Professor Dr. Shigeru Fujimura

Information Architecture Filed, Research in Smart Industry

Laboratory　N225　Tel: 093-692-5293　E-mail: fujimura@waseda.jp
URL: http://www.fujimura-lab.org/

1. Biographical Information

Apr. 1983 – Mar. 1985	Master's course of Major in Electrical Engineering, Science and Engineering, Waseda University
Apr. 1985 – Mar. 2003	Yokogawa Electric Corporation
Mar.1995	Dr. of Engineering (Waseda University)
Apr. 2003 –	Graduate School of Information, Production and Systems, Waseda University

2. Research

With the high speed innovation of Information and Communication Technology, high expectations are growing for realizing smart industries. We are proposing many kinds of systems adapting to the various environments surrounding industries, which make a decision about what kind of products we should make, how to make them, and when we should make. To realize such systems, our research group is conducting many research themes from the two following viewpoints.

From functionality viewpoint

It is important how to use collected information regarding production processes (order, production management, past records, progress report, inventory and shipment), analyzing mechanisms of decision making in real time. We propose a methodology how to realize such mechanisms on information systems, and business process models to improve performance. Through these researches, we propose Japanese style Industry 4.0.

From systemization viewpoint

Researches on implementation of production support systems and the other related applications are conducted in our research group. IoT (Internet of Things), Big Data Analysis, Artificial Intelligence are applied to production systems, and many fundamental techniques on systemization are required including Evolutional Algorithms, Agile Software Development Methodology and Object-oriented Technology.

Research Themes

1) Development of Real World Applications
- Implementation of Smart factories based on IoT technology
- Operator Moving Line Analysis System
- Spiral-evolutional Production Scheduling System

2) Advanced Research for Next Generation Production Systems
- Order Life Cycle Management System
- Operation Support System based on AR (Augment Reality) according to Analysis of Expert Behavior
- Production Process Operation Support System based on Deep Learning
- Time-Series Prediction System

3) Advanced Research for Improvement of Algorithms
- Performance Improvement of Meta-Heuristic Optimization Algorithms
- Performance Improvement of Multi-Objective Optimization Algorithms

3. Message

To enjoy your research life
- Experience the thrill of research first hand!
- Everyone's opinions will be respected, and positive debate is most welcome!
- Let's send results of research and messages for the outside!

Professor: Jinglu HU (Takayuki FURUZUKI)

Information Architecture Field
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URL: http://www.waseda.jp/sem-hflab/; http://www.f.waseda.jp/jinglu/

【Research Theme】

The main research interests of our lab are Computational Intelligence including neural networks, fuzzy systems and genetic algorithm, especially deep learning and its applications. Our researches mainly focus on how to apply those technologies to prediction, classification, clustering and optimization in various real applications, such as pattern recognition and classification, system identification and control, data mining, financial analysis and so on. Based on the information extracted automatically from application domain, we are trying to develop application specific new efficient computational intelligent technologies.

（1）Neurocomputing Technologies:

- Deep learning, deep kernel learning and applications
- Support vector machines and applications
- Learning networks with easy-to-use structure
- Evolutionary algorithms balancing adaptivity and diversity

（2）Applications

- High performance pattern classifier based on deep learning
- Modeling, identificaiton and control of nonlinear dynamical systems
- DNA gene function prediction, protein structure prediction
- FX, stock prediction, stock evaluation, bankruptcy prediction

