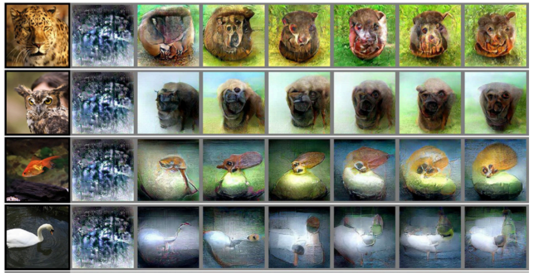
IST-1: Neuroinformatics Group

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

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.

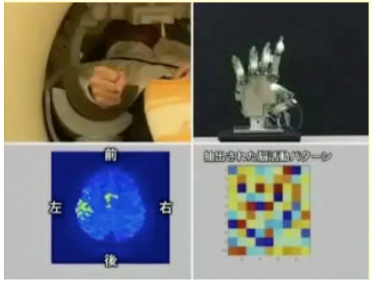
Brain Decoding

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



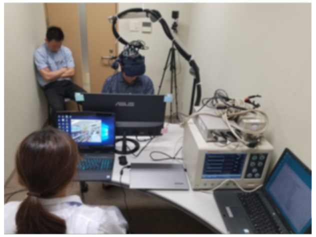
BMI

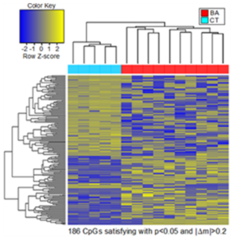
New approaches to brain-machine interfaces (BMI) are studied to effectively connect the brain and the world.



Neural Basis of Mental Disorders

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




Color Key
-2 -1 0 1 2
Row Z-score
BA
CT
186 CpGs satisfying with p<0.05 and |Δm|>0.2

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.

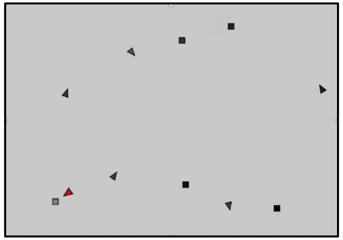
Mechanisms of Human Cognition

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

Lab 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 Group

Adjunct 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

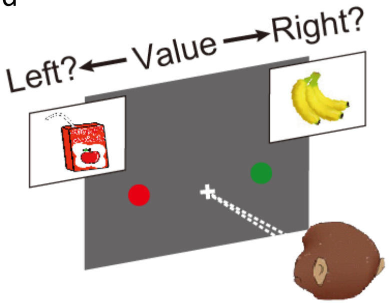
Computational theory of mind

Neural computations for empathy, social norm

Reward-Based Learning & Decision-Making

Reinforcement learning

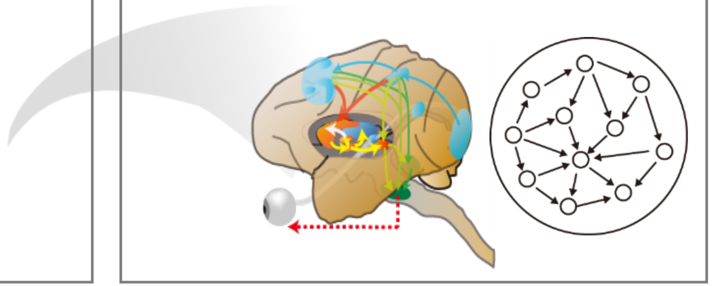
Neural computations for emotion and mood



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-4b: Computational Cognitive Neuroscience Group

Adjunct Professor Wataru Sato

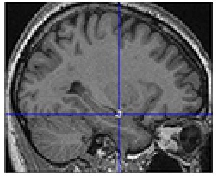
This group aims to understand the neurocognitive mechanisms of the human mind, and to validate this understanding by creating androids that have (or can be perceived to have) the human mind. Our current main research interests are in emotion and emotional interaction.

Psychological Research

To investigate human behavior and information processing, we conduct cognitive psychological experiments that measure ratings and reaction times.
We also measure physiological responses such as electromyography and electrodermal responses.

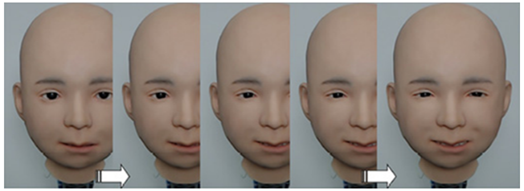
Cognitive Neuroscience Research

To investigate the neural basis of human information processing, we conduct functional neuroimaging research, electroencephalography research, and neuropsychological research (on patients with unilateral amygdala damage).



Android Research

We aim to implement human-like psychological activity in androids.
We investigate human participants' psychological and neural responses to the developed androids.



Message to Applicants

We welcome students who aim for the unique integration of psychology, neuroscience, informatics, and robotics.

