1st Keynote speech

Title: Acute Interaction: adaptive Human AI Interaction supporting human's bounded rationality.

Tadashi Okoshi (Keio University)

Abstract: People's interaction with IT and AI technologies are not simple. Just showing a notification "You need to walk 3000 steps more" on their smartphone does not effectively work for their actual behavior change. In this talk, I introduce my recent and ongoing research works including attention-aware interaction, mood-aware interaction, and more that supports human's bounded rationality, and would like to possibly initiate our discussion on humans and interactions in intelligent and XR environments.

CV : Tadashi Okoshi is an associate professor in Faculty of Environment and Information Studies, Keio University. He is a computer scientist especially focusing on information and computing systems for supporting our life-long wellbeing. His major is mobile and ubiquitous computing, context-aware computing etc. His recent research works are on human attention management, mobile affective computing, and computing for well-being (WellComp). He has served as organizing and program committee member of mobile and ubiquitous systems, and networking conferences and workshops. He sits on the editorial boards of ACM Proceedings on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT). He has been servicing as social media director of ACM SIGMOBILE since 2016. In 2019, he was awarded IPSJ Microsoft Faculty Award, an annual award for young researchers who have made outstanding international contributions to research and development in major areas of informatics.He holds B.A. in Environmental Information (1998), Master of Media and Governance (2000) from Keio University, M.S. in Computer Science (2006) from Carnegie Mellon University, and Ph.D. in Media and Governance (2015) from Keio University, respectively. He also has over 7 year experiences of entrepreneurship, software architecting, product management, and project management in IT industries (Web2.0, blogging, social networking and social media).

4th Keynote speech

Title: Assuring safety in intelligent systems

Yorie Nakahira (CMU)

Abstract: Distributed multiagent systems must safely operate in unpredictable, interactive, and occluded environments. When agents use data-driven techniques to learn their policies, the black-box policies may not be safe or robust. When agents adapt their policies in an unconnected environment without centralized information, the learned policy may not have gone through an exhaustive safety verification process. Rules that govern safety (collision avoidance, safer detour, etc.) often directly conflict with those that can maximize performance (aggressive maneuvers, reaching goals quickly, etc.). When making real-time decisions in latency-critical environments, the long-term impacts of all of these factors must be accounted for, despite the possible SWAP (size, weight, and power) constraints of onboard resources. In this talk, we will overview our recent work to assure the safety of intelligent systems in such challenging situations.

Yorie Nakahira is an Assistant Professor in the Department of Electrical and Computer Engineering at Carnegie Mellon University. She received B.E. in Control and Systems Engineering from Tokyo Institute of Technology in 2012 and Ph.D. in Control and Dynamical Systems from California Institute of Technology in 2019. Her research interests include the fundamental theory of optimization, control, and learning and its application to neuroscience, cell biology, smart grid, cloud computing, finance, and autonomous robots.

Session A: "Humans and Interactions: HCI, VR/AR, Cognitive aspects"

Title: Heatstroke Risk Prevention by Information & Environmental Wearables

Guillaume LOPEZ (Aoyama Gakuin University)

Abstract: The number of people dying from heatstroke in the ten years to 2018 has almost doubled from the previous ten years, while the number of people transported by ambulance has doubled from five years ago. It is necessary to take preventive measures for the elderly who are hard to feel the heat, infants who cannot cope with the heat by themselves, and people working in hot environments. It is necessary to measure body temperature, activity, and heart rate to be aware of the risk of heatstroke and prevent it from becoming more severe. We have been studying how wearable information and environmental technology could contribute to protecting against heat stress, the elderly living alone, and the workers. To prevent aggravation, we have been developing algorithms to detect heat stress from smartwatch sensor data and new wearable devices that support heat regulatory functions. The challenge is to form a human information sensing, processing, and feedback action loop only based on wearable devices to minimize the user burden.

CV: Guillaume Lopez received an M.E. in Computer Engineering from INSA Lyon, a M.Sc., and a Ph.D. in Environmental Studies from the University of Tokyo in 2000, 2002, and 2005 respectively. He worked as a research engineer at Nissan Motor Corp. from September 2005 and as a project dedicated Assistant Professor at the University of Tokyo from March 2009. In April 2013, he joined Aoyama Gakuin University as an Associate Professor in the Department of Integrated Information Technology. Full Professor since April 2020, his research interests include lifestyle enhancement, skill science, and healthcare support based on intelligent information systems using wearable sensing technology. He is an executive board member of the Academy of Human Informatics and the executive director of IPSJ-SIG Behavior Transformation by IoT. His professional memberships include the AAAC, ACM, AHI, IEEE, IPSJ, SICE.