【Selected Publications】

- "A Self-Organizing Quasi-Linear ARX RBFN Model for Nonlinear Dynamical Systems Identification", *SICE JCMSI*, 9(2), 2016
- "Maximum Power Tracking Control for a Wind Energy Conversion System Based on a Quasi-ARX Neural Network Model", *IEEJ TEEE*, 10(4), 368-375, 2015.
- "Context-based Segmentation of Renal Corpuscle from Microscope Renal Biopsy Image Sequence", *IEICE Trans. on Fundamentals*, E98A(5), 1114-1121, 2015.
- "Quasi-linear Support Vector Machine for Nonlinear Classification", *IEICE Trans. on Fundamentals*, E97A(7), 1587-1594, 2014.
- "A Modified Pulse Coupled Neural Network with Anisotropic Synapic Weigh Matrix for Image Edge Detection", *IEICE Trans. on Fundamentals*, E96A(6), 1460-1467, 2013.
- "Fast SVM Training Using Edge Detection on Very Large Datasets", *IEEJ TEEE*, 8(3), 229-237, 2013.
- "Hierarchical Multi-label Classification Based on Over-sampling and Hierarchy Constraint for Gene Function Prediction", *IEEJ TEEE*, 7(2), 183-189, 2012.
- "Accurate Reconstruction for DNA Sequencing by Hybridization Based on a Constructive Heuristic", *IEEE Trans. on CBB*., 8(4), 1134-1140, 2011

【Personal Records】

1983 Department of Electronic Engg., Sun Yet-Sen University, China (Bachelor)
1986 Graduate School of Information Engg., Sun Yet-Sen University, China (Master)
1986 Research Associate of Dept of Electronic Engg, Sun Yet-Sen University, China
1988 Lecturer of Department of Electronic Engineering, Sun Yet-Sen University, China
1997 Faculty of Comp. Sci. and Syst. Engg, Kyushu Institute of Technology (PhD)
1997 Research Associate of Graduate School of Information Science and Electrical Engg., Kyushu University
2003 Associate Professor of Graduate School of Information, Production and Systems, Waseda University
2008 Professor of Graduate School of Information, Production and Systems, Waseda University

Graduate School of Information, Production and Systems,
Waseda University
Field: Information Architecture
Name: Mizuho IWAIHARA
Title: Professor
E-mail: iwaihara@waseda.jp
URL: http://www.iwaihara-lab.org/pub/

[Research Themes]

In the Data Engineering Laboratory, data mining for extracting useful information from vast contents over the Internet is the main focus, with emphasis on text analytics such as document classification, keyphrase extraction, summarization, sentiment analysis, and authorship attribution. To solve these problems, new deep learning methods are investigated. Our research area also includes data mining over social media, in which links between contents play important roles. Link analysis and link prediction, and temporal prediction of social contents are studied. Knowledge graphs are link-structured representation of knowledge. Our area includes acquisition of new knowledge from Wikipedia, and inference and question answering utilizing knowledge graphs. Large language models are also utilized for these subjects, and new applications are explored.

[Examples of Research Projects]

(1) Document classification, summarization and keyphrase extraction based on deep learning.
(2) Development and applications of knowledge graphs.
(3) New approaches utilizing large language models and their new applications.

[Recent publication]

[1] Zeyu Wang and Mizuho Iwaihara: Few-Shot Multi-Label Aspect Category Detection Utilizing Prototypical Network with Sentence-Level Weighting and Label Augmentation, Proc. 34th Int. Conf. on Database and Expert Systems Applications (DEXA2023), LNCS Vol.14147, pp.363-377, Aug. 2023.
[2] Bin Chen and Mizuho Iwaihara: Enhancing Keyphrase Generation by BART Finetuning with Splitting and Shuffling, Proc. 20th Pacific Rim Int. Conf. on Artificial Intelligence (PRICAI23), LNAI 14325, pp. 1–6, Dec. 2023.
[3] Zhaoyi Wang, Zhenyang, Zhang, Jiaxin Qin and Mizuho Iwaihara: SLHCat: Mapping Wikipedia Categories and Lists to DBpedia by Leveraging Semantic,Lexical, and Hierarchical Features, Proc. ICADL2023, LNCS Vol. 14457, pp.133-148, 2023.
[4] Xu Zhewei, Mizuho Iwaihara: Self-training involving semantic-space finetuning for semi-supervised multi-label document classification. Int. J. Digitital Libraries, Springer, 15 pages, May 2023.

