routing Algorithm to Mitigate Traffic Congestion** *Doris E M Brown, Venkata Sriram Siddhardh Nadendla and Sajal K. Das*	
17:05 - 18:30	**Move to Banquet Site**	
18:30 - 21:00	**Banquet**	**The Landmark Square Osaka**

Tuesday, July 2nd

08:00 - 08:45	**Venue will open & Breakfast(Provided) / Registration**	**Foyer 12F**
08:45 - 10:15	**Panel: Generative, Creative, Cooperative – The transformative element of AI for Smart Computing** *Prof. Takashi Takenaka, Prof. Qi Han, Prof. Sozo Inoue and Prof. Gregor Schiele*	**Conf. Hall 12F**
10:15 - 10:45	**Break**	
10:45 - 12:15	**Session 5 Federated Learning for Networked Systems** **DP-MTFL: Differentially Private Multi-Tier Federated Learning for IoT applications** *Ramin Soleimani and Dirk Pesch* **FMLFS: A federated multi-label feature selection based on information theory in IoT environment** *Afsaneh Mahanipour and Hana Khamfroush* **Towards Opportunistic Federated Learning Using Independent Subnetwork Training** *Victor Romero II, Tomokazu Matsui, Yuki Matsuda, Hirohiko Suwa and Keiichi Yasumoto*	**Conf. Hall 12F**
12:15 - 13:15	**Lunch**	**Foyer 12F**
13:15 - 15:00	**Session 6 Smart Computing for Security and Anomaly Detection** **Explainable Deep Learning Models for Dynamic and Online Malware Classification** *Quincy Card, Daniel Simpson, Kshitiz Aryal, Maanak Gupta and Sheik R Islam* **Leveraging Homeostatic Plasticity to Enable Anomaly Detection in Spiking Neural Networks** *Rawan M. A. Nawaiseh, Fabrizio De Vita, Enrico Catalfamo and Dario Bruneo* **On the Role of Re-Descending M-estimators in Resilient Anomaly Detection for Smart Living CPS** *Sahar Abedzadeh and Shameek Bhattacharjee*	**Conf. Hall 12F**

	A Domain-Specific Tool for the Creation of Machine Learning Models with Imbalanced Datasets *Dmitrii Fomin, Philippe Lalanda and Denis Morand*	
15:00 - 15:30	**Coffee Break**	**Foyer 12F**
15:30 - 16:45	**PhD Forum**	**1008 10F**
17:00 -	**Adjourn**	

Keynote Presentations

Keynote 1: Toward Enhancing Digital Resiliency

Chair: Hayato YAMANA, Waseda University, Japan

Time: June 29th, 8:45 - 9:45

Location: Conf. Hall (12F)

Presenter: Dr. Masugi Inoue, Director General of Resilient ICT Research Center, National Institute of Information and Communications Technology (NICT), Japan

Abstract:

Thirteen years have passed since the Great East Japan Earthquake. During that time, efforts have been made to strengthen the information and telecommunications infrastructure and research and development for this purpose. However, the Noto Peninsula earthquake that occurred on January 1 this year once again recognized the vulnerability of the infrastructure, as in the previous earthquake, although the emergency recovery response of the telecommunications environment has improved from 13 years ago. Connected cars, drones, HAPS, and satellite constellations are essential to the layering of information and communication resilience, but the existing infrastructure that is the foundation of those systems has multiple vulnerabilities. After reviewing them and research trends in resilient information and communication networks, this presentation will introduce the research and development being undertaken at NICT. NerveNet, a regional digital and telecommunications infrastructure with enhanced resilience, has recently begun to be used as both a normal and emergency network in Shirahama Town, Wakayama Prefecture, and Nobeoka City, Miyazaki Prefecture. A network based on the “Die-Hard Network” concept, which is capable of carrying and delivering data in a bucket relay fashion even in the event of a complete loss of communication, is in use in Konan City, Kochi Prefecture, and research and development is still ongoing for systems that can be used by the Self-Defense Forces, police, fire departments, and other agencies that are in actual operation at the time of disaster. The presentation will consider how ICT can improve the resilience of society.

Biography:

Dr. Masugi Inoue, Director General of Resilient ICT Research Center, National Institute of Information and Communications Technology (NICT), Japan

Masugi Inoue graduated from Kyoto University in 1992, received his Dr. Eng. degree from The University of Tokyo in 1997, and joined the Communications Research Laboratory (CRL) of the

Ministry of Posts and Telecom, Tokyo, Japan, which is now NICT. He was involved in the research and development of the world fastest WLAN in MM-wave bands, common-signaling MIRAI architecture for heterogeneous networks in the 4G era, ID-locator split architecture called HIMALIS for future Internet, a resilient information and communications platform system called NerveNet, etc. He also worked for international cooperation through the operation of Joint Research Programs such as ASEAN IVO, Japan-US called JUNO and Japan-EU under HORIZON 2020. He has been in his current position since April 2021. He was a visiting researcher at Polytechnic University, New York, in 2000 – 2001. He received the Best Paper Award from IPSJ in 2006 and 2007, the Young Scientists' Prize in 2007 and the Prize for Science and Technology in 2019 from the Minister of Education, Culture, Sports, Science and Technology, the ITU-AJ Accomplishment Award in 2020, etc. He has been serving as Director of Finance of IEICE (a member of the board) and previously served as Chairman of the Technical Committee on Mobile Network and Applications, Director of General Affairs, Director of Finance and so on in the IEICE Communications Society. He is a fellow of IEICE and a member of IEEE.

Keynote 2: Cyber Physical Systems in Healthcare, Transport and Emergency Response

Chair: Dirk Pesch, University College Cork, Ireland

Time: June 30st, 8:45 - 10:00

Location: Conf. Hall (12F)

Presenter: Prof. Niki Trigoni (University of Oxford, UK)

Abstract:

Cyber physical systems have widespread application in a multitude of smart city applications. In this talk, I will present our experiences and lessons learnt from cyber physical systems in three different settings: healthcare, transport, and emergency response. I will present some of the key challenges faced by sensing, scene understanding and coordination algorithms, including lack of sensing infrastructure, sparsity of training data and dynamic changes in sensing quality and connectivity. I will then present recent research directions that we have pursued to address these challenges including multi-modal sensing, cross modality training and domain adaptation techniques.

Biography:

Prof. Niki Trigoni (University of Oxford, UK)

Niki Trigoni is Professor at the Oxford Department of Computer Science, heading the Cyber Physical Systems Group. Her interests lie in the tight integration of sensing and machine intelligence for context inference, control and human-machine interaction. She has applied her work to a number of application scenarios, including mobile autonomy, asset monitoring, and localisation systems for emergency situations, as well as workforce safety and efficiency. Trigoni has founded and served from 2014-2019 as Director of the Centre for Doctoral Training on Autonomous and Intelligent Machines and Systems. Driven by her passion for research translation, in 2015, she founded Navenio Ltd, a deep tech Oxford spinout on infrastructure free indoor positioning, and a 2020 KPMB Best British Tech Pioneer. In 2020, she won the CTO of the Year award at the UK's Women in IT Awards, demonstrating impact from translating positioning tech to improve efficiency in the healthcare sector.

Keynote 3: 25 years later: Delivering the promise of wearable computing with generative AI

Chair: Franca Delmastro, IIT-CNR, Italy

Time: July 1st, 8:45 - 9:45

Location: Conf. Hall (12F)

Presenter: Prof. Paul Lukowicz (DFKI and University of Kaiserslautern, Germany)

Abstract:

For nearly three decades now Wearable Computing has been promoted as the next step in the evolution of personal devices. The vision builds on a combination of advanced context awareness, unobtrusive multimodal input and head mounted displays to provide “any time any place” access to digital information and a seamless fusion of the digital and physical worlds. While with smart watches, sensor enabled earbuds and even rings individual wearable devices have become common, the broader vision of ubiquitous intelligent assistance acting at the interface of the physical and the digital world to continually support human actions and interactions in all situations is still far from reality. Despite many attempts head mounted displays (HMD), the hallmark of wearables, have never caught on.

In the talk I will argue that the above is less due to hardware limitations, including the limitations of current HMDs,than to the limited ability of current systems to adequate recognize and adapt to complex dynamic, real world situations. Context recognition systems are trained to recognize predefined lists of narrowly defined aspects of the environment, rather then being able to comprehensively interpret the situation around the user. Assistive functionalities tend to be limited to static sets of actions “hard wired” to such narrowly defined situations.

Emerging generative AI systems in particular multimodal foundational models, promise to be able to change that. Vision enabled LLMs are already able to provide rich descriptions of complex real world scenes. From such descriptions they can also generate flexible actions plans taking into account user profiles and processing advanced multimodal input (speech gesture etc). This will finally enable the original wearable vision of ubiquitous always on assistants and the fusion of the digital and physical world in users’s every day life.

Biography:

Prof. Paul Lukowicz (DKFI and University of Kaiserslautern, Germany)

Prof. Dr. Paul Lukowicz is a Full Professor of AI at the RPTU in Kaiserslautern, Germany and at the same time Scientific Director at DFKI Kaiserslautern, where he heads the Embedded Intelligence group. His research focuses on context-aware ubiquitous and wearable systems, quantum computing, and human-AI interaction,

including sensing, machine learning, system architectures, large-scale-to-edge systems, and applications. He is the Coordinator of the HumanE AI-Net, a large networking project with more than 50 European partners and acts as Editor for various scientific publications. He has served on more than 50 program committees (including TPC Chair) at high-quality international conferences of all the main conferences within his research area.

Invited Speaker

Toward High-Assurance Learning-Enabled Cyber-Physical Systems

Chair: Sajal K. Das, Missouri University of Science and Technology, USA

Time: June 30th, 18:00-18:30

Location: Conf. Hall (12F)

Presenter: Prof.Insup Lee, PRECISE Center,Department of Computer and Information Science, University of Pennsylvania

Abstract:

Learning-Enabled Cyber-Physical Systems are becoming increasingly essential to society. Many advances have been made in the last decade in constructing autonomous Cyber-Physical Systems (CPS), as evidenced by the proliferation of unmanned systems in air, ground, and sea. These advances have been driven by innovations in several areas, such as computing platform technologies, control theory, design methods and tools, machine learning, modeling, and simulation technologies, among others. In particular, machine learning provides a potentially revolutionary way of extracting functionalities needed for higher-level autonomy. Unfortunately, our current lack of understanding of when and how machine learning works makes it challenging to provide guarantees for learning-enable components in safety-critical systems. Despite this limitation, given the impressive experimental results of machine learning, researchers have quickly incorporated learning in perception-action loops, even in driverless cars and aerial vehicles, where the safety requirements are very high. This has resulted in unreliable behavior and public failures (e.g., Tesla and drone crashes, Uber running a red light) that may lead to a loss of trust in autonomy.

