IST-1: Neuroinformatics Group

Professor Yukiyasu Kamitani, Associate Professor Yukiori Goto,
Lecturer Hiroshi Hosokawa, Assistant Professor Shingo Maegawa, Yoshihiro Nagano

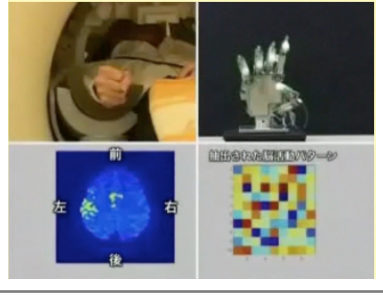
We study how the brain gives rise to behavior and experience by computational modeling of neural and behavioral data. We seek to realize communication technologies that directly connect the brain and the world.

Brain decoding

Methods for decoding human brain signals are developed to reveal mental contents and to understand underlying mechanisms.

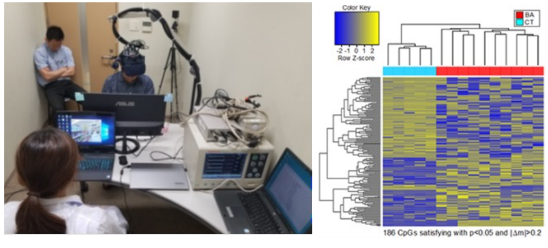
BMI

New approaches to brain-machine interfaces (BMI) are studied to effectively connect the brain and the world.



Neural basis of mental disorders

Neural activity and circuits associated with dysfunction in psychiatric disorder are identified.



Message to Applicants

We welcome applicants with diverse backgrounds. The ideal candidate will have interests in both neuroscience and AI.

Lab Information

Lab HP: https://kamitani-lab.ist.i.kyoto-u.ac.jp/
Address: Frontier Science Building #501, Medicine Camus
Contact: kamitani@i.kyoto-u.ac.jp

IST-2: Psychoinformatics Group

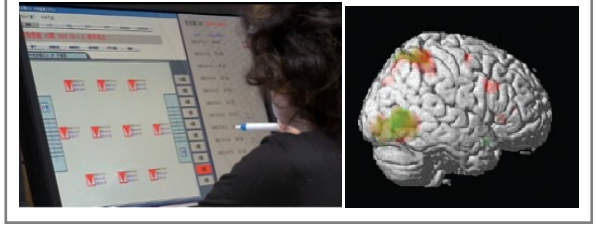
Professor Takatsune Kumada, Associate Professor Ryoichi Nakashima

It is important to solve problems related to the interaction between information technology and humans. Our goals are to understand the mechanisms of the human mind and to introduce knowledge about the human mind into informatics.

Mechanisms of human cognition

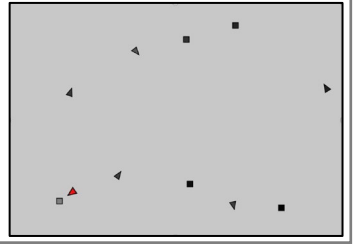
Investigation of human cognition by methods of psychology and neuroscience

- Attention (information selection)
- Executive function (behavior control)



Agents' personality estimation

Expression of personality by the movement of the agent (e.g., triangle)
When people see the movement, they tend to feel that the agent has a specific personality.



Cognitive interface

Driving situations:
Building a machine learning model that discriminates the driver's state from driving behavior

Message to Applicants

We welcome motivated students who are interested in the human mind and deal with the problems in the field (the boundary areas among psychology, brain and cognitive science, and informatics).

Lab Information

HP: https://www.genome.ist.i.kyoto-u.ac.jp
Address: Room 130, Research Building No. 7
Contact: t.kumada@i.kyoto-u.ac.jp

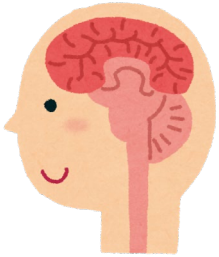
IST-3: Cognitive Informatics Group

Professor Shin'ya Nishida, Associate Professor Hiroaki Mizuhara, Assistant Professor Kiyofumi Miyoshi

We are studying the mechanisms of human cognitive information processing through psychological and behavioural experiments, functional brain measurements, and computer simulations. We are also interested in the comparison of the information processing characteristics between AIs (artificial neural networks) and humans.