[Brief biography]

1988 B. Eng., Dept. Computer Science and Communication Eng., Kyushu University
1993 Dr. Eng., Graduate School of Engineering, Kyushu University
1996 Associate Professor, Dept. Computer Science and Comm. Eng., Kyushu University
2001 Associate Professor, Dept. Social Informatics, Kyoto University
2009 Professor, Graduate School of IPS, Waseda University

Professor Dr. Sei-ichiro Kamata

Image Media Group, Information Architecture Field
Laboratory N203 tel: 093-692-5219 E-mail:kam@waseda.jp
URL: http://www.waseda.jp/sem-kamlabo011/

1. Biographical Information

Dr. Kamata received the B.E. degree in computer science from Kyushu Institute of Technology in 1983, the M.S. degree in computer science from Kyushu University in 1985, and the D.E. degree from the Department of Computer Science, Kyushu Institute of Technology in 1995. From 1985 to 1988, he was with NEC, Ltd. In 1988, he joined the faculty at Kyushu Institute of Technology. From 1996 to 2001, he was an Associate Professor in the Graduate School of Information Science and Electrical Engineering, Kyushu University. In 2001, he joined KES R&D and was a visiting Professor at RISE, Waseda University. Since 2003, he has been a Professor in the Graduate School of Information, Production and Systems, Waseda University.

2. Research

Since the late 1980s, my research target is to contribute to social life by creating new ideas. There are two main topics in my research and development: image processing and pattern recognition. The study is done from fundamentals based on mathematical modeling such as sparse representations, graph representations, etc., to several applications. Since 1995, some related products using my new novel algorithms in image processing and pattern recognition have been launched: for example, a very large-scaled video surveillance system (over 1,000 cameras installed) is utilized at 26th G7/G8 summit in Kyushu, using space-filling curves created by a great mathematician David Hilbert, (see Figure 1). Recent research topics are as follows: (1) research on sparse hypergraph-based representation, etc., (2) research on large-scale neural network applications, (3) Medical image analysis (cancer cell segmentation, MR imaging, etc.), (4) Computer vision applications such as remote sensing, texture analysis (see Figure 2). New methodologies and their applications in image media research have to be developed always.

Publications: (1) Petrou and Kamata: Image Processing -Dealing with Texture-, Wiley (2021). (2) Zhou, Kamata, Luo and Wang: Multiscanning Strategy-Based Recurrent Neural Network for Hyperspectral Image Classification, IEEE Trans. Geoscience and Remote Sensing, vol.60 (2022). (3) Ryu and Kamata, An Efficient Computational Algorithm for Hausdorff Distance Based on Points-ruling-out and Systematic Random Sampling, Pattern Recognition, vol.114 (2021). (4) Kamata: Brain Functional Connectivity Network: from Viewpoint of Visual Information Processing, Neurological Medicine, vol.81 (2014) (in Japanese). (5) Kamata, Eason and Bandou: A New Algorithm for N-Dimensional Hilbert Scanning, IEEE Trans. on Image Processing, vol.8 (1999).

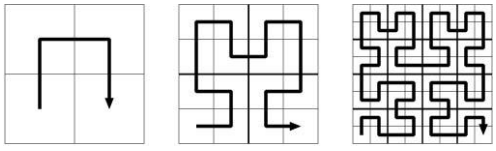


Fig. 1 Space filling curve by D.Hilbert

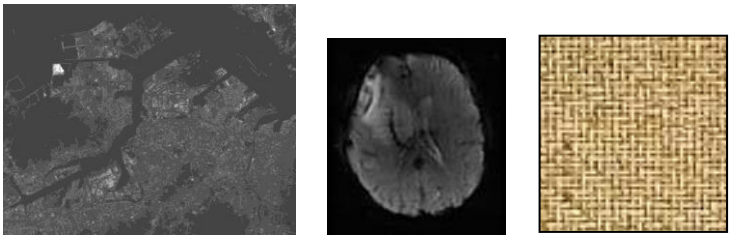


Fig. 2 Computer vision applications

Professor Dr. Jun Kameoka

Information Architecture Field, Bioinformation sensing Research
Laboratory N215 tel: TBA E-mail: jkameoka@waseda.jp
URL:

1. Biographical Information

Dr. Kameoka received Master of Science and Ph.D degrees in Electrical Engineering from Cornell University (Ithaca NY, USA) in 2000 and 2002, respectively. After 1 year of post-doctoral research experience at National Science Foundation Nanobiotechnology center, he started his academic carrier at Texas A&M University at Electrical and Computer engineering department in 2003 as an assistant professor and became a full professor in 2017 with joint appointment in Material science and Engineering department. He also accepted adjunct professor positions in MD Anderson Cancer Center (Houston Texas, USA) and Jikei University of Medicine (Tokyo, Japan) in 2005 and 2015, respectively. He has joined Waseda University in Information, Production and System engineering Department in 2022 September.

2. Research

Dr. Kameoka has over 20 years of research and teaching experience in 1) biosensors including the development of molecular imprinted paper sensor, wearable sensor, a low cost wireless paper sensor, implantable hydrogel sensor (Figure 1a), microneedle sensor (Figure 1b), biomarker and toxic molecule sensors, 2) microfluidic platform including the production of implantable tissue building block production platform for organoid (Figure 1c), exosome isolation microfluidics platform (Figure 1d), single molecule detection, SERS microfluidic platform and, 3) soft robotics and soft actuator including soft platform for wearable medical, mechanical sensor and biology applications, soft floating wave energy converter, pneumatic microgripper (Figure 1e). These research projects have generated more than 100 peer reviewed papers as well as 12 US and Japanese patents that resulted in licensing and commercialization.

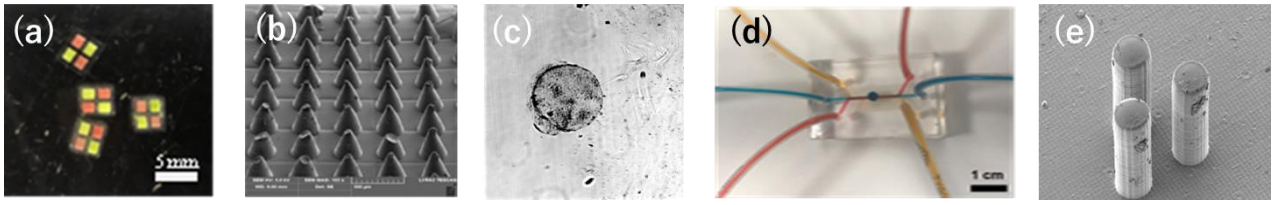


Figure 1: Images of past research achievements.

The goal of my current research is **(1) the development of multiplexing and continuous monitoring biosensor, (2) the integration of biosensors with Digital and Artificial intelligence (AI) technologies.** The multiplex and continuous monitor biosensor is expected to provide much larger data volume than that of the conventional biosensor. A large data volume is critical for the AI-based data processing. The integration of Digital and AI technology with biosensors can improve the accuracy of sensing result as well as provide new information after data processing. Some of current research topics are (1) the aerosol virus detection with wearable paper sensor, (2) aptamer-based cortisol sensor with machine learning process, (3) bacterial oxygen consumption sensor with machine learning process, and (4) multiplexing microneedle sensor for the early detection of acute cardiac failure.

3. Message,

During the past 5 years, the main goal of biosensor research has been shifted from the development of biosensor device for targets to the integration of biosensor with AI and digital technologies to extract new information. In my group, new biosensors are developed particularly for multiplexing, continuous monitoring and AI applications. Graduate students with AI or information technology background and interested in biosensing and wearable devices are very welcome to join my group. If you are interested in this field, please feel free to contact to me (jkameoka@waseda.jp).