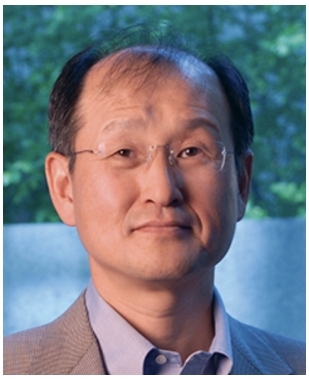
There are many challenges in developing autonomous Learning-Enabled CPS that are safe and secure. This talk will present assurance problems, challenges, and techniques. They include safety verification of closed-loop systems with neural network components, confidence estimation and composition at runtime, assumption monitoring and checking of CPS, Out-of-Distribution (OOD) detection and adversarial digital and physical attack detection, and CPS checkpointing and recovery.

Biography:

Prof.Insup Lee, PRECISE Center,Department of Computer and Information Science, University of Pennsylvania

Insup Lee is Cecilia Fitler Moore Professor of Computer and Information Science and Director of PRECISE Center since 2008 at the University of Pennsylvania. He also holds a

secondary appointment in the Department of Electrical and Systems Engineering. His research interests include cyber-physical systems (CPS), real-time systems, embedded systems, high-confidence medical device systems, formal methods and tools, run-time verification, and adversarial learning. The theme of his research activities has been to assure and improve the correctness, safety, and timeliness of life-critical embedded systems. His papers received the nine best conference paper awards. Recently, he has been working in Internet of Medical Things, security of cyber physical systems, and safe autonomy.



He has served on many program committees, chaired many international conferences and workshops, and served on various steering and advisory committees of technical societies. He is founding co-Editor-in-Chief of ACM Transactions on Computing for Healthcare (HEALTH, 2018) and was founding co-Editor-in-Chief of KIISE Journal of Computing Science and Engineering (JCSE, 2007). He has also served on the editorial boards on the several scientific journals, including Journal of ACM, ACM Transactions on Cyber-Physical Systems, IEEE Transactions on Computers, Formal Methods in System Design, and Real-Time Systems Journal. He was founding Co-Director of Penn Health Tech (2017-2020). He was Chair of ACM Special Interest Group on Embedded Systems (SIGBED, 2015-2019) and Chair of IEEE TC on Real-Time Systems (TCRTS, 2003-2004). He was a member of Technical Advisory Group (TAG) of President's Council of Advisors on Science and Technology (PCAST) Networking and Information Technology (2006-2007). He was a member of the National Research Council's committee on 21st Century Cyber-Physical Systems Education (2014-2015). He received IEEE TC-RTS Outstanding Technical Achievement and Leadership Award in 2008. He received an appreciation award from Ministry of Science, IT and Future Planning, South Korea in 2013. His work received the Runtime Verification (RV) Test-of-Time award in 2019. He received ACM SIGBED Distinguished Leadership Award in 2022 and IEEE Technical Committee on Cyber-Physical Systems (TCCPS) Distinguished Leadership Award in 2023. He is ACM fellow, IEEE fellow and AAAS fellow.

Tutorial

Tutorial 1: The Internet of Bio-Nano Things -Smart Computing in the Human Body

Time: June 29th, 14:45 – 16:45

Location: 803 (8F)

Presenter: Prof. Stefan Fischer, the University of Lübeck, Germany

Abstract:

The Internet of Bio-Nano Things (IoBNT) is an innovative field of research located at the intersection of nanotechnology, biotechnology and information and communication technologies. It aims to enable the seamless integration of biological and nanoscale systems into the Internet in order to develop advanced biomedical applications, environmental monitoring sensors and energy-efficient networks. At the core of IoBNT are biocompatible nanodevices that can function in living organisms to monitor or modify specific biological processes in real time. These devices communicate with each other and with the Internet to collect, process and transmit data, opening up entirely new possibilities for health monitoring, disease control, environmental protection and many other areas. By merging biology and nanotechnology, IoBNT promises to push the boundaries of what is technically possible while improving the efficiency and sustainability of technological solutions.

This tutorial first introduces the basics of IoBNT. It explains the basic requirements and existing technologies and looks at a number of example applications, primarily medical applications. In the main part, DNA-based nanonetworks are presented as a promising implementation technology. Before providing an outlook, further concepts are addressed, which focus in particular on gateways between communication inside and outside the body.

Biography:

Prof. Stefan Fischer, the University of Lübeck, Germany

Stefan Fischer is a full professor in Computer Science at the University of Lübeck, Germany, and the director of the Institute for Telematics. He got his doctoral degree in Computer Science from the University of Mannheim, Germany, in 1996, respectively. He held positions at the International University in Germany as an assistant professor and at the Technical University of Braunschweig as an associate professor, until he joined Lübeck University in 2004. His research interest is focused on network and

distributed system structures such as Internet of Things and nano communications in these fields. He has (co-)authored more than 200 scientific books and articles.

Tutorial 2: Contactless Physiological Health Sensing: Challenges, Solutions & Opportunities

Time: June 29th, 14:45 – 16:45

Location: Conf. Hall (12F)

Presenter: Prof. Nirmalya Roy, University of Maryland Baltimore County, USA

Ph.D. candidate Zahid Hasan, University of Maryland Baltimore County, USA

Abstract:

Contactless health monitoring techniques, such as Remote Photoplethysmography (rPPG) and video-based Respiratory Rate (RR) estimation have emerged as promising methods utilizing regular camera sensors for capturing vital signs like Heart Rate (HR) and Respiratory Rate (RR). These approaches offer cost-effective, widely applicable, and safe solutions for regular and long-term health monitoring. However, the primary challenge lies in extracting accurate vital signals from the captured videos due to their low signal-to-noise ratios.

In this tutorial, we aim to provide a comprehensive background on rPPG and video-based heart rate estimation, covering signal acquisition and physics-inspired estimation principles. We will discuss signal-processing approaches and their limitations. We will delve into DL-based estimation systems, addressing the challenge of inherent aleatoric uncertainty (irreducible uncertainty from various stochastic factors like sensor variations and inter-subject differences) in the ground truth data annotation that hinders the development of generalized deep learning-based rPPG estimation system. To reinforce a robust DL model addressing these inherent uncertainties in rPPG data streams, we will discuss three novel deep-learning approaches – a multi-task learning method, a self-supervised learning method, and a generative adversarial network-based architecture for rPPG estimation. Furthermore, we will demonstrate a real-time heart rate estimation system, RhythmEdge, using a low-cost camera sensor and describe the rPPG-specific pruning techniques to reduce rPPG model size for efficient edge implementation. We will conclude the tutorial with existing research gaps and potential directions in contactless rPPG and respiratory rate estimation research.

Biography:

Prof. Nirmalya Roy, University of Maryland Baltimore County, USA

Dr. Nirmalya Roy is a Professor in the Information Systems department and the director of the Mobile, Pervasive and Sensor Computing Lab at the University of Maryland, Baltimore County. He is also the associate director of the Center for Real-time Distributed Sensing

and Autonomy (CARDS) at UMBC. His current research interests include use-inspired AI/ML and human-centric data science with applications to smart health, cyber-physical systems, IoT, robotics and autonomy. He received his B.E., M.S. and Ph.D. degrees in Computer Science and Engineering from Jadavpur University in 2001, and the University of Texas at Arlington in 2004 and 2008, respectively. More information about his research can be found at https://mpsc.umbc.edu/.

Ph.D. candidate Zahid Hasan, University of Maryland Baltimore County, USA

Mr. Zahid Hasan is a Ph.D. candidate under the supervision of Dr. Nirmalya Roy in the Information Systems department at the University of Maryland, Baltimore County. His research interests include video information retrieval and contactless physiological health monitoring using camera sensors. As the student lead of this project, he has pioneered the development of deep learning models for rPPG estimation, addressing the challenge of uncertainty associated with ground truth data annotation. More information about his research can be found at https://mxahan.github.io/digital-cv/.

Tutorial 3: Advancing Smart Computing: A Comprehensive Tutorial to 3D Point Clouds

Time: July 1st, 13:15 - 15:15

Location: 1101 & 1102 (11F)

Presenter: Asst. Prof. Tatsuya Amano, Osaka University, JAPAN

Assoc. Prof. Hamada Rizk, Osaka University, JAPAN and Tanta University, Egypt

Abstract:

3D point clouds from LiDAR sensors have emerged as a powerful representation for understanding and interacting with the surrounding environment in smart computing systems. This tutorial aims to provide an overview of fundamental techniques, considerations, and applications of 3D point cloud recognition, with a focus on both deep learning and non-deep learning approaches. We will begin by introducing the unique characteristics and challenges of point cloud processing, highlighting the differences from traditional image-based approaches. Through the example of PointNet, a pioneering deep learning model for point cloud recognition, we will discuss the specific considerations and best practices for handling point cloud data. Recognizing the limitations of deep learning in

resource-constrained and mobile environments, we will also explore alternative statistical and probabilistic techniques, such as Fisher Vector-based approaches, which enable efficient and lightweight point cloud processing and context recognition. These techniques are particularly relevant for smart computing applications that require real-time processing on edge devices and in Internet of Things scenarios.

The tutorial will also showcase various applications of point cloud recognition in smart computing contexts. We will showcase a case study of Osaka University smart campus, where we have deployed a large-scale pedestrian tracking system using a network of approximately 70 LiDAR sensors. Additionally, we will discuss the use of point clouds for remote space sharing in extended reality (XR) applications, demonstrating how point cloud recognition enables immersive and interactive experiences.We will also present a case study of our LiDAR mobile device (hitonavi-μ).

Biography:

Asst. Prof. Tatsuya Amano, Osaka University, JAPAN

Tatsuya Amano is an Assistant Professor at Osaka University, Japan. He received M.E. Degree and Ph.D. in Information and Computer Science from Osaka University in 2018 and 2021, respectively. He was a young research fellow (DC1) of the Japan Society for the Promotion of Science (JSPS) from2018 to 2021. His research interests include spatial computing, smart city, and mobile computing.Since 2023, he has been an PRESTO Researcher, Japan Science and Technology Agency (JST). He is a member of IEEE, IPSJ (Information Processing Society of Japan), and IEICE (Institute of Electronics, Information and Communication Engineers).