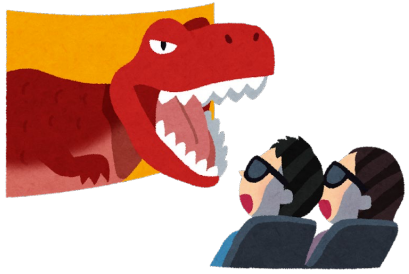
Human information processing

We integrate psychophysics with media informatics to understand human sensory processing and cognitive judgments.



Media technology using perceptual characteristics

We develop perception-based media technologies and leverage cognitive neuroscience for information engineering.



Brain mechanisms of communication

Functional brain measurements such as EEG and fMRI are used to elucidate the brain communication mechanisms.

Message to Applicants

We are a laboratory belonging only to the graduate school and have no undergraduates, so all master's students start their research at the same starting line after admission. Necessary knowledge is acquired through daily research.

Lab Information

Lab HP: http://www.cog.ist.i.kyoto-u.ac.jp/
Address: Room 304, Research Building No.12
Contact: nishida.shinya.2x@kyoto-u.ac.jp

IST-4a: Computational Cognitive Neuroscience

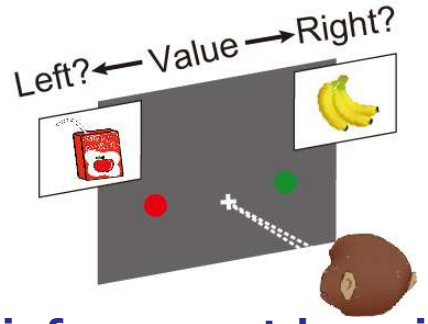
Professor Hiroyuki Nakahara

The long-term goal of our laboratory is to understand the computational principles that underlie the way neural systems realize adaptive behavior, decision-making, and associated learning; in particular, reward-based learning and social decision-making

Social decision-making

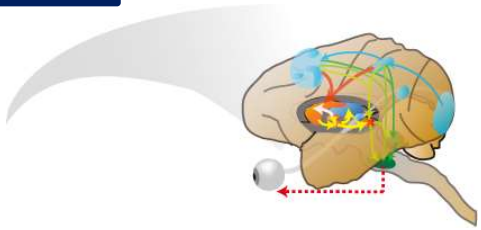
- **Computational theory of mind**
- **Neural computations for empathy, social norm**

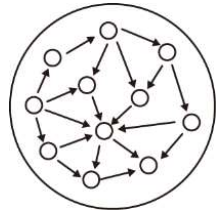
Reward-based learning & decision-making



- **Reinforcement learning**
- **Neural computations for emotion and mood**

Theoretical neuroscience





- **Model-based analysis**
- **Brain intelligence: representation learning and Bayes inference**

Message to Applicants

Candidates should have strong interest in our research topics. Experience related to either human experiment or quantitative skills such as math/computer/statistics is desirable.

Lab Information

Lab HP: : http://www.itn.brain.riken.jp/japanese/recruit.html
Address: Room 135, Research Building No. 7
Contact: hiroyuki.nakahara@riken.jp

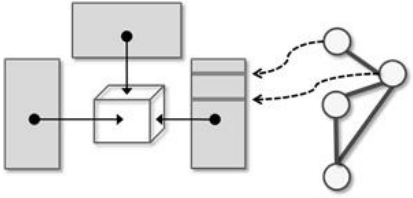
IST-6: Collective Intelligence Group

Professor Hisashi Kashima, Senior Lecturer Koh Takeuchi,
Assistant Professor Kyohei Atarashi, Program-Specific Assistant Professor Han Bao

Our research focus is on advanced data analysis methods such as machine learning, data mining, and human computation, and on their real world applications in various fields such as marketing, healthcare, and industrial systems.

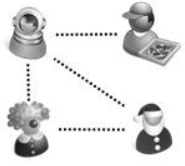
Machine Learning

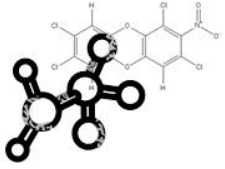
Finding new data analysis problems, and developing mathematical models and high-performance algorithms for them, e.g., graph-structured data analysis.



Novel Applications

Developing novel advanced applications of data analysis technologies and linking data analysis technology to the real world.
Application fields: healthcare, education, transportation, materials science, drug discovery, human resource management, finance, ...