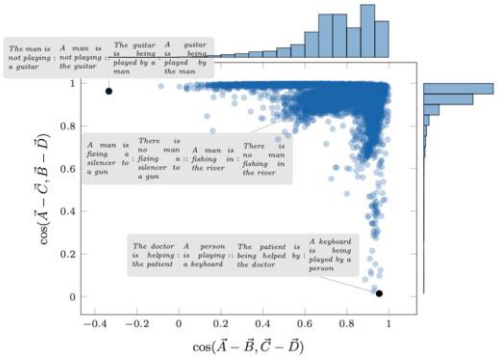
Professor Dr. Yves Lepage

Information Architecture Field, Example-based machine translation / natural language processing lab
Office: N223 tel: 093-692-5287 e-mail: yves.lepage@waseda.jp

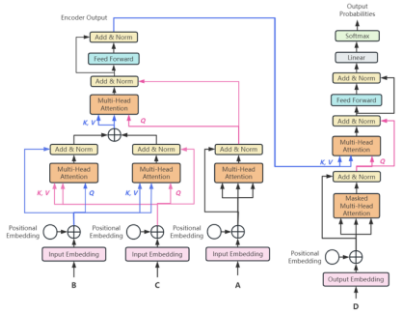
1. Biographical information

1983 École Nationale Supérieure des Mines de St Etienne
1989 Grenoble university, GETA lab, PhD in computer science
2003 Grenoble university, habilitation
2006 French University National Council, linguistics section, qualification for full professorship
2006 French Univ. National Council, computer science section, qualification for full professorship

2. Overview of research



Historically, the lab has been focusing on **machine translation**, concentrating on **analogy**-based methods and **low-resourced** languages (case-based reasoning). In modern terms, our scientific question is to identify **regularity** from **scarce data** and learn how to **generalize safely** and **faster** from it. We used to apply symbolic methods, e.g., in formal morphology, or in the syntax of short sentences. We studied semantic analogies between words in word embedding models. With the advent of large language models (LLMs), our interest shifted to **numerical methods** and **longer sentences** or **texts.** We study how much linguistic knowledge LLMs capture by inspecting their linguistic competence through **analogy questions.** We aim at exploiting the analogical structure of language to attempt **faster generalization,** advocating for the use and development of smaller language models.



Research topics:

- **Formalization of analogy**: analogy between strings, **numerical analogy**
- Creation of analogy datasets, for any language data
- Linguistic competence of large and smaller language models
- **Analogical reasoning** in classical and **generative AI**
- Development of **analogy-based neural networks**

凉:倞 玿:璹 冷:冼
冼:伴 沼:壽 泠:洴
津:律 招:擣 拎:拌
冼:侁 佋:儔

謞:談 璹:玿 曋:曈
槁:椄 壽:沼 澤:潼
擇:撞

Taught courses:

- Distributional semantics: background and basics
- Natural language processing
- Machine translation technology

3. Message to new students

- Recruit students with a strong interest in languages
- Encourage students to attend international conferences

Professor Dr. Takafumi MATSUMARU

Bio-Robotics and Human-Mechatronics Group, Information Architecture Filed.
Laboratory: Bio-Robotics and Human-Mechatronics Laboratory (T. Matsumaru laboratory).
N205 (teacher's), N206 (office), N253 (students').
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https://www.youtube.com/@brhmlabwaseda919/videos (YouTube)

1. Biographical Information

Education:

1985	B.S., Mechanical Engineering, Waseda University
1987	M.S., Mechanical Engineering, Waseda University
1998	Ph.D., Mechanical Engineering, Waseda University

Experience:

1987-1999	Toshiba Corporation (R&D center)
1999-2010	Shizuoka University, Associate Professor
2010-	Waseda University, Professor

2. Research

Aiming at the better relations of humans and machines (robotic and mechatronic systems), various phenomena between humans and machines will be taken up. The purpose is to make artificial systems more friendly and more useful for users. We should demand robotic and mechatronic systems to help humans in real lives, being always conscious of the connection of own research theme with the actual world. We plan to realize desired functions putting current technology together firstly (the choice of elemental technologies and their combination are based on individual engineering sense as a system integrator), and we also research and develop elemental technologies by ourselves that do not yet exist presently.