Assoc. Prof. Hamada Rizk, Osaka University, JAPAN and Tanta University, Egypt

Hamada Rizk (Associate Professor, IEEE Senior Member) received the M.E. and Ph.D. degrees in computer science and engineering from Tanta University and E-JUST in 2016 and 2020, respectively. He is with Osaka University, Japan and Tanta University, Egypt. He has been working in mobile and pervasive computing, spatial intelligence, and AI research areas. He has been involved in several projects funded by many academic and industrial organizations such as NTRA Egypt, Uber, USA, ASTEP JST, Kakenhi JSPS, NVIDIA, Japan, etc. He has authored several publications in top journals and conferences and holds a number of patents. Hamada is the recipient of the silver medal in the 2019th ACM SigSpatial competition held in Chicago and was honored as an outstanding young researcher by the HLF foundation, Germany (2019), and by Google (2019 & 2020), among other awards.

Tutorial 4: Science of Cyber Physical Security in Smart Living Applications

Time: July 1st, 13:15 - 15:15

Location: Conf. Hall (12F)

Presenter: Prof. Sajal K. Das, Missouri University of Science and Technology, USA

Asst. Prof. Shameek Bhattacharjee, Western Michigan University, USA

Abstract:

The vision behind community-scale smart living applications is to use sensor-actuator devices, the so-called Internet of Things (IoT), to generate sensing data that provide situational awareness of the physical world to improve the quality of human life at the city scale. Examples applications include smart transportation, customer and distribution layers of the smart grid metering, smart water networks, etc. The effects of threats such cyber-attacks, device/network faults and malfunctions, unsafe events, typically manifest themselves as anomalies that need to be promptly detected. However, there are unique challenges in anomaly detection for smart living : (1) behavioral randomness of humans creates dynamic spatiotemporal variations in data patterns making it difficult to learn the profile of benign behavior leading to unusable false alarm frequencies; (2) High non-linearity, non-IID data, random evolving patterns, cause traditional anomaly detection/learning methods to lose detection sensitivity; (3) smart living sensing data often have privacy and individual device profiling concerns; (4) unlabeled threats present while learning benign profile.

To address such challenges, we present a unified framework to detect various threats in a light-weight, timely, and privacy preserving manner. The tutorial covers the following topics: (1) decentralized graph representations of the wide area CPS; (2) anomaly detection metric learning; (3) resilient machine learning for finding detection thresholds; (4) bio-inspired classification methods to identify individual devices affected by the threats. We show key results achieved by the overarching framework in smart grid, smart transportation, smart water networks, etc.

Biography:

Prof. Sajal K. Das, Missouri University of Science and Technology, USA

Sajal K. Das is a Curators' Distinguished Professor of Computer Science and Daniel St. Clair Endowed Chair at Missouri University of Science and Technology, USA. His interdisciplinary research expertise includes machine learning, data science, security of cyber-physical systems, IoT, smart environments, UAVs wireless

and sensor networks, mobile and pervasive computing, edge/ and cloud computing. He has made fundamental contributions to these areas, published more than 600 papers in high quality journals and conference proceedings, coauthored 4 books, and 5 US patents. A recipient of 12 Best Paper Awards at prestigious IEEE and ACM conferences, he received the IEEE Computer Society's Technical Achievement Award for pioneering contributions to sensor networks, and University of Missouri System President's Award for Sustained Career Excellence. His h-index is 99 with more than 41,800 citations. He is the founding Editor-in-Chief of Elsevier's Pervasive and Mobile Computing journal, and Associate Editor of IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Mobile Computing, IEEE Transactions on Sustainable Computing, ACM/IEEE Transactions on Networking, and ACM Transactions on Sensor Networks. He is a Distinguished Alumnus of the Indian Institute of Science, Bangalore, and a Fellow of the IEEE, National Academy Inventors (NAI), Asia-Pacific Artificial Intelligence Association (AAIA).

Asst. Prof. Shameek Bhattacharjee, Western Michigan University, USA

Dr. SHAMEEK BHATTACHARJEE is an assistant professor of Computer Science at Western Michigan University, Kalamazoo, USA. His research interests include the theory of anomaly detection, explainable artificial intelligence and data science for cyber security. He is a recipient of IEEE PIMRC best paper award and Top 3 paper award in IEEE/ACM ICCPS.

Panel Session

Generative, Creative, Cooperative - The Transformative Element of AI for Smart Computing

Moderator: Stephan Sigg (Aalto University, Finland)

Time: July 2nd, 8:45 – 10:15

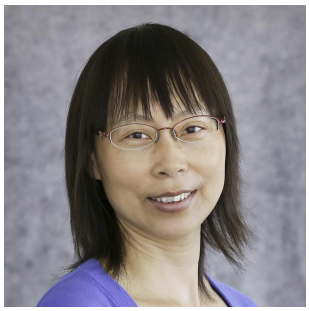
Location: Conf.Hall (12F)

Panelists: Takashi Takenaka (NEC, Japan), Qi Han (Colorado School of Mines, USA), Sozo Inoue (Kyushu Institute of Technology, Japan), and Gregor Schiele (Universität Duisburg-Essen, Germany)

Biography:

Dr. Takashi Takenaka (NEC)

Takashi Takenaka received his M.E. and Ph.D. degrees from Osaka University in 1997 and 2000, respectively. He joined NEC Corporation in 2000 and is currently a director of Green AI Research Group, Secure System Platform Laboratories, NEC Corporation. He was a visiting scholar at the University of California, Irvine, from 2009 to 2010. His current research interests include the acceleration of AI/ML, system-level design methodology, high-level synthesis, formal verification, and stream processing. He is a member of IEEE, IEICE, and IPSJ.



Prof. Qi Han (Colorado School of Mines)

Dr. Qi Han is Professor in the Department of Computer Science at the Colorado School of Mines. She founded and currently directs the Pervasive Computing Systems (PeCS) research group (http://pecs.mines.edu). Her broad research interests lie in the areas of wireless and mobile systems with specific focuses on mobile sensing, crowdsourcing, Internet of Things, networked robotic systems, mobile augmented reality, and cyber-physical systems. She has been active in interdisciplinary research where she applies her expertise to a variety of applications in the domains of smart cities, intelligent transportation, underground safety, environmental monitoring, and space exploration. Her research has been mainly funded by the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and Army Research Labs (ARL). She has led multiple interdisciplinary research projects. Dr. Han holds a Ph.D. degree from the Donald Bren School of Information and Computer Sciences at the

University of California, Irvine. She has served on a number of technical program committees for international conferences and held several workshop or conference program chair positions. She is an ACM Distinguished Speaker, an ACM senior member, and an IEEE senior member.

Prof. Sozo Inoue (Kyushu Institute of Technology)

Sozo INOUE is a full professor in National Kyushu Institute of Technology, Japan, and the Chief Technical Officer of AUTOCARE LLC. His research interests include human activity recognition with smart phones, and healthcare application of web/pervasive/ubiquitous systems. Currently he is working on applictions of activity recognition and health forecasting for nursing care and medicine to hospitals and more than 50 nursing facilities using smartphones and IoT. Inoue has a Ph.D of Engineering from Kyushu University in 2003. After completion of his degree, he was appointed as an assistant professor in the Faculty of Information Science and Electrical Engineering at the Kyushu University, Japan. He then moved to the Research Department at the Kyushu University Library in 2006. Since 2009, he has been appointed as an associate professor in the Faculty of Engineering at Kyushu Institute of Technology, Japan, and moved to Graduate School of Life Science and Systems Engineering at Kyushu Institute of Technology in 2018, and appointed as a full professor from 2020 and a head of Care XDX Center in Kyushu Institute of Technology from 2022. Meanwhile, he was a guest professor in Kyushu University, a visiting professor at Karlsruhe Institute of Technology, Germany, in 2014, a special researcher at Institute of Systems, Information Technologies and Nanotechnologies (ISIT) during 2015-2016, and a guest professor at University of Los Andes in Colombia in 2019. He was a technical advisor of Team AIBOD Co. Ltd during 2017-2019, and a guest researcher at RIKEN Center for Advanced Intelligence Project (AIP) during 2017-2019. He was a director during 2020-2021 and is a senior member of the Information Processing Society of Japan (IPSJ), a member of the IEEE Computer Society, the ACM, the Institute of Electronics, Information and Communication Engineers (IEICE), the Japan Society for Fuzzy Theory and Intelligent Informatics, the Japan Association for Medical Informatics (JAMI), and the Database Society of Japan (DBSJ).

Dr. Gregor Schiele (Universität Duisburg-Essen, Germany)

Dr. Gregor Schiele is professor for embedded systems and leads since november 2014 the Intelligent Embedded Systems group at the University Duisburg-Essen at the campus Duisburg. Before that he was working from 2012 to 2014 at the Insight Centre for Data Analytics and the Digital Enterprise Research Institute (DERI) as well as at the National University of Ireland, Galway. From 2006 to 2012 he was working at the department of Prof. Dr. Christian Becker at

the University Mannheim. He wrote his doctorate 2007 at the University Stuttgart at the department of Prof. Dr. Kurt Rothermel.

The core of his current research interest consist of adaptive embedded systems as well as the Internet of Things. He has great interest in how embedded systems can be operated with as little maintenance as possible, in a cheap and reliable way over a long operation time of several years to decades by using three-dimensional environmental models and methods of artificial intelligence.

Prof. Stephan Sigg (Aalto University)

Stephan Sigg is an Associate Professor at Aalto University in the Department of Communications and Networking. With a background in the design, analysis and optimisation of algorithms for distributed and ubiquitous systems, he focuses on sensing systems for environmental perception and Usable (perception-based) Security. Especially, his work covers proactive computing, distributed adaptive beamforming, context-based secure key generation and device-free passive activity recognition. Stephan is an editorial board member of the Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), the Elsevier Journal on Computer Communications and has been a guest editor for the Springer Personal and Ubiquitous Computing Systems Journal. He has served on the organizing and technical committees numerous prestigious conferences including IEEE PerCom, ACM Ubicomp, IEEE ICDCS.

Workshops

8th International Workshop on Big Data and IoT Security in Smart Computing (BITS 2024)

Invited Talk 1: Security and Privacy Challenges in Digital Realities: A Focus on VR/AR Devices in Smart Computing

Time: 10:20-11:00 (30 min + 10 min QA)

Location: 806 (8F)

Presenter: Prof. Akira Kanaoka (Toho University, Japan)

Abstract:

The rapid advancements in VR/AR technology are creating new dimensions in the realm of digital realities. While traditional mobile devices like smartphones and tablets continue to be used, it is the dedicated VR/AR head-mounted displays (HMDs) with integrated computing capabilities that deserve significant attention. These specialized VR/AR devices are equipped with a variety of sensors, making them key components in the emerging metaverse and other digital reality spaces.