Human Computation

Tackling problems that are difficult to solve with artificial intelligence alone by combining human intelligence and machine intelligence through crowdsourcing.

Message to Applicants

We are looking for students who are motivated to conduct research that will have an impact on the world using data analysis.

Lab Information

Lab HP: http://www.ml.ist.i.kyoto-u.ac.jp/
Address: Room 304, Research Building No. 7
Contact: kashima@i.kyoto-u.ac.jp

IST-7: Symbol Emergence Systems

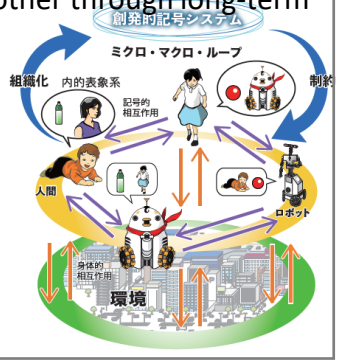
Professor Tadahiro Taniguchi, Assistant Professors Masatoshi Nagano,
Program-Specific Assistant Professors Yuanyuan Jia

Humans adapt and behave intelligently in real-world environments. The languages we use and the conversations are intellectual functions that we, as a society, have acquired through evolution and development. We are studying the emergence of language and symbols based on real-world cognition as the core of intelligence.

Symbol Emergence in Robotics

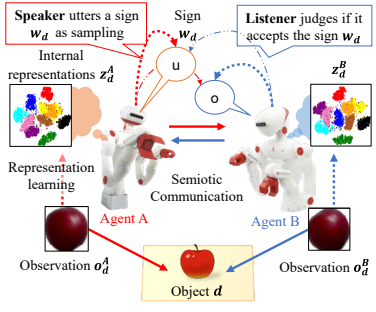
How can humans and robots better understand each other through long-term interactions?

We study the intelligence of humans and robots through a constructive approach



Emergent Communication

By creating robots learn about the world and generate language, we study the origins and functions of human language.



Multimodal Language Understanding

Language is not just text. We can understand and use language in the real world. What about robots?

Message to Applicants

We welcome students who are interested in the intelligence and communication of humans and robots and who have a curiosity to explore mysteries of intelligence.

Lab Information

Lab HP: https://www.emergent-symbol.systems/
Address: Room 217, Research Building No. 7
Contact: taniguchi@i.kyoto-u.ac.jp

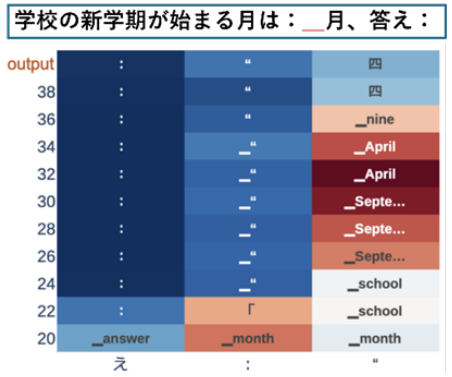
IST-8: Language Media Processing Group

Program-Specific Professor Sadao Kurohashi, Associate Professor Yugo Murawaki, Program-Specific Associate Professor Chenhui Chu
Program-Specific Senior Lecturer Fei Cheng, Program-Specific Assistant Professor Yin Jou Huang

We explore natural language processing (NLP), a field rapidly evolving with the rise of large language models (LLMs) like ChatGPT. While applications continue to expand, many fundamental questions remain. We take a balanced approach, advancing both the theory of language and its practical engineering applications.

Understanding LLMs

Exploring multilingual abilities, cognitive gaps, and applications



Understanding communication

Supporting multilingual communication, LLM-driven moderation, and more

Interview Support System

Translation from interview dialogue to writen languge and knowledge structure analysis

Message to Applicants

We are looking for students who are interested in pushing back the boundaries of conventional thinking, are not afraid of failure, and are willing to try anything new.

Lab Information

Lab HP: https://nlp.ist.i.kyoto-u.ac.jp/EN/
Address: S208, Research Building No. 9
Contact: contact@nlp.ist.i.kyoto-u.ac.jp

IST-9: Speech and Audio Processing Group

Professor Tatsuya Kawahara,
Associate Professor Keisuke Imoto, Assistant Professor Koji Inoue

Speech communication plays a key role in human intelligence. We are studying intelligent processing of speech, audio and music exchanged by human beings for automatic recognition, understanding and interaction systems.