It is important not only to make academic papers of scientific journals and professional magazines based on research results, but to suggest and demonstrate them as a new function and usage in the world and to present them with higher social impact.

3. Message

Education:

(1) Upbringing of a system integrator playing an active part in the real world: I wish to bring up an engineer /a researcher who can deal with things by versatile thought and acting power for the future.

(2) Upbringing of an engineer / a researcher to be able to entrust with the future: I'd like to bring up the person who can produce something new for the world and whom we can entrust with the future.

(3) Continuous developing for myself: Let's grow up together while developing the new related field at the environment where the people who had a new thinking way with high-potential being free from the existing domain and filed is gathering.

External activity:

(1) Social contribution: We will research and develop technology to realize better society thinking to make it used in real world.

(2) International services: The competition to maintain the position and the living standard as the developed country is necessary, but we want to contribute to the realization of the idea called an international community particularly.

Precautions:

Take "Human-Robot Interaction" (Spring Semester), "Bioengineering" (Fall Semester), and "Robotic" (Fall Semester). Laboratory activities will continue even outside the lecture period. Presentations and discussions at laboratory debriefing sessions and meetings are always required (mainly in English). In order to make an intermediate presentation, it is essential to complete an interim report comparable to the final thesis.

Professor Makoto Tsubokawa

Information Architecture Field, Fiber-optic systems
Fiber-optic systems laboratory (Tsubokawa Laboratory)
Direct: 093-692-5273,
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URL: https://tsubokawa.m.w.waseda.jp/

1. Biographical Information

1984- NTT corporation
2010- Graduate School of IPS, Waseda University

2. Research theme

Our recent interests are in research on new optical devices based on optical fiber and optical waveguide technology, and in the technology for configuring optical networks.

Examples of research themes:

- Optical waveguide devices
  Structural design of nanosized optical beam shaping and optical tweezer devices. Design of optical metasurface structures that create new functions.
- Optical measurement technology
  Sensing technology that uses optical waveguides, such as temperature and refractive index sensors.
- Optical network architecture
  Methods of constructing redundant access networks using wavelength division multiplexing technology, etc.

3. Messages

Students will learn a wide range of knowledge in the field of optics, and in seminars, they will deepen their understanding of the significance and content of the current topics by reading the latest literature on optical waveguides and nano-devices.
In research activities, students will seek out original research themes and aim to gain confidence and a sense of accomplishment by taking on the challenge of submitting academic papers themselves. Japanese and English will be used on a daily basis.