This talk will explore how the well-established concepts of Big Data and IoT security within smart computing are being redefined and applied to these VR/AR ecosystems. As VR/AR devices become more widespread, the security and privacy concerns associated with their sensor-rich environments and data-intensive operations become paramount. This session will examine the current state of security and privacy technologies in digital realities, highlighting the unique challenges and opportunities they present.

Biography:

Prof. Akira Kanaoka (Toho University, Japan)

Akira Kanaoka received his Ph.D. in Engineering from the University of Tsukuba in 2004. His career includes positions as a researcher at SECOM Co., Ltd., a researcher and assistant professor at the University of Tsukuba, and an assitant professor at Toho University before assuming his current position. He is engaged in research on usable security with a focus on human factors and the practical application of advanced cryptography. He has been a driving force in the field of usable security research in Japan, having the launch of the Usable Security Workshop (UWS) and served as the editor-in-chief for the special

issue on usable security in the IPSJ Journal. He received a number of awards including the Best Paper Award of the 3rd International Conference on HCI for Cybersecurity, Privacy and Trust (HCI-CPT), the Best Paper Award of the 10th Asia Joint Conference on Information Security (AsiaJCIS 2015). He served as a Program Co-Chair of IWSEC 2020, AsiaJCIS 2017, 2018, 2019.

Main Session

Chair: TBA

Time: June 29th, 11:00 – 11:25

Location: 806 (8F)

Protecting Cross-camera Person Re-identification Data with Image Differential Privacy

Lucas Maris (Nara Institute of Science and Technology, Japan), Yuki Matsuda (Okayama University and RIKEN AIP, Japan), Keiichi Yasumoto (Nara Institute of Science and Technology and RIKEN AIP, Japan)

10th Workshop on Sensors and Smart Cities (SSC)

Main Session

Chair: TBA

Time: June 29th, 10:15 – 12:15, 13:15 - 14:15

Location: 804 (8F)

Crowd Flow Prediction from Mobile Traces Through Time Series PoI Stay Counts

Osamu Yamada (Nara Institute of Science and Technology, Japan); Yuki Matsuda (Okayama University, Nara Institute of Science and Technology, and RIKEN Center for Advanced Intelligence Project AIP, Japan); Hirohiko Suwa (Nara Institute of Science and Technology, and RIKEN Center for Advanced Intelligence Project AIP, Japan); Keiichi Yasumoto (Nara Institute of Science and Technology, and RIKEN Center for Advanced Intelligence Project AIP, Japan)

Comparison of Commercial Pedometer Applications: A Rigorous Approach

Alessio Terzi, Federico Montori (University of Bologna, Italy); Lorenzo Gigli (University of Bologna, Italy); Luca Bedogni (University of Modena and Reggio Emilia, Italy); Marco Di Felice (University of Bologna, Italy); Luciano Bononi (University of Bologna, Italy)

Bibliometric Mining of Research Trends for Smart Cities

Lars G. Lundberg (Blekinge Institute of Technology, Sweden)

Paving the way for an Urban Intelligence OpenStack-based Architecture

Giuseppe Tricomi (National Interuniversity Consortium for Informatics, University of Messina, and National Research Council (CNR), Italy); Luca D'Agati, Francesco Longo, Giovanni Merlino, and Antonio Puliafito (National Interuniversity Consortium for Informatics, and University of Messina, Italy); Stefano Silvestri (National Research Council (CNR), Italy)

A Machine Learning-Based Temperature Control and Security Protection for Smart Buildings

Mostafa Zaman, and Maher Al Islam (Virginia Commonwealth University, USA); Nasibeh Zohrabi (Pennsylvania State University Brandywine, USA); Sherif Abdelwahed (Virginia Commonwealth University, USA)

3rd International Workshop on Smart Agriculture for the Environmental Emergency (SmartAgr 2024)

Welcome from the Chairs

Chair: Gabriele Cecchetti (Scuola Superiore Sant'Anna, Italy)

Time: June 29th, 10:15 - 10:20

Location: Conf. Hall (12F)

Session 1: Exploring Artificial Intelligence Applications in Smart Agriculture

Time: June 29th, 10:20 - 11:00

Automated Visual Quality Detection for Tilapia Using MobilenetV2 Convolutional Neural Network

Israel F Breta, Karl Adriane D.C. Catalan, Sev Kristian M Constantino, Ralph Adrian R Mones and Edward D Bustillos (Adamson University, Philippines)

Early Identification of Oil Palm Health based on UAV images using Feature-Based Machine Learning

Chang Yi Lee, Lee Choo Tay, Weng Chun Tan, Weng Kin Lai (Tunku Abdul Rahman University of Management and Technology, Malaysia), Sheng Siang Lee (Aonic, Malaysia)

Session 2: Advanced ICT for Smart Agriculture

Time: June 29th, 11:00 - 12:00

A Smart Sensor-based Watering Automation System for Nursery Plants

Gabriele Cecchetti and Anna Lina Ruscelli (Scuola Superiore Sant'Anna, Italy)

Boosting Farm Efficiency: An Ant Colony Optimization Approach to Smart Agriculture

Lai Weng Kin and Lee Choo Tay (Tunku Abdul Rahman University of Management and Technology, Malaysia)

Session 3: Sustainable Agriculture

Time: June 29th, 13:15 - 14:00

Farm households food security status automation through supervised learning approach: a look at agroecological farms

Nikiema Théodore (Institut de Mathématiques et de Sciences Physiques, Benin); Pamela G. Katic (University of Greenwich, United Kingdom (Great Britain)); Eugène C. Ezin (Institut de Formation et de Recherche en Informatique (IFRI), Benin); Sylvain Kpenavoun Chogou (University of Abomey Calavi, Benin)

Categorizing farms to promote agroecology: a supervised learning approach

Nikiema Théodore (Institut de Mathématiques et de Sciences Physiques, Benin); Eugène C. Ezin (Institut de Formation et de Recherche en Informatique (IFRI), Benin); Sylvain Kpenavoun Chogou (University of Abomey Calavi, Benin)

9th IEEE Workshop on Smart Service Systems (SmartSys)

Main Session

Chair: TBA

Time: June 29th, 10:15 – 12:15, 13:15 - 14:15

Location: 805 (8F)

AcouDL: Context-Aware Daily Activity Recognition from Natural Acoustic Signals

Avijoy Chakma (Bowie State University, USA); Anirban Das (NIIT University, India); Abu Zaher Md Faridee (Amazon, USA); Suchetana Chakraborty (IIT Jodhpur, India); Sandip Chakraborty (IIT Kharagpur, India); Nirmalya Roy (UMBC, USA)

AI-Based Kinematic Analysis for Track Athletes

Mostafa Habibi and Mehrdad Nourani (The University of Texas at Dalla, USA); Mohammad Nourani (California Polytechnic State University, USA)

Acoustic Camera-based Anomaly Detection for Wind Turbines

Ming-Lun Lee (National Yang Ming Chiao Tung University, Taiwan); Yuan-Heng Sun (National Yang Ming Chiao Tung University, and Industrial Technology Research Institute, Taiwan); Ya-Chu Chi (National Yang Ming Chiao Tung University, Taiwan); Yan-Ann Chen (Yuan Ze University, Taiwan); Yao-Long Tsai (Industrial Technology Research Institute, Taiwan); Yu-Chee Tseng (National Yang Ming Chiao Tung University, National Yang Ming Chiao Tung University, and Academia Sinica, Taiwan)

Detecting Distress Changes Using Multimodal Data During Interaction with A Smart Speaker

Chingyuan Lin (Nara Institute of Science and Technology, Japan); Yuki Matsuda (Okayama University and Nara Institute of Science and Technology, Japan); Hirohiko Suwa, and Keiichi Yasumoto (Nara Institute of Science and Technology, Japan)

DIME: Distributed Inference Model Estimation for Minimizing Profiled Latency

Robert Viramontes, Azadeh Davoodi (University of Wisconsin - Madison, USA)

1st International Workshop on Digital and Mobile Smart Health Systems (DM-SmartHealth 2024)

Main Session

Chair: TBA

Time: June 29th, 10:15 – 12:15

Location: 803 (8F)

Requirements Analysis for Responsible Explainable AI for Pediatric Sleep Apnea Diagnosis

Marta Quemada López, Thomas Plageman, Vera H. Goebel, Jonathan Adams and David Hui, Britt Øverland, Harriet Akre and Lars Andre Strøm Arnesen (University of Oslo, Norway)

Federated Learning for Sleep Detection Problems

Guilherme Borges (University of Coimbra, Coimbra, Portugal and Federal Institute Sul-rio-grandense (IFSUL) Rio Grande Sul, Brazil); Julio Cesar Santos dos Anjos (Federal University of Ceará Fortaleza, Brazil); Jorge Sá Silva (University of Coimbra Coimbra, Portugal)

A Numerical Comparison of Deeply Quantized Models for sEMG Hand Gesture Classification on Constrained Devices

Emanuele Giuseppe Siani and Laura Scigliano, Dario Bruneo, Fabrizio De Vita, Valeria Tomaselli and Danilo Pietro Pau (University of Messina, Italy)

Insights on the development of PRACTICE, a research-oriented healthcare platform

Dragan Ahmetovic, Alessio Angileri, Sara Arcudi, Claudio Bettini, Gabriele Civitarese, Marco Colussi, Andrea Giachi, Roberta Gualtierotti, Sergio Mascetti, Matteo Manzoni, Flora Peyvandi, Aiman Solyman and Addolorata Truma (Università degli Studi di Milano, Milan, Italy and Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy)

Main Technical Sessions

Session 1: Smart Computing for Smart Cities

Chair: Stefan Sigg, Aalto University, Finland

Time: June 30th, 10:15 – 12:15

Location: Conference Hall (12F)

POSCA: Path Optimization for Solar Cover Amelioration in Urban Air Mobility

Debjyoti Sengupta, Anurag Satpathy and Sajal K. Das (Missouri University of Science and Technology, USA)

Abstract: Urban Air Mobility (UAM) encompasses both piloted and autonomous aerial vehicles, spanning from small unmanned aerial vehicles (UAVs) like drones to passenger-carrying personal air vehicles (PAVs), to revolutionize smart transportation in congested urban areas. This emerging paradigm is anticipated to offer disruptive solutions to the mobility challenges in congested cities. In this context, a pivotal concern centers on the sustainability of transitioning to this mode of transportation, especially with the focus on incorporating clean technology into developing innovative solutions from the ground up. Recent studies highlight that a significant portion of the total energy consumption in UAM can be attributed to the flight operations of the aircraft. To address this challenge, this paper introduces a framework POSCA aimed at meeting the energy requirements of UAM flights. It delves into a complex and dynamic route-planning problem. It introduces a novel concept called the Phototropic Index, calculated by considering the traversal distance and solar coverage along the route. To solve the path planning problem, we propose two solutions, S-POSCA and D-POSCA, catering to static and dynamic setups. Simulation results confirm an average increase of 8.81% in static conditions and 10.64% in the dynamic condition for the cumulative Global Horizontal Irradiance (GHI) compared to the baseline approaches.