Speech Recognition

Automatic speech recognition (ASR) of real-world conversations, including emotion and speaker attributes

Audio Scene Analysis

Analysis of the audio environment, where multiple persons and a variety of sound sources exist

Dialogue Systems

Spoken dialogue models and systems, which will behave like and naturally interact with human beings

Message to Applicants

We welcome those interested in advanced pattern recognition and machine learning including deep learning and/or speech communication.

Lab Information

Lab HP: http://sap.ist.i.kyoto-u.ac.jp/EN/
Address: Room 417, Research Building No. 7
Contact: kawahara@i.kyoto-u.ac.jp

IST-10: Computer Vision Group

Professor Ko Nishino, Associate Professor Ken Sakurada, Senior Lecturer Ryo Kawahara

We conduct multifaceted research towards elevating computer vision to a truly intelligent perceptual modality with self-driving, AR/VR, and elderly support as the driving application domains.

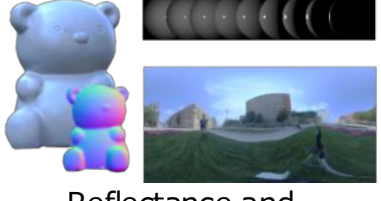
Perceiving People

Understanding of a person's attention, intention, actions, and interactions from sight.

Pointing Estimation

Perceiving Things

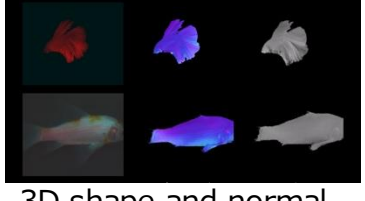
Estimation of physical and semantic information, such as illumination, reflectance, geometry, and material, from object and scene appearance.



Reflectance and illumination estimation

Seeing Better

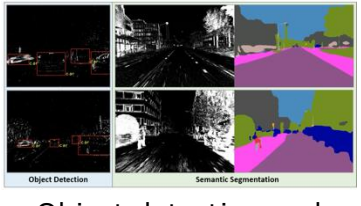
Development of novel imaging systems that use computation as an integral part, referred to as computational photography.



3D shape and normal estimation

Spatial AI

Simultaneous localization and mapping (SLAM) + Scene understanding (Application: Autonomous driving, Robotics, XR)



Object detection and semantic segmentation

Message to Applicants

We look forward to working on far-reaching research with students who can think outside the box and enjoy either or all of theoretical derivation, coding, or experimentation.

Lab Information

Lab HP: https://vision.ist.i.kyoto-u.ac.jp/
Address: Room S-303, Research Building No.9
Contact: nishino.ko.5a@kyoto-u.ac.jp

IST-11: Human Sensing Group

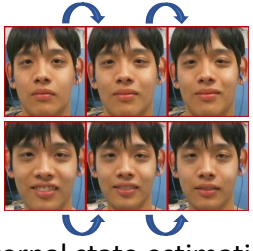
Professor Yuichi Nakamura, Associate Professor Kazuaki Kondo, Assistant Professor Kei Shimonishi

This group designs and implements human-centered cyber-physical systems with visual and somatic interactions, e.g., systems that provide motion and action assist, media that provide communication support, and media that enable memory and experience sharing , which increase self-efficacy and self-esteem of the users.

Human Sensing

Recognition or estimation of intention, emotion, or other internal states which may include estimation of QOL (Quality Of Life) by observing human behaviors and facial expressions.

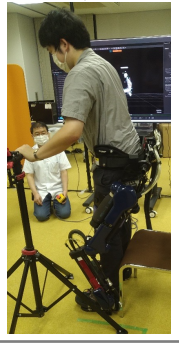
attention estimation



internal state estimation from facial expression

Motion Assist

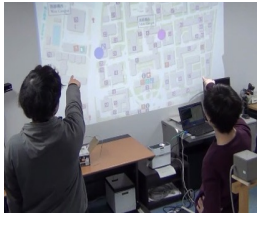
Power assist, motion support based on user intention and motion prediction, which is provided based on the sensing of motion and posture, and muscle sensing as well.