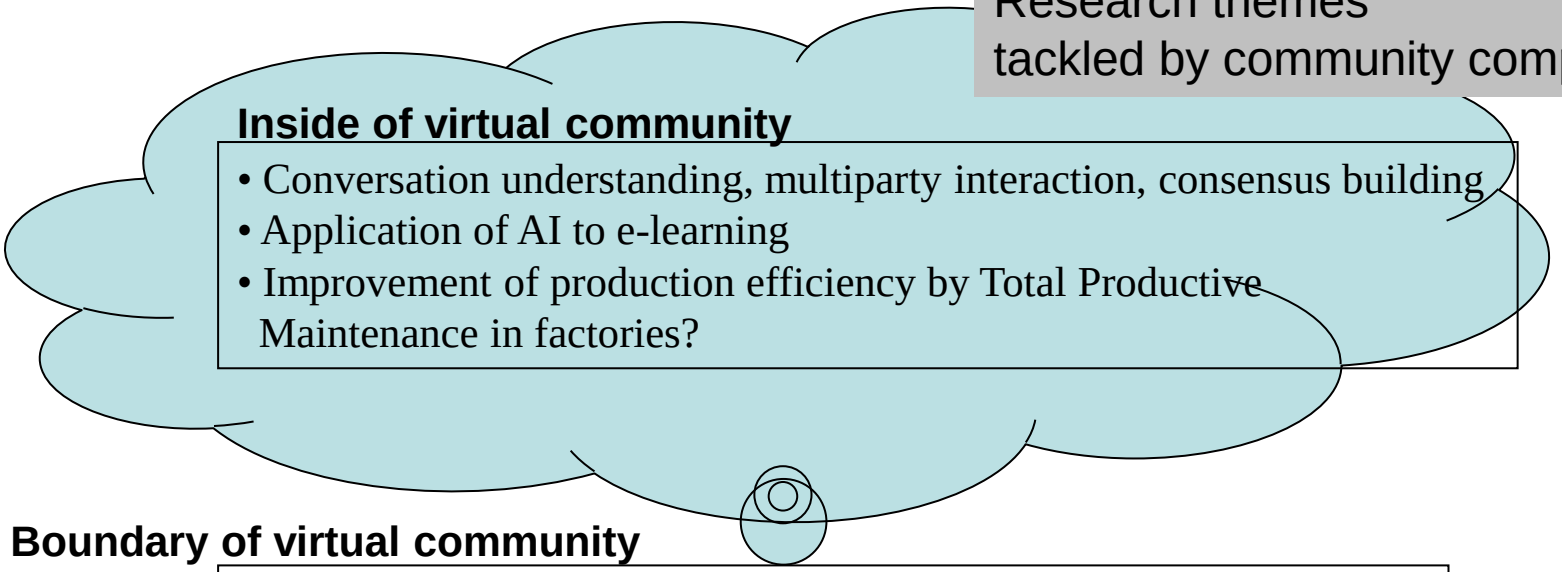
YOSHIE Laboratory

Prof. Dr. Osamu Yoshie contact yoshie@waseda.jp

Our research field, *community computing*, deals with technologies for constructing and running communities, in which locality exists and knowledge logistics – "right knowledge" for "right person" at "right time" in "right form" – is achieved.

Members:
1 professor, 2 visiting lecturers, 3 RA's, 3 Ph.D. candidates and 19 students in master program

Research themes
tackled by community computing



Inside of virtual community

- Conversation understanding, multiparty interaction, consensus building
- Application of AI to e-learning
- Improvement of production efficiency by Total Productive Maintenance in factories?

Boundary of virtual community

- How to store unconscious information in database?
- How to define and implement collaborative and exploratory search?
- How to share educational contents globally?
- Others

Professor Dr. Jun WU

Information Architecture Field, Research in Network Intelligence and Security Laboratory N209 E-mail: junwu@aoni.waseda.jp
URL:

1. Biographical Information

Sept. 2008 – Sept. 2011	Dr. of Science in Global Information and Telecommunication Studies, Waseda University, Japan
Dec. 2011 – Dec. 2012	Post-Doctoral Researcher, National Institute of Advanced Industrial Science and Technology, Japan
Sept. 2011 – Aug. 2013	Researcher, Global Information and Telecommunication Institute, Waseda University, Japan
Sept. 2013 – Aug. 2021	From Assistant Professor to Professor, Shanghai Jiao Tong University, China
Sept. 2021 –	Professor, Graduate School of Information, Production and System, Waseda University, Japan

2. Research

In the era of 5G/6G, intelligence is the main trend of future networks, where endogenous security is the important guarantee. The optimal trade-off between artificial intelligence and cyber security is a must for networks. We are studying the technologies to provide in-network intelligence and secure computing, communication and control. There are three research areas of our group.