A Graph Neural Network Framework for Imbalanced Bus Ridership Forecasting

Samir Amitkumar Gupta, Agrima Khanna, Jose Talusan and Anwar Said (Vanderbilt University, USA); Dan Freudberg (WeGo Public Transit, USA); Ayan Mukhopadhyay and Abhishek Dubey (Vanderbilt University, USA)

Abstract: Public transit systems are critical in lowering carbon emissions and reducing urban congestion for environmental sustainability. However, overcrowding has adverse effects on the quality of service, passenger experience, and overall efficiency of public transit causing a decline in the usage of public transit systems. Therefore, it is crucial to

identify and forecast potential windows of overcrowding to enhance passenger experience and encourage higher ridership. Predicting ridership is a complex task, due to the inherent noise of collected data and the sparsity of overcrowding events. Existing studies in predicting public transit ridership consider only a static depiction of bus networks.We address these issues by first applying a data processing pipeline that cleans noisy data and engineers several features for training. Then, we address sparsity by converting the network to a dynamic graph and using a graph convolutional network, incorporating temporal, spatial, and auto-regressive features, to learn generalizable patterns for each route. Finally, since conventional loss functions like categorical cross-entropy have limitations in addressing class imbalance inherent in ridership data, our proposed approach uses focal loss to refine the prediction focus on less frequent yet critical overcrowding instances. Our experiments, using real-world data from our partner agency, show that the proposed approach outperforms existing state-of-the-art baselines in terms of accuracy and robustness.

iFair: Achieving Fairness in the Allocation of Scarce Resources for Senior Health Care

Modeste M Kenne (University of California Irvine, USA); Prasanna Date (Oak Ridge National Laboratory, USA); Ronald Eguchi and Zhenghui Hu (ImageCat, Inc., USA); Julie Rousseau (University of California Irvine School of Medicine, USA); Nalini Venkatasubramanian (University of California, Irvine, USA)

Abstract: Efficient resource allocation is crucial in many domains, particularly in senior care, where assigning resources to older adults must consider uncertainties associated with vulnerable populations. In collaboration with Senior Health Facilities (SHFs) and domain experts, this paper presents iFair, a novel framework designed to assist decision-makers in equitably allocating scarce resources to older adults. iFair was prototyped in the context of ongoing work on a data exchange platform, CAREDEX, used for enhancing older adults' resilience during disasters. A key novelty of iFair focuses on aligning resident preferences with resources in urgent situations, expediting care, and enhancing task efficiency. We integrate static and dynamic environmental data, including facility layouts and sensor data, with detailed resident profiles to cater to the individual needs and preferences of residents. While our framework primarily focuses on allocation within facilities, it also extends to a regional scale to support the planning and transfer of seniors to mutual aid facilities. Our experiments adapt data from a real SHF to emulate resource allocation in an emergency fire evacuation setting, and highlights the delicate balance that decision-makers can achieve between efficiency and fairness.

Towards Enhanced Urban Management: Introducing A Model for Autonomic Smart City Management

Elham Okhovat and Michael A. Bauer (University of Western Ontario, Canada)

Abstract: A smart city leverages Internet of Things (IoT) to enhance citizens' lives. Real-time management of massive data is a challenge. Smart cities are complex and interconnected, requiring interdisciplinary collaboration for urban planning, IoT, and monitoring. This paper proposes a novel Model for Autonomic Smart City Management, aimed at comprehensive management of diverse urban aspects, including environmental conditions and multi-layered infrastructure. Emphasizing continuous monitoring, data analysis, and real-time resource assessment, the system employs the MAPE-K approach for automated data processing, with the aim of reducing the need for human intervention. A novel aspect of the model is that it leverages and integrates existing IoT and monitoring platforms. The model introduces algorithms and policies with the aim of automating management activities and operations. The primary goal is to enhance urban efficiency, sustainability, and residents' quality of life while minimizing manual efforts and ensuring long-term cost savings.

A method for city-wide PoI-level congestion prediction via assimilation of actual and simulation-based PoI congestion data

Haruka Sakagami, Osamu Yamada, Yuki Matsuda, Hirohiko Suwa and Keiichi Yasumoto (Nara Institute of Science and Technology, Japan)

Abstract: Regulating human flow is essential to reducing congestion in areas where people gather. A digital twin that realistically simulates human flow helps for this purpose.Regulating human flow is essential to reducing congestion in areas where people gather. A digital twin that realistically simulates human flow helps for this purpose.To realize a realistic human flow simulation mechanism, it is essential to take into account people's attributes.However, existing simulation methods use only location-specific information to predict people's behavior, thus do not reflect the routines that appear in people's actual lives. In this paper, we propose a human flow simulation using synthetic population data that help extract the attributes of people living in a target area. In the proposed method, we simulate the movement of people with each attribute like office workers, students, etc. every 15 minutes using the synthetic population data and the hourly transition probability matrix between PoIs (Points of Interest) by computing the transition probability matrix from hourly PoI-level congestion (people count) in the target area using people trajectory data included in the point-type fluid population data commercially available and applying a Markov chain to the congestion. The proposed simulation mechanism is based on the data assimilation of the actual PoI congestion vector (how many people were staying in each PoI) obtained from the point-type fluid population data

and the virtual PoI congestion vector generated from the prediction of people's movement using the attribute information in the synthetic population data at regular time intervals. The data are assimilated at regular intervals to obtain highly accurate PoI-level congestion forecasts. The results of the mobility simulation for office workers showed that the maximum cosine similarity with the actual PoI congestion was 0.96 after 12 hours even when the actual PoI congestion vector is known only for a part of the area (one mesh).

Session 2: Smart Computing Applications

Chair: Nirmalya Roy, University of Maryland Baltimore County, USA

Time: June 30th, 13:15 – 15:15

Location: Conference Hall (12F)

RATTLE: Train Identification through Audio Fingerprinting

Leonardo Ciabattini, Luca Sciullo, Alfonso Esposito, Ivan Zyrianoff and Marco Di Felice (University of Bologna, Italy)

Abstract: Train model identification can enhance the structural monitoring of railway infrastructures by providing contextual information about train passages. While approaches relying on timetables are impractical due to delays, camera-based solutions present challenges related to deployment costs and privacy concerns. In this paper, we propose RATTLE, a self-contained framework for train tracking and identification based on audio signal fingerprinting. We have developed a prototype IoT system tailored for train tracking and ground truth assessment, enabling the acquisition of a real-world dataset spanning four months of measurements. Then, we conducted a comparative analysis of several traditional Machine Learning (ML) and Deep Learning (DL) algorithms for audio features classification, MEL spectrogram classification, and image classification (serving as baselines). Our findings highlight that MEL-trained CNN algorithms achieve high accuracy (97%) comparable to the best video-based DL solution, while substantially reducing model size. Furthermore, we explored the potential for migrating the classification task to the edge through quantisation techniques.

ContextGPT: Infusing LLMs Knowledge into Neuro-Symbolic Activity Recognition Models

Luca Arrotta (University of Milan, Italy); Claudio Bettini (Università degli Studi di Milano, Italy); Gabriele Civitarese and Michele Fiori (University of Milan, Italy)

Abstract: Context-aware Human Activity Recognition (HAR) is a hot research area in mobile computing, and the most effective solutions in the literature are based on supervised deep

learning models. However, the actual deployment of these systems is limited by the scarcity of labeled data that is required for training. Neuro-Symbolic AI (NeSy) provides an interesting research direction to mitigate this issue, by infusing common-sense knowledge about human activities and the contexts in which they can be performed into HAR deep learning classifiers. Existing NeSy methods for context-aware HAR rely on knowledge encoded in logic-based models (e.g., ontologies) whose design, implementation, and maintenance to capture new activities and contexts require significant human engineering efforts, technical knowledge, and domain expertise. Recent works show that pre-trained Large Language Models (LLMs) effectively encode common-sense knowledge about human activities. In this work, we propose ContextGPT: a novel prompt engineering approach to retrieve from LLMs common-sense knowledge about the relationship between human activities and the context in which they are performed. Unlike ontologies, ContextGPT requires limited human effort and expertise. An extensive evaluation carried out on two public datasets shows how a NeSy model obtained by infusing common-sense knowledge from ContextGPT is effective in data scarcity scenarios, leading to similar (and sometimes better) recognition rates than logic-based approaches with a fraction of the effort.

AMPHI: Adaptive Mission-Aware Microservices Provisioning in Heterogeneous IoT Settings

Yuqiao Li (University of California, Irvine, USA); Fangqi Liu (University of California at Irvine, USA); Cheng-Hsin Hsu (National Tsing Hua University, Taiwan); Nalini Venkatasubramanian (University of California, Irvine, USA)

Abstract: In mission-critical IoT environments, where data from diverse data sources (stationary and mobile) must be analyzed rapidly, ensuring reliable service provisioning for the execution of analytics is critical. Under dynamic conditions and changing infrastructure capabilities, adaptive methods are required to handle surges in data volumes and execute complex services for IoT applications. In this paper, we propose AMPHI - an adaptive microservice provisioning framework that handles various mission-aware workflows in combined stationary-mobile IoT environments to enable flexible deployment of containerized microservices. AMPHI exploits the variability in cost and performance among operators that implement similar functionalities but with distinct cost/quality/time tradeoffs, and employs apriori and on-the-fly techniques for intelligent selection, placement, and sharing of operators across a hybrid set of devices (stationary sensors, drones, and rovers) to maximize Quality of Service (QoS) and resource efficiency under dynamic situations. We formulate the microservice provisioning and instantiation as an (NP-hard) optimization problem and design efficient heuristic approaches to deploy microservices by utilizing application and system context. AMPHI is evaluated in the context of smart firefighting with high-rise fires utilizing building sensors and autonomous aerial mobile units. Through real-world testbeds and extensive simulations, we show how AMPHI allows flexible and cost-effective execution of dynamically changing IoT workflows.