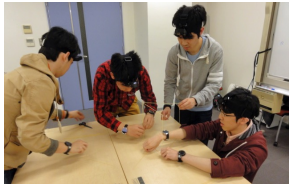
motion assists through estimating user's intention

Communication Support

Analyses of a variety of human-human communications such as conversation, presentation, collaborative works, and design of information and robot systems that supports those human activities.



pointing interface



group work analysis and supports

Message to Applicants

We invite students who investigate a future framework of human-centered systems with us. Required knowledge on image and signal processing, and DNN, etc. can be acquired through research activities.

Lab Information

Lab HP: http://www.ccm.media.kyoto-u.ac.jp/
Address: Room 306, Research Building No. 5
Contact: lab@ccm.media.kyoto-u.ac.jp

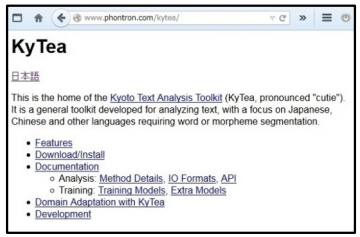
IST-12: Text Media Group

Professor Shinsuke Mori and Assistant Professor Hirotaka Kameko

We are researching computer processing techniques for natural languages (such as Japanese and English) that are normally used by humans. We are also working on information processing for multimedia via natural languages.

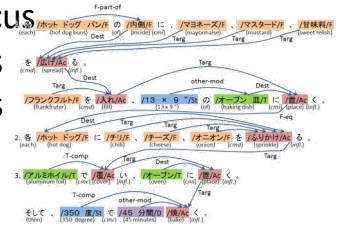
Resources and Tools

It's important for natural language processing research to develop and release language resources and processing tools. We are continuously developing language resources to solve problems. At the same time, we also develop and release tools for domain-specific processing with adaptation.



Procedural Text Understanding

A procedural document is a document that represents a procedure, such as cooking recipe or assembly instructions. One of the goals of natural language understanding is to device the correct procedure from these natural language documents. We focus on procedural texts such as recipe texts to understand these documents.



Explanation of Machine Thinking

The improvement of AI technologies has been remarkable, and they surpass humans in many areas. Our goal is to show how computers think by using natural language that is easy for humans to understand. We focus on game commentary generation to show the reasons of AIs' decisions.

Message to Applicants

We focus on language understanding and the relationship between the real world and natural language. We respect independence of students.

Lab Information

HP: http://www.lsta.media.kyoto-u.ac.jp/home-e.html
Address: Room 315, Research Building No. 5
Contact: forest@i.kyoto-u.ac.jp

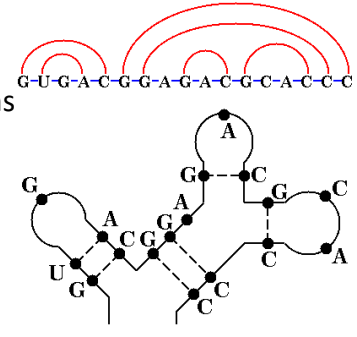
IST-13: Biological Information Networks Group

Professor Tatsuya Akutsu, Associate Professor Takeyuki Tamura, Assistant Professor Motomu Matsui

This group is studying bioinformatics, especially on mathematical models and algorithms for analyzing such data as DNA, proteins, and their networks. The laboratory is located in the Uji campus, and you can study in a calm environment.

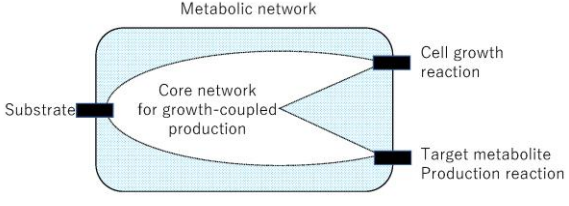
Prediction of Functions of Protein/RNA data

We develop methods for prediction of functions from sequence and structure data of proteins and RNAs.



Design of Metabolic Networks as Cell Factories

We develop algorithms and software for design of metabolic networks that produce useful substances.



Database of Gene Deletion Strategies

We develop a database of gene deletion strategies for metabolic network design and utilizing it to develop machine learning-based methods.

Message to Applicants

Our motto is biology for the subject and mathematics for the method. You need an interest in biology, but no knowledge on it. However, programming skill is required..

Lab Information

Lab HP: https://www.bic.kyoto-u.ac.jp/takutsu/index.html
Address: Room CB319, Uji Research Building I
Contact: tamura@kuicr.kyoto-u.ac.jp