Session A: "Humans and Interactions: HCI, VR/AR, Cognitive aspects"

Title: Human-Agent Interaction: New Vision for Augmentation of Social Intelligence

Hirotaka Osawa (Keio University, Science Fiction and Fantasy Writers of Japan)

Abstract: Human-agent interaction is a broad discipline that deals with the interaction between humans and social agents. Agents in human-agent interaction exist in many implementations, including social robots, on-screen agents, and game characters, but they all have one thing in common: they are social entities that are perceived by humans as having intentions. Just as artificial intelligence technologies augment human intelligence, these agent technologies can be considered augmenting human society in future. This talk will look at some of the agent research in the field of human-agent interaction, including anthropomorphic technology, board game research, and science fiction research, and examine how human-agent interaction can augment human society in the future.

CV: Dr. Hirotaka Osawa is Associate Professor at Keio University and Visiting Assistant Professor at University of Tsukuba. His research interest is in human-agent interaction, including the development of anthropomorphic devices, simulation of social agents using social games, and research on human imagination using science fiction. His own research focuses on how human-like appearance and attitude can improve user-machine interaction. He also focuses on how society can be improved by social intelligence and conducts research using board games. Recently, he has analyzed the relationship between science fiction and innovation with sci-fi prototyping. He is co-author of "AIWolf: Artificial Intelligence to Deceive, See Through, and Persuade," "Designing the Space between Humans and Robots," "Can AI and Humans Coexist?," "Thinking about Trust: From Leviathan to Artificial Intelligence," "SF Prototyping: New Strategies for Innovation from Science Fiction." He also supervised the books "Ai to Aizawa" and "SF Thinking: Skills for Business and Your Future." He is also a member of the steering committee of the International Conference on Human-Agent Interaction and program chair of the HAI 2015, 2016, 2020. 2021. He also related to several conferences like the International Conference on Human-Robot Interaction (HRI). He is the 21st president of the Science Fiction and Fantasy Writers of Japan. He received his PhD in Engineering, MS and BS in Computer Science from Keio University.

Session B: "Emerging hybrid worlds, transitions and transformations"

Kaoru Ota, Professor, Muroran Institute of Technology, Japan

Title: Self-Optimizating Wirelesss Communication Environments Assisted by RIS

Abstract: While mmWave is a promising spectrum for achieving high-speed wireless communication in beyond 5G networks, it is very sensitive to blockage from buildings and objects due to high propagation loss. Reconfigureble Intellegent Surface (RIS) which is made of many passive reflection elements is an emerging technology to control mmWave and optimize wireless communication environments. However, to deploy RIS in the real world, there exists various research issues to be tacked such as an increase of environmental noises and a complexity of propagation paths. In this talk, I will introduce our research progress on this filed, especially about the problem of maximizing the average achievable rate for multiple users indoor wireless communication assisted by multiple RISs. Unlike most existing works considering single-RIS single-user scenarios or single-RIS multi-user scenarios, the multi-RIS can reflect the signals from several transmission links in all destinations. The average achievable rate maximization problem for indoor communication systems is solved by optimizing the phase shifts of reflective elements. Thus, we propose a Multi-verse Optimizer approach to solve the problem. Our simulation results demonstrate that a communication system with multiple RISs provides considerable achievable rate gains relative to baseline schemes.

CV: Dr. Ota received M.S. degree in Computer Science from Oklahoma State University, the US in 2008, and Ph.D. degree in Computer Science and Engineering from The University of Aizu, Japan in 2012. She is currently a Professor at Muroran Institute of Technology, Japan. She was a visiting scholar at University of Waterloo, Canada from 2010 to 2011, and a JSPS research fellow at Tohoku University, Japan from 2012 to 2013. Her research interests include wireless networks and IoT systems. She has published more than 270 papers in peer-reviewed journals and conferences. She serves as international journal editors including IEEE Transactions on Cognitive Communications and Networking and IEEE Internet of Things Journal. She is a Clarivate Analytics Highly Cited Researcher both in 2019 and 2021.