Distributed Radiance Fields for Edge Video Compression and Metaverse Integration in Autonomous Driving

Eugen Šlapak and Matúš Dopiriak (Technical University of Košice, Slovakia); Mohammad Al Faruque (UC Irvine, USA); Juraj Gazda (Technical University of Kosice, Slovakia); Marco Levorato (University of California, Irvine, USA)

Abstract: The metaverse is a virtual space that combines physical and digital elements, creating immersive and connected digital worlds. For autonomous mobility, it enables new possibilities with edge computing and digital twins (DTs) that offer virtual prototyping, prediction, and more. DTs can be created with 3D scene reconstruction methods that capture the real world's geometry, appearance, and dynamics. However, sending data for real-time DT updates in the metaverse, such as camera images and videos from connected autonomous vehicles (CAVs) to edge servers, can increase network congestion, costs, and latency, affecting metaverse services. Herein, a new method is proposed based on distributed radiance fields (RFs), multiaccess edge computing (MEC) network for video compression and metaverse DT updates. RF-based encoder and decoder are used to create and restore representations of camera images. The method is evaluated on a dataset of camera images from the CARLA simulator. Data savings of up to 80% were achieved for H.264 I-frame - P-frame pairs by using RFs instead of I-frames, while maintaining high peak signal-to-noise ratio (PSNR) and structural similarity index measure (SSIM) qualitative metrics for the reconstructed images. Possible uses and challenges for the metaverse and autonomous mobility are also discussed.

Sharing the Edge: System Status Aware Object Recognition Task Offloading

Chenyang Wang, Owen Eicher and Qi Han (Colorado School of Mines, USA)

Abstract: The combination of object recognition capability with Unmanned Aerial Vehicles (UAVs) and Unmanned Ground Vehicles (UGVs) benefits applications like remote surveillance, search and rescue, and infrastructural monitoring. Offloading deep learning-based object recognition models from UAVs to UGVs can address energy and computational constraints on UAVs. However, when multiple UAVs are in contact with one single UGV, how to provide timely offloading decisions considering various system status information such as dynamic network conditions and remaining energy levels on UAVs remains under-explored. This paper presents our work in this area. Our online offloading decision engine, running on the UAV's onboard computer, dynamically determines offloading decisions and encoding bitrates considering fluctuating network conditions. In addition, our task scheduler running on the UGV prioritizes tasks according to the system statuses of each UAV. We conducted extensive evaluations of our approach in both lab and

field settings. Experiments show that our system reduces the end-to-end system latency by up to 88% compared to a previous study that reduces both offload data size and local computation.

Session 3: Smart resource management and optimization

Chair: Keiichi Yasumoto, NAIST, Japan

Time: July 1st, 10:15 – 12:15

Location: Conference Hall (12F)

Enhancing UAV Operational Efficiency through Cloud Computing and Autopilot System Integration

Luca D'Agati, Francesco Longo, Giovanni Merlino and Antonio Puliafito (University of Messina, Italy); Giuseppe Tricomi (Institute for High Performance Computing and Networking of ICAR, Italy & University of Messina, Italy)

Abstract: This paper presents a groundbreaking study on the integration of cloud computing with UAV autopilot systems, aiming to significantly enhance operational efficiency, scalability, and autonomy in unmanned aerial vehicle (UAV) operations. By leveraging the synergies between the Internet of Things (IoT), cloud computing, and sophisticated UAV autopilot technologies, we introduce a novel architectural framework designed to overcome existing challenges in UAV operations, such as advanced mission planning, real-time data analytics, and dynamic resource management. The presented approach emphasizes the integration of the MAVLink protocol and the Robot Operating System (ROS) with the PX4 autopilot system, marking a crucial step towards achieving autonomous UAV operations characterized by enhanced safety and reduced mission execution times. Empirical assessments, supported by detailed operational scenario analyses, demonstrate the effectiveness of this integration, revealing improvements in UAV performance metrics. The outcomes highlight the potential of cloud computing integration with UAV operational paradigms, paving the way for further exploration in autonomous systems and cloud-assisted IoT applications.

Water-COLOR: Water-COnservation using a Learning-based Optimized Recommender

Guang Xue Zhang and David L. Feldman (University of California, Irvine, USA); Yiming Lin (University of California, Berkeley, USA); Sharad Mehrotra and Nalini Venkatasubramanian (University of California, Irvine, USA); Thayer Drew and Kim Sentovich (Rachio Inc., USA); Owen Veranth (Analytiks Inc., USA)

Abstract: Efficient water use, particularly in the realm of irrigation, has emerged as a critical concern in regions suffering from persistent drought, such as California and Florida. With the advent of smart irrigation controllers encouraged by environmental policies, a new paradigm of water management is gaining traction. Among these, the Rachio smart controller has garnered significant attention. However, without direct feedback or actual water usage data, optimizing these irrigation systems for enhanced efficiency remains challenging. This paper introduces Water-COLOR, a novel recommendation system integrated within the Rachio smart controller's framework to address this challenge. The system leverages similar landscape profiles to suggest irrigation schedules that are both water-efficient and user-preferable. By analyzing manual user interactions with the controller, Water-COLOR infers user satisfaction, which, along with estimated water usage, informs the adaptation of irrigation plans. The system eschews the need for additional sensors, thereby reducing infrastructure requirements. Our evaluation demonstrates consistent performance across diverse climatic regions and indicates that the system's recommendations could significantly contribute to water conservation efforts. The results not only showcase the potential of Water-COLOR to enhance the efficiency of existing smart irrigation systems but also open avenues for deploying real-time, data-driven environmental solutions.

From Calls to Scales: Harnessing Smartphone for Daily Mass Measurement

Hamada Rizk (Osaka University, Japan); Merna Hesham (AUC, Egypt); Moustafa Youssef (American University in Cairo, Egypt)

Abstract: Mobile technologies, particularly smartphones, have become integral to human life, influencing nearly every aspect of daily activities. Their ubiquity and advanced capabilities have led to them being a solution to a wide range of problems. Recent research has focused on leveraging the existing sensors in smartphones to supplant more costly and less accessible dedicated hardware. In this vein, we introduce MobiScale, a novel system designed to measure the weight of light objects using the built-in accelerometer and vibration motor of smartphones. This system utilizes advanced feature extraction techniques to effectively capture the temporal and spectral characteristics of the weight data. The core of MobiScale is its CNN-LSTM architecture, which processes these features to estimate weights accurately. The implementation of various regularization techniques has been vital in enhancing the system’s ability to generalize, thereby improving its performance. Tested across multiple devices and under various conditions, MobiScale has shown consistent and precise performance, achieving a mean square error of just 12 grams in weight estimation, underscoring its potential as a versatile and reliable tool for weight measurement using smartphone technology.

Cost-based Modeling and Optimization of Secure Matrix Multiplication in the Cloud

Richard Hernandez and Kemal Akkaya (Florida International University, USA); Soamar Homsi (Air Force Research Laboratory – Information Directorate (AFRL/RI), USA)

Abstract: Machine Learning (ML) applications are prominent in many fields due to their ability to derive insights and automate processes. However, the need for sensitive data in ML operations raises significant privacy concerns when outsourcing to the cloud. Multiparty computation (MPC) is a promising method for privacy-preserving ML. However, it has a significant computational overhead, mainly due to the required Matrix Multiplications (MM). This paper improves the secure MM performance by adopting and integrating the Strassen algorithm in the MPC protocols. The challenge is tuning the different cloud infrastructure parameters to maximize the Strassen algorithm's benefits. To address this challenge, we formulated a multiobjective optimization problem. The goal is to improve the MM's response time while minimizing the cloud resource costs and potential security losses, given a successful cyberattack on the cloud. We then developed several solutions to identify the best parameters (e.g., matrix dimension, number of MPC nodes, among others) to optimize the trade-off among different optimization goals. Our implementation over SPDZ shows that we can significantly reduce resource costs and minimize potential security loss with respect to the naive MM over MPC approach.

Optimizing Risk-averse Human-AI Hybrid Teams

Andrew S Fuchs (University of Pisa & National Research Council (CNR), Italy); Andrea Passarella and Marco Conti (IIT-CNR, Italy)

Abstract: We anticipate increased instances of humans and AI systems working together in what we refer to as a hybrid team. The increase in collaboration is expected as AI systems gain proficiency and their adoption becomes more widespread. However, their behavior is not error-free, making hybrid teams a very suitable solution. As such, we consider methods for improving performance for these teams of humans and AI systems. For hybrid teams, we will refer to both the humans and AI systems as agents. To improve team performance over that seen for agents operating individually, we propose a manager which learns, through a standard Reinforcement Learning scheme, how to best delegate, over time, the responsibility of taking a decision to any of the agents. We further guide the manager's learning so they also minimize how many changes in delegation are made as a result of undesirable team behavior. We demonstrate the optimality of our manager's performance in several grid environments which include failure states which terminate an episode and should be avoided. We perform our experiments with teams of agents with varying degrees of acceptable risk, in the form of proximity to a failure state, and measure the manager's ability to make effective delegation decisions with respect to its own risk-based constraints, then compare these to the optimal decisions. Our results show our manager can

successfully learn desirable delegations which result in team paths near/exactly optimal with respect to path length and number of delegations.

Session 4: Best Paper Candidates

Chair: Dario Bruneo, University of Messina, Italy

Time: July 1st, 13:45 – 15:30

Location: Conference Hall (12F)

An MCS Navigation System Based on Road Surface Quality for Bicycle Riders

Federico Montori, Rocco Pastore, Luca Sciullo and Luciano Bononi (University of Bologna, Italy); Luca Bedogni (University of Modena and Reggio Emilia, Italy)

Abstract: Road surface quality is a major concern for bicycle riders and plays an important role in the mobility infrastructure. In the era where smarter cities aim to increase the well-being of citizens and the efficiency of infrastructures, navigation systems relying on Mobile Crowdsensing (MCS) are mostly designed for car drivers, and account for road traffic conditions. To cover the gap, in this paper, we propose a full architectural pipeline of an MCS-based navigation system for bicycle riders that accounts for the road surface quality. The MCS paradigm leverages the sensor data produced by the personal devices of participating citizens to describe phenomena of common interest. Our system classifies road segments using inertial sensor data gathered by users, using a combination of supervised and unsupervised methods, as human labeling in this context is impractical and too subjective. We prove the efficacy of our method in a controlled environment, and then we implement and deploy the full system in a real city, finally reporting on its results.