Network Intelligence Methodologies

It is a very key concerns for distribute the artificial intelligence from the cloud to the network edge. We study the methodologies to enable intelligent scheduling between the recourse consumers and providers for in-network computing, communication, and control. Typical research themes include:

- Intelligent network resources management
- Intelligent analysis of in-network big data
- Edge-end-could intelligent coordination

Network Security Methodologies

With the high intelligence and openness of various networks, there are more and more threats across the cyber side and physical side. It is very important to ensure the security for the data, nodes, protocols, algorithm and hardware/software of the networks. We study the network security detection, defense, response and prediction methodologies under intelligent environments. Typical research themes include:

- Network intrusion detection and prevention
- Cryptography based secure protocol and data protection
- Decentralized trust management
- Integrated information and function security

Application and System Development of Intelligent Security

Researches on application and system development of network intelligence and security are conducted in our group. Typical research themes include:

- Applications of network intelligence and security methodologies in IoT (Internet of things), Industry 4.0, E-heath, smart transportation, smart grid, digital twin, etc.
- IEEE standard and test-bed system for security management of intelligent networks

3. Message

- Let's make the networks smarter and securer!
- Encourage student to promote international collaborative research!

Assistant Professor Dr. Yuya Ieiri

Information Architecture Field, Community Computing Laboratory
Office: N209 tel: 093-692-5247 E-mail: yuya.ieiri@aoni.waseda.jp

1. Biographical Information

[Education]

2017 B.E., Industrial and Management System Engineering, Waseda University
2019 M.E., Industrial and Management System Engineering, Waseda University
2021 Ph.D., Industrial and Management System Engineering, Waseda University

[Experience]

2019/04 – 2021/03	Research Fellowship for Young Scientists in Japan (DC1)
2021/04 – 2022/03	Research Fellowship for Young Scientists in Japan (PD)
2021/04 – 2022/03	Visiting Research Fellow, University of Surrey, UK
2022/04 –	Assistant Professor, Waseda University

2. Research

Information Utilization for Revitalizing Community

The realization of an optimal information system for individual communities sharing purposes and interests is progressing in an information-oriented society with a large amount of data obtained at various granularities. Under such circumstances, it is necessary to clarify what kind of information should be collected and how it is collected and utilized for the community. Thus, we focus on information processing in community units and pursue problem-solving in the real world and technological novelty from a wide range of perspectives such as informatics, engineering management, and social science.

Social System Construction in Collaboration with Stakeholders

It is necessary to pursue practicality to withstand use in the real world to socially implement the information utilization approach for revitalizing the community as described above. Therefore, we work on a demonstration experiment based on a problem-solving approach in collaboration with various stakeholders in society. Furthermore, we aim to build a practical social system for revitalizing the community by integrating multiple field practices.

Specific Research Theme

We have been working on commercial areas and tourist destinations. For instance, consumer behavior data in commercial areas is collected by focusing on community-based loyalty programs and community currencies. Using this data, we attempt to construct a social system aiming to revitalize the commercial area using agent simulations. Tourist behavior and satisfaction data are collected by mobile applications and IoT (Internet of Things) at tourist destinations. By analyzing this data based on the tourism theory, we work on constructing a system for discovering novel tourist spots. Besides these attempts, we have identified various problems in the real world and are trying to solve them by integrating informatics, engineering management, and social science. The latest academic papers are listed below.

- Y. Ieiri et al., "Area-POS Data: A Novel Method for Commercial Area Management," 13th International Conference on E-Education, E-Business, E-Management, and E-Learning, ACM, 2022.
- Y. Ieiri et al., "Individual Excitement Level Curve: Visualization of Changes in Excitement Level Using Emotional Data in Tourism," Journal of Human Interface Society, Vol.23, No.1, 2021.

3. Message

I use English and Japanese in my lectures which encourage practical learning through interactive experiences rather than one-way lecture styles. I support students in their studies and research activities and all aspects of their university life. Let's enjoy a fulfilling university life together at IPS!