Session B: "Emerging hybrid worlds, transitions and transformations"

Title: Security Research on Blockchain

Naoto Yanai (Osaka University)

Abstract: Blockchains have became a major platform in the current society but they also contain security issues. In this talk, we discuss two topics about combination between cybersecurity and blockchains. The first topic is role-based access control using smart contracts (RBAC-SC). Smart contracts are a programming platform based on blockchains and RBAS-SC realizes role-based access control in a distributed manner by leveraging Ethereum smart contracts. The second topic is Eth2Vec, machine learning-based vulnerability detection for Ethereum smart contracts. Eth2Vec can recognize vulnerability stably by leveraging natural language processing. Both tools are publicly available in GitHub. We also discuss a future direction for integration of cybersecurity, blockchains, and machine learning.

CV: Naoto Yanai received the B.Eng. degree from The National Institution of Academic Degrees and University Evaluation, Japan, in 2009, the M.S.Eng. from the Graduate School of Systems and Information Engineering, the University of Tsukuba, Japan, in 2011, and the Dr.E. degree from the Graduate School of Systems and Information Engineering, the University of Tsukuba, Japan, in 2014. He was an assistant professor at Osaka University, Japan, until 2021 and is now an associate professor at Osaka University, Japan. His research area is information security.

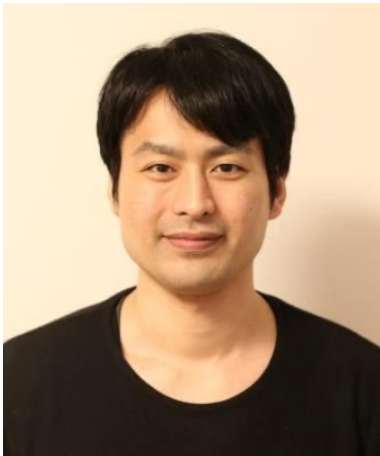Session C: "Social computing and simulations"

Title: Learning multi-agent rules from real-world trajectory data

Keisuke Fujii (Nagoya University)

Abstract: Understanding real-world multi-agent motions is a fundamental issue in engineering, biology, and human behavioral science. However, in real-world multi-agent systems, the rules behind their complex movements are often unknown. In such cases, it would be effective to estimate the unknown parts using machine learning from measured data. In this talk, I will first introduce a machine learning method for estimating interaction rules from movement trajectories in multiple species of animals and a theoretical model of animal behaviors. We adopt an approach for augmenting incomplete multi-agent behavioral models described by time-varying dynamical systems with neural networks. For efficient and interpretable learning, our model leverages theory-based architectures separating navigation and motion processes, and the theory-guided regularization for reliable behavioral modeling. Next, we introduce a causal inference method for estimating time-varying individual treatment effects (ITEs) from limited data for multi-agent trajectories in different domains such as biological movement simulators, autonomous driving simulators, and team sports. Our model leverages graph variational recurrent neural networks and theory-based computation with domain knowledge for the ITE estimation framework based on long-term prediction of multi-agent covariates and outcomes. These frameworks would provide insights into learning approaches of multi-agent rules from limited real-world trajectory data.

CV: Keisuke Fujii is an associate professor at the Graduate School of Informatics, Nagoya University, Japan. He received his B.S., M.S., and Ph.D. degrees from Kyoto University in 2009, 2011, and 2014, respectively. After his work as a postdoctoral fellow and research scientist at Nagoya University and RIKEN Center for Advanced Intelligence Project in Japan, he joined Nagoya University. He is also a visiting scientist at RIKEN Center for Advanced Intelligence Project in Japan. His research interests include machine learning, multi-agent systems, sports sciences, mathematical models, behavioral sciences, computational biology, and robotics. In particular, he is interested in the integration of domain knowledge and machine learning for analyzing multi-body time series data, such as various sports (soccer, basketball, badminton, baseball, handball, rugby, race walk, figure skating, etc.), animal group behaviors, and autonomous vehicle simulations. Recently he published two representative papers: "Learning interaction rules from multi-animal trajectories via augmented behavioral models" (Fujii et al. 2021, NeurIPS'21) and "Estimating counterfactual treatment outcomes over time in complex multi-vehicle simulation" (Fujii et al. 2022, ACM SIGSPATIAL'22). In the former, he adopt an approach for augmenting incomplete multi-agent behavioral models described by time-varying dynamical systems with neural networks. For efficient and interpretable learning, the model leverages theory-based architectures separating navigation and motion processes, and the theory-guided regularization for reliable behavioral modeling. In the latter, he