Clustering-Enhanced Reinforcement Learning for Adaptive Offloading in Resource-Constrained Devices

Khoa Anh Tran (National Institute of Information and Communications Technology, Japan); Nguyen Do Van (NICT, Japan); Minh-Son Dao (National Institute of Information and Communication Technology, Japan); Koji Zettsu (NICT, Japan)

Abstract: The Federated Edge Artificial Intelligence (Edge AI) deploys AI applications on Internet-of-Things (IoT) devices, addressing data privacy concerns in the real world. To achieve effective Federated Learning (FL), three challenges must be addressed: i) limited computing power on devices, ii) non-uniform impacts on devices, and iii) adaptability to changing network conditions. This study introduces a new algorithm called Adaptive Offloading Point (AOP), designed to accelerate local training on constrained devices. It

decomposes deep neural network (DNN) layer blocks, enabling training on both client and server sides. The novelty of the proposed method lies in using a reinforcement learning-based Gaussian mixture model (GMM) clustering to dynamically determine DNN layer offloading, addressing nullability, computation uniformity, training time, and network bandwidth variation issues. Experimental results on real devices, using vision transformer (ViT) models with an identification image dataset, show that AOP's training time is significantly faster than that of previous baseline methods.

PREDEA: Predicted-RoI based Resource-Efficient Object Detection with Aggregation

Yoshikazu Watanabe, Seiya Shibata and Takashi Takenaka (NEC Corporation, Japan)

Abstract: In recent years, there has been a growing need to perform object detection even at the edge. Since the edge environment has tight physical constraints, resource efficiency is a key challenge to executing object detection at high throughput. This paper proposes PREDEA, a predicted-RoI (Region of Interest) based Resource-Efficient object detection with RoI aggregation. PREDEA prepares expected RoIs for the incoming subsequent frames before the arrival using a lightweight predictor, and it generates aggregated images by combining the cropped images for the RoIs on the reception of the next frames. Object detection inference is performed on the aggregated images, which contain less background regions than the original frames. Our evaluation with the MOT17 dataset confirmed that the PREDEA reduced the computation resources needed for object detection inference by half while keeping degradation in accuracy to almost zero.

TASR: A Novel Trust-Aware Stackelberg Routing Algorithm to Mitigate Traffic Congestion

Doris E M Brown, Venkata Sriram Siddhardh Nadendla and Sajal K. Das (Missouri University of Science and Technology, USA)

Abstract: Stackelberg routing platforms (SRP) reduce congestion in one-shot traffic networks by proposing optimal route recommendations to selfish travelers. Traditionally, Stackelberg routing is cast as a partial control problem where a fraction of traveler flow complies with route recommendations, while the remaining respond as selfish travelers. In this paper, a novel Stackelberg routing framework is formulated where the agents exhibit probabilistic compliance by accepting SRP's route recommendations with a trust probability. A greedy Trust-Aware Stackelberg Routing algorithm (in short, TASR) is proposed for SRP to compute unique path recommendations to each traveler flow with a unique demand. Simulation experiments are designed with random travel demands with diverse trust values on real road networks such as Sioux Falls, Chicago Sketch, and Sydney networks for both single-commodity and multi-commodity flows. The performance of TASR is compared with state-of-the-art Stackelberg routing methods in terms of traffic

congestion and trust dynamics over repeated interaction between the SRP and the travelers. Results show that TASR improves network congestion without causing a significant reduction in trust towards the SRP, when compared to most well-known Stackelberg routing strategies.

Session 5: Federated Learning for Networked Systems

Chair: Antonio Puliafito, University of Messina, Italy

Time: July 2nd, 11:00 – 12:15

Location: Conference Hall (12F)

DP-MTFL: Differentially Private Multi-Tier Federated Learning for IoT applications

Ramin Soleimani (University College Cork & SFI Centre for Research Training in Advanced Networks for Sustainable Societies, Ireland); Dirk Pesch (University College Cork, Ireland)

Abstract: Differentially Private Federated Learning (DP-FL) is a privacy-preserving machine learning paradigm. Building on a standard DP-FL approach, we introduce and implement a novel Differentially Private Multi-Tier Federated Learning approach specifically tailored for IoT applications, specifically short-term load forecasting. Our method integrates a Sampled Gaussian Mechanism for differential privacy with a hierarchical federated learning approach. By enabling local servers to participate in learning with other local federations while adhering to approximate differential privacy with respect to the global server, our proposed method mitigates privacy risks associated with the failure parameter delta within the approximate differential privacy context. Our approach fosters reduced information sharing with less trusted entities, such as global servers. We specifically study the optimal number of local rounds on global model convergence. In the evaluation of our method, we utilise an energy consumption dataset from the UK Power Networks Low Carbon London project. Our results show that our approach achieves privacy preserving objectives while obtaining the optimal number of local rounds that minimise the prediction error. Our research contributes to advancing privacy-preserving federated learning methods, particularly in the context of IoT applications.

FMLFS: A federated multi-label feature selection based on information theory in IoT environment

Afsaneh Mahanipour (University of Kentucky, USA); Hana Khamfroush (University of Kentucky, USA)

Abstract: In certain emerging applications such as health monitoring wearable and traffic monitoring systems, Internet-of-Things (IoT) devices generate or collect a huge amount of multi-label datasets. Within these datasets, each instance is linked to a set of labels. The presence of noisy, redundant, or irrelevant features in these datasets, along with the curse of dimensionality, poses challenges for multi-label classifiers. Feature selection (FS) proves to be an effective strategy in enhancing classifier performance and addressing these challenges. Yet, there is currently no existing distributed multi-label FS method documented in the literature that is suitable for distributed multi-label datasets within IoT environments. This paper introduces FMLFS, the first federated multi-label feature selection method. Here, mutual information between features and labels serves as the relevancy metric, while the correlation distance between features, derived from mutual information and joint entropy, is utilized as the redundancy measure. Following aggregation of these metrics on the edge server and employing Pareto-based bi-objective and crowding distance strategies, the sorted features are subsequently sent back to the IoT devices. The proposed method is evaluated through two scenarios: 1) transmitting reduced-size datasets to the edge server for centralized classifier usage, and 2) employing federated learning with reduced-size datasets. Evaluation across three metrics - performance, time complexity, and communication cost - demonstrates that FMLFS outperforms five other comparable methods in the literature and provides a good trade-off on three real-world datasets.

Towards Opportunistic Federated Learning Using Independent Subnetwork Training

Victor Romero II (Nara Institute of Science and Technology, Japan & University of the Philippines, Philippines); Tomokazu Matsui, Yuki Matsuda, Hirohiko Suwa and Keiichi Yasumoto (Nara Institute of Science and Technology, Japan)

Abstract: Enabling federated learning in opportunistic networks unlocks the potential for machine learning in challenging environments like disaster zones and remote regions. However, the divergent models induced by dynamic node encounters, combined with complete parameter overlap in model-homogeneous training lead to catastrophic interference, which disrupts training progress. Furthermore, when whole models must be transmitted, nodes with shorter contact duration are limited from participating in the training process. To address these challenges, we propose a different approach for training neural networks in opportunistic settings that leverages independent subnetworks and sequential training. We partition the original neural network into non-overlapping subnetworks and assign each to a unique node. These subnetworks are then trained and exchanged repeatedly during node encounters, exposing them further to diverse datasets. As a consequence, we achieve parallel and conflict-free progress while minimizing participation costs. Our experiments demonstrate that continuous training and subnetwork accumulation foster the development of a more robust model. Moreover, by

utilizing pre-trained backbones as feature extractors, we achieve a test accuracy of 75.06% on MEDIC's disaster damage severity assessment task, demonstrating that the approach can be adopted in resource-constrained and dynamic scenarios in the real world.

Session 6: Smart Computing for Security and Anomaly Detection

Chair: Hana Khamfroush, University of Kentucky, USA

Time: July 2nd, 13:15 – 15:00

Location: Conference Hall (12F)

Explainable Deep Learning Models for Dynamic and Online Malware Classification

Quincy Card, Daniel Simpson, Kshitiz Aryal and Maanak Gupta (Tennessee Technological University, USA); Sheik R Islam (Rutgers University, USA)

Abstract: In recent years, there has been a significant surge in malware attacks, necessitating more advanced preventive measures and remedial strategies. While several successful AI-based malware classification approaches exist-categorized into static, dynamic, or online analysis-most successful AI models lack easily interpretable decisions and explanations for their processes. Our paper aims to delve into explainable malware classification across various execution environments (such as dynamic and online), thoroughly analyzing their respective strengths, weaknesses, and commonalities. To evaluate our approach, we train Feed Forward Neural Networks (FFNN) and Convolutional Neural Networks (CNN) to classify malware based on features obtained from dynamic and online analysis environments. The feature attribution for malware classification is performed by explainability tools, SHAP, LIME and Permutation Importance. We perform a detailed evaluation of the calculated global and local explanations from the experiments, discuss limitations and, ultimately, offer recommendations for achieving a balanced approach.

Leveraging Homeostatic Plasticity to Enable Anomaly Detection in Spiking Neural Networks

Rawan M. A. Nawaiseh, Fabrizio De Vita and Enrico Catalfamo (University of Messina, Italy); Dario Bruneo (Universita di Messina, Italy)

Abstract: Anomaly detection systems are crucial for identifying deviations from normal behavior in various domains, ranging from cybersecurity to industrial system monitoring. Traditional approaches often rely on predefined rules or supervised learning algorithms, which may struggle to adapt to complex and evolving patterns. As a result, deep learning techniques have been employed to address these challenges, but they usually require

significant computational resources and memory for training and inference. On the contrary, Spiking Neural Networks (SNNs), inspired by the brain neural architecture, excel in effectively capturing complex temporal patterns present in real-world data through unsupervised learning, potentially leading to more robust performance while also conserving memory and reducing energy consumption. In this paper, we employ the homeostatic plasticity characteristic that governs the synapses behaviour in SNN to implement an anomaly detection system designed for processing raw vibration data. Initially, we generate spike trains to represent the input data. These are then fed into a Balanced Spiking Neural Network (BSNN) to detect suspicious anomalies. The proposed SNN learning algorithm dynamically adjusts synaptic weights based on the precise timing of spikes between neurons, and introduces a combination of Spike Timing Dependent Plasticity (STDP) and reverse STDP techniques. Experimental results conducted on a public available vibration dataset demonstrate the effectiveness of the proposed approach in accurately identifying anomalies while maintaining low false positive rates.