introduced a causal inference method for estimating time-varying individual treatment effects (ITEs) from limited data for multi-agent trajectories in different domains such as biological movement simulators. The proposed model leverages graph variational recurrent neural networks and theory-based computation with domain knowledge for the ITE estimation framework based on long-term prediction of multi-agent covariates and outcomes. Overall, his main research question is "How can we model real-world multi-agent systems?" Specifically, he tackles two research problems for modeling and data analysis: "How can we model human behaviors with top-down and bottom-up processing?" and "How can we analyze real-world multi-agent behaviors?" As his standpoint, he consider that: (i) realistic multi-agent simulation must integrate rule-based (domain knowledge) and machine learning models; (ii) for real-world multi-agent behavior analysis, forward (and backward) models should be required; and (iii) To develop such methodologies, we need to investigate multi-agent systems in various domains.

Session C: "Social computing and simulations"

Title: Toward AI-supported decision makings on crowd movement guidance with spatio-temporal causal inference frameworks.

Koh Takeuchi (Kyoto University)

Abstract: Crowd movement guidance has been a fashionable problem in the contexts of traffic control, disaster management, evacuation planning, and pandemics. Predicting the travel time of crowds for possible guidance plans is a promising approach to help decision-makers in emergency situations. However, the problem of learning to predict the distribution of traveling time among moving members of a crowd has not been considered in the relevant literature due to the existence of selection bias on guide plans. In this talk, we introduce a spatio-temporal causal inference framework to predict a travel time distribution of guided crowd movements from a few biased data. With a help of a multi-agent simulator, we generate a biased dataset of evacuation movements from a building layout and report a performance comparison on a prediction task.

CV: Koh Takeuchi is an assistant professor at Department of Intelligence Science and Technology, Kyoto University. Before joining the faculty, he was a research scientist in Communication Science Laboratory of NTT from 2011 to 2020. His research focuses on the foundations of machine learning and data mining, and on their advanced applications to various fields.

Session D: "Real World Applications"

Title: Macro-Micro Interaction Technology and Its Applications

Tadayoshi Aoyama (Nagoya University)

Abstract: The use of intracytoplasmic sperm injection (ICSI), an assisted reproductive technique (ART), is increasing widely. Manipulation of microscale objects is quite difficult, and ICSI is currently performed by specially skilled embryologists. The shortage of skilled embryologists has become a problem with the increasing demand for ART. Macro-micro interaction technologies have been developed to connect the macro-world with the micro-world, and enable people to operate in the micro-world. This talk outlines macro-micro interaction technology that simplifies ICSI, focusing on view-expansive microscopy systems, 3D image presentation interfaces, micro-manipulation interfaces, and immersive micro-manipulation systems.

CV: Tadayoshi Aoyama received B.E., M.E., and Ph.D degrees from Nagoya University, Japan, in 2007, 2009, and 2012, respectively. He is currently an Associate Professor with the Department of Micro-Nano Mechanical Science and Engineering, Nagoya University. He was an Assistant Professor at Hiroshima University from 2012 to 2017, and at Nagoya University from 2017 to 2019. He was JST PRESTO researcher from 2018 to 2022. He is currently serving as a collaborator of JST CREST project, and a research director of JST AIP Acceleration research.

Session D: "Real World Applications"

Title: Assistive Robots for Older People and Its Applications in Nursing Care Field

Abstract: In recent years, the declining birthrate and aging population, as well as the shortage of caregivers, have prompted the development of robotic technology to support the activities of the older people and to reduce the physical burden on caregivers. This talk will focus on social implementation research of novel assistive robots especially in the field of nursing care facilities. First, we report on the effectiveness and usefulness of commercially-available assistive robots to support daily life such as transferring, bathing, and toileting in Japanese nursing homes for more than one year, in terms of reducing the physical burden on caregivers and supporting the independence of care recipients. Next, to accelerate the development of next-generation assistive robots, we introduce recent research on the "Living Lab", a novel demonstration field which can be adapted to various life situations for older people to verify their behaviors and lifestyles with novel assistive robots.

CV:Kenji Kato received B.E., M.E. degrees from Keio University, Japan, in 2009, 2011, and Ph.D degree from the Graduate University for Advanced Studies in 2014. He is currently an Associate Professor with Laboratory of Clinical Evaluation with Robotics, Assistive Robot Center, National Center for Geriatrics and Gerontology in Japan from 2017. He is currently serving as a Co-Investigator of JST AIP Acceleration research and a Principal Investigator of JST Moonshot R&D program [Moonshot Goal 3].

Session E: "Ethical and Legal aspects"

Title: Experimental democracy: consensus process towards diverse common goods

Susumu Ohnuma (Hokkaido University)

Abstract:

This presentation introduces the studies bridging the ideal of democracy over actual human behaviors and public decisions. Normatively, citizens in a public deliberation are expected to discuss not from self-interests but from desirability for the entire society, i. e. common goods. Meanwhile, people do not always do so in reality. Human beings pursue self-interest in nature. However, game experiment studies have demonstrated that individuals are willing to cooperate beyond self-interests under conditions that they can trust others and expect mutual cooperation. Moreover, a huge volume of game experiments has shown that individuals are more attentive to fairness than maximizing self-interests. A question arises about what aspect of common goods is prioritized or balanced when public benefit (utilitarianism) and justice (fairness) are incompatible. We have developed the index to measure the discourse quality regarding diverse common goods and have begun to examine the effects of agenda framing on group decisions. Finally, case studies of citizen participation implemented in accrual policymaking are introduced, showing the significance of procedural justice for public acceptance.

CV:

Susumu Ohnuma

Professor, Department of Behavioral Science, Faculty of Humanities and Human Sciences / Director, Center for Experimental Research in Social Sciences, Hokkaido University / advisory board, Executive Office for Research Strategy, Hokkaido University.

2020 Fellow, Japanese Association of Simulation & Gaming

2005 Ph. D. Psychology (Nagoya University) / 1995 MA Psychology (Nagoya University)

Session E: "Ethical and Legal aspects"

Title: Ethical consideration of companion robots for people with dementia

Hidenobu Summioka (Advanced Telecommunications Research Institute International (ATR))

Abstract:

BPSD (Behavioral and Psychological Symptoms of Dementia), often exhibited by older people with dementia, is not only a burden on caregivers but also a major social issue that increases the economic burden on society. Robot therapy is a promising approach to reducing BPSD. However, it also offers us ethical and legal issues. In this talk, I will discuss some issues, presenting short- and long-term experiments we have conducted with our baby-like interactive robot. I point out that there are no guidelines on robot therapy for people with dementia and indicate that the efforts made in doll therapy may be helpful. In addition, I will discuss that the caregiver's perspective must also be considered in developing a robot for the elderly with dementia.

CV: Hidenobu Sumioka (Ph.D. eng.)

He received the Ph.D. degrees in engineering from Osaka University, Osaka, Japan, in 2008. From April 2008, he was a Research Fellow of the Japan Society for the Promotion of Science (JSPS fellow, PD). From April 2009, he was a senior assistant at University of Zurich. Since January 2012, he has been a researcher at Hiroshi Ishiguro Laboratory, Advanced Telecommunications Research Institute International (ATR). Currently, he is the leader of Presence Media Research Group in Hiroshi Ishiguro Laboratories, ATR. His research interests include human-robot touch interaction, application of a social robot to elderly care, investigation of biological influence of social robot.

Takayuki Ito (Kyoto University)
Program co-chair of JST-ERCIM 2022

CV: Dr. Takayuki ITO is Professor of Kyoto University. He received the Doctor of Engineering from the Nagoya Institute of Technology in 2000. He was a JSPS research fellow, an associate professor of JAIST, and a visiting scholar at USC/ISI, Harvard University, and MIT twice. He was a board member of IFAAMAS, the PC-chair of AAMAS2013, PRIMA2009, General-Chair of PRIMA2014, IEEE ICA2016, is the Local Arrangements Chair of IJCAI2020, and was a SPC/PC member in many top-level conferences (IJCAI, AAMAS, ECAI, AAAI, etc). He received the JSAI Contribution Award, the JSAI Achievement Award, the JSPS Prize, the Fundamental Research Award of JSSST, the Prize for Science and Technology of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science, and Technology (MEXT), the Young Scientists' Prize of the Commendation for Science and Technology by the MEXT, the Nagao Special Research Award of IPSJ, the Best Paper Award of AAMAS2006, the 2005 Best Paper Award of JSSST, and the Super Creator Award of 2004 IPA Exploratory Software Creation Project. He was a JST PREST Researcher, and a principal investigator of the Japan Cabinet Funding Program for Next Generation World-Leading Researchers. He is currently principal investigator of JST CREST project.