On the Role of Re-Descending M-estimators in Resilient Anomaly Detection for Smart Living CPS

Sahar Abedzadeh and Shameek Bhattacharjee (Western Michigan University, USA)

Abstract: Anomaly-based attack detection methods that rely on learning the benign profile of operation are commonly used for identifying data falsification attacks and faults in cyber-physical systems. However, most works do not assume the presence of attacks (or data errors) while training the anomaly detectors- and their impact on eventual attack detection performance during the test set. Some robust learning methods also overcompensate mitigation which leads to increased false positive in the absence of attacks/threats during training. To achieve this balance, this paper proposes a framework to enhance the robustness of previous anomaly detection frameworks in smart living applications, by introducing three profound design changes for threshold learning of time series anomaly detectors:(1) Tukey biweight loss function instead of square loss function (2) adding quantile weights to regression errors to Tukey Loss (3) modifying the definition of empirical cost function from MSE to the harmonic mean of quantile weighted Tukey losses. We show that these changes mitigate performance degradation in anomaly detectors caused by poisoning attacks during training- while is simultaneously able to prevent false alarms in the absence of training set attacks. We evaluate our work using a proof of concept that uses state-of-the-art anomaly detection in smart living CPS that detects false data injection in smart metering.

A Domain-Specific Tool for the Creation of Machine Learning Models with Imbalanced Datasets

Dmitrii Fomin (Université Grenoble Alpes, France); Philippe Lalanda (Grenoble University, France); Denis Morand (Schneider Electric, France)

Abstract: In this paper, we introduce a domain-specific tool designed to streamline the development of deep learning models for industrial applications, particularly those facing the challenges posed by imbalanced datasets. The advent of pervasive computing has allowed the creation of new smart services based on machine learning, yet the complexity of effectively harnessing data from IoT devices remains a challenge. The data characteristics ranging from noise and scarcity to a lack of labels and imbalance - present significant obstacles for their utilization. A focal point of this research is the issue of class imbalance, which significantly impedes the achievement of accurate predictive models, especially in critical applications like anomaly detection. Our paper presents a solution through the development of a specialized tool that integrates state-of-the-art techniques and metrics specifically designed to deal with class imbalance. This tool also adapts to various constraints set forth by domain experts, thereby facilitating the creation of optimized models suited to specific industrial needs. To demonstrate its practicality and effectiveness, we apply our tool in a case study focusing on the detection of motor malfunctions in the context of Industry 4.0, in collaboration with Schneider Electric.

Industry Session

Chair: Kyoungsoon Kim, AIST, Japan

Time: June 30th, 15:45 – 16:45

Location: Conf. Hall (12F)

Threshold Estimation-assisted Unsupervised Patch-wise Model for Industrial Inspection of Anomaly

Yang Chen, Peiyue Yuan, Yanyu Wang and Chai Kiat Kiat Yeo (Nanyang Technological University, Singapore); David Aik-Aun Khoo, Minhoe Hur and Keng Teck Ma (Hyundai Motor Group Innovation Center in Singapore, Singapore)

OPTIMUS: Discrete Event Simulator for Vehicle-to-Building Charging Optimization

Jose Talusan and Rishav Sen (Vanderbilt University, USA); Ava Pettet, Aaron Kandel, Yoshinori Suzue and Liam Pedersen (Nissan Advanced Technology Center Silicon Valley, USA); Ayan Mukhopadhyay and Abhishek Dubey (Vanderbilt University, USA)

PhD Forum

Time: June 30th, 16:45 – 18:15, (Poster: June 30th, 16:45 – 18:00)

Location: 1008 (10F), (Poster: Foyer (12F))

MalFormer 001: Transformer-based Multimodal Fused Attention Malware Detector

Pradip Kunwar (Tennessee Technological University, USA)

Sustainable Route Planning and Efficient Computation Offloading in Urban Air Mobility

Debjyoti Sengupta (Missouri University of Science and Technology, USA)

Learning at the Time of Disasters

Victor Romero II (Nara Institute of Science and Technology, Japan & University of the Philippines, Philippines)

Trust-Aware Routing of Human Drivers to Mitigate Traffic Congestion

Doris E M Brown (Missouri University of Science and Technology, USA)

Deep Neural Networks at the Edge

Robert Viramontes (University of Wisconsin Madison, USA)

Distributed Radiance Fields for Edge Video Compression and Metaverse Integration in Autonomous Driving

Matúš Dopiriak (Technical University of Košice, Slovakia)

Drug Solubility And Subcategory Prediction Using SMILES Strings

Sarwan Ali (Georgia State University, USA)

Towards Efficient Urban Mobility: Leveraging GNN and MTL for Demand Forecasting

Samir Amitkumar Gupta (Vanderbilt University, USA)

Posters | Demos

Time: June 30th, 16:45 – 18:00

Location: Foyer (12F)

Posters

An Implementation of Private Function Evaluation Using FHE and TEE for Smart Computing Systems

Ruixiao Li, Ryutaro Onishi and Hayato Yamana (Waseda University, Japan)

Solving Sequential Competitive Facility Location Challenges: Using Parallel Genetic Algorithms

Sadan Kulturel-Konak and Abdullah Konak (Penn State Berks, USA); Lawrence Snyder (Lehigh University, USA)

Reinforcement Learning based Matching for Parallel Computation Offloading in Dynamic Fog Computing Networks

Tran Hoa and Dong Seong Kim (Kumoh National Institute of Technology, Korea)

OpenCyberCity Testbed's Recent Progress in Smart City Management

Mostafa Zaman, Ahmed Malik, Maher Al Islam and Courtney Van (Virginia Commonwealth University, USA); Alyssa Pollard and Brittany Davis (Virginia State University, USA); Sherif Abdelwahed(Virginia Commonwealth University, USA); Nasibeh Zohrabi (Pennsylvania State University, USA)

Demos

A Table-top Interface for Real-time Coaching in Abacus Learning

Yuki Matsuda (Okayama University)

Enhanced Pedestrian Detection Model Transfer-Trained on YOLOv8 Using DenseFused RGB and FIR Images

Yoshihara Arata, Ismail Arai, Arata Endo, Kazutoshi Fujikawa and Masatoshi Kakiuchi (Nara Institute of Science and Technology)

A Demonstration of Voice-Interactive AI Agents for Vehicles Utilizing Multiple LLMs

Toru Furusawa, Masatoshi Saitoh (Toyota Motor Corporation)

Local Restaurants & Attractions

Osaka Castle

URL: https://www.osakacastle.net/

Location: 1-1 Osakajo, Chuo-ku, Osaka 540-0002

The symbol of Osaka. From the top floor of Osaka Castle, you can have a panoramic view of Osaka City.

Tsutenkaku

URL: https://www.tsutenkaku.co.jp/

Location: 1-18-6 Ebisu Higashi, Naniwa-ku, Osaka City

One of the landmark towers in Osaka. There's a 'Billiken' statue at the observatory; touching its feet is said to bring good luck.

Osaka City Central Public Hall

URL: https://osaka-chuokokaido.jp/

Location: 1-1-27 Nakanoshima, Kita-ku, Osaka 530-0005

Nationally designated important cultural property. One of the symbols of Osaka Nakanoshima in the neo-renaissance style.

Bank of Japan Osaka Branch Old Building

URL: https://www3.boj.or.jp/osaka/guide/tour-index.html

Location: 2-1-45 Nakanoshima, Kita-ku, Osaka 530-8660

Authentic Western-style architecture of brick and stone. Tours of the building interior are available.

Umeda Sky Building/Floating Garden Observatory

URL: https://www.skybldg.co.jp/en/

Location: 1-1-88 Oyodonaka, Kita-ku, Osaka-shi, Osaka Prefecture

One of the symbolic buildings of Osaka with 360-degree open-air rooftop observation floor.

Osaka Nakanoshima Museum of Art

URL: https://nakka-art.jp/en/

Location: 4-3-1 Nakanoshima, Kita-ku, Osaka

The collection comprises over 6,000, focusing on representative art and design pieces from Japan and abroad.

National Museum of Art, Osaka

URL: https://www.nmao.go.jp/en/

Location: 4-2-56 Nakanoshima, Kita-ku, Osaka

An exceptionally rare, fully underground art museum that houses around 8,200 collections.

Universal Studios Japan

URL: https://www.usj.co.jp/web/en/us

Location: 2-1-33 Sakurajima, Konohana-ku, Osaka 554-0031

One of Osaka's representative theme parks. You can experience the worlds of The Wizarding World of Harry Potter™, Minions, Super Mario, and others.

Kaiyukan

URL: https://www.kaiyukan.com/language/eng/

Location: 1-1-10 Kaigandori, Minato-ku, Osaka 552-0022

A prominent aquarium in Osaka, which houses and displays about 620 species and 30,000 creatures.

Kuromon Market

URL: https://kuromon.com/en/

Location: 2-4-1 Nihonbashi, Chuo-ku, Osaka 542-0073

In the market, where wholesale and retail combined amount to about 150 stores, it is very popular with tourists.

Sakebo Uoman Yodobashi

URL: https://www.cfs-japan.com/brands/uoman/shops/umeda/en/

Location: 8F Yodobashi Umeda, 1-1 Ofuka-cho, Kita-ku, Osaka-shi, Osaka 530-0011

You can enjoy dishes such as fresh sashimi platters and sea bream rice cooked in a Shigaraki clay pot.

Osaka Botejyu

URL: https://osaka-botejyu.com/en/

Location: 3-7-20 Namba, Chuo-ku, Osaka 542-0076

The Osaka Botejyu main store is a popular, long-established restaurant for okonomiyaki, one of Osaka's soul foods.

Kushikatsu Daruma

URL: https://www.kushikatu-daruma.com/

Location: 10F LUCUA 1100, 3-1-3 Umeda, Kita-ku, Osaka-shi, Osaka

Kushikatsu Daruma is a popular restaurant that serves kushikatsu, one of Osaka's soul foods. You can experience the unique Osaka culture of "no double-dipping" the sauce.

sumile OSAKA

URL: https://love-central.jp/sumile/

Location: 2-1-18 Nishitenma, Kita-ku, Osaka City

This restaurant is a casual Italian restaurant based on the concept of Seafood & Grill.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