Lab Information

Lab HP: https://watarusato.shin-gen.jp/MainE.html
Address: Kyoto University (Kyoto) or Guardian Robot Project, RIKEN (Keihanna)
Contact: wataru.sato.ya@riken.jp

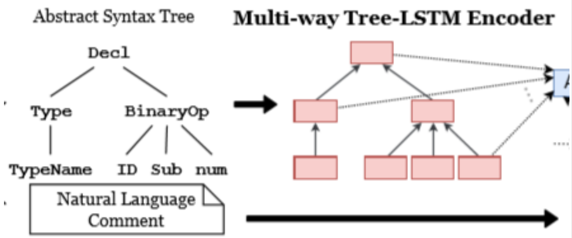
IST-5: Computational Intelligence Group

Professor Akihiro Yamamoto   Program-Specific Associate Professor Natsuhiro Ichinose

We focus on establishing new foundations of intelligent systems, in particular, algorithms for machine learning and knowledge extraction from discrete data and its application to many fields including bio-infromatcs. We are also relationships between machine learning, mathematical logic, and computational algebra.

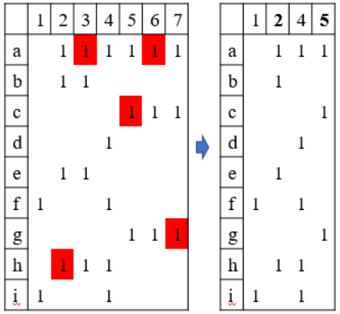
Machine Learning from Structured Data

Machine Learning methods for discrete and structured data such as parsing trees of program source codes and HTML data.


Abstract Syntax Tree
Multi-way Tree-LSTM Encoder
Decl
Type
BinaryOp
TypeName
ID
Sub
num
Natural Language Comment

Data Mining

Mining methods for extracting useful and readable knowledge in the form of closed sets from binary data (relation data)

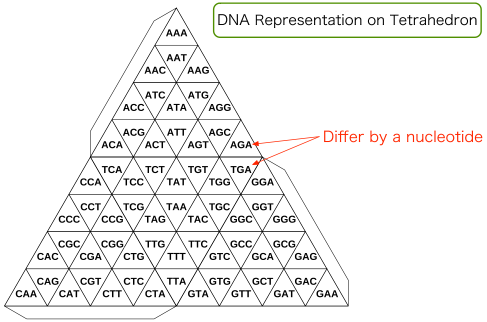


	1	2	3	4	5	6	7
a		1	1	1	1	1	1
b		1	1				
c					1	1	1
d				1			
e		1	1				
f	1			1			
g					1	1	1
h		1	1	1			
i	1			1			

	1	**2**	4	**5**
a		1	1	1
b		1		
c				1
d			1	
e		1		
f	1		1	
g				1
h		1	1	
i	1		1	

Biological information

Representation methods and comparison algorithms for discrete biological information such as DNA sequences.


DNA Representation on Tetrahedron
Differ by a nucleotide
AAA
AAT
AAC
AAG
ATC
ATG
ACC
ATA
AGG
ACG
ATT
AGC
ACA
ACT
AGT
AGA
TCA
TCT
TGT
TGA
CCA
TCC
TAT
TGG
GGA
CCT
TCG
TAA
TGC
GGT
CCC
CCG
TAG
TAC
GGC
GGG
CGC
CGG
TTG
TTC
GCC
GCG
CAC
CGA
CTG
TTT
GTC
GCA
GAG
CAG
CGT
CTC
TTA
GTG
GCT
GAC
CAA
CAT
CTT
CTA
GTA
GTT
GAT
GAA

Message to Applicants

Students interested in either system construction or basic theory are welcome. You will proceed your research smoothly if you are familiar with mathematical methods such as dynamic programming.

Lab Information

Lab HP: http://www.iip.ist.i.kyoto-u.ac.jp/
Address: Room 324, Research Building No. 7
Contact: akihiro@i.kyoto-u.ac.jp

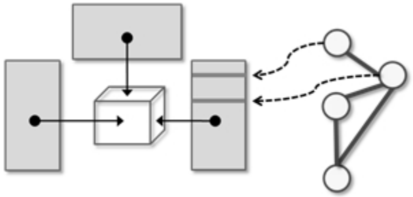
IST-6: Collective Intelligence Group

Professor Hisashi Kashima, Associate Professor Makoto Yamada,
Assistant Professor Koh Takeuchi, 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.

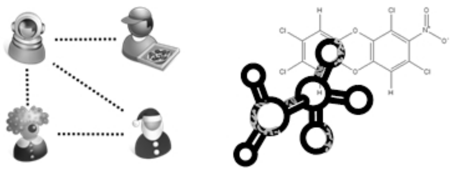
Machine Learning

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

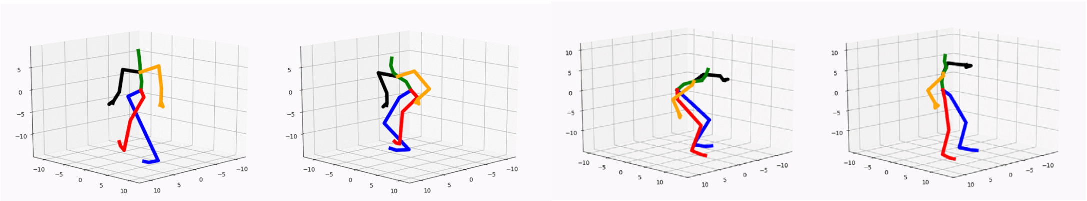
Lab HP: http://www.ml.ist.i.kyoto-u.ac.jp/
Address: Room 304, Research Building No. 7
Contact: kashima@i.kyoto-u.ac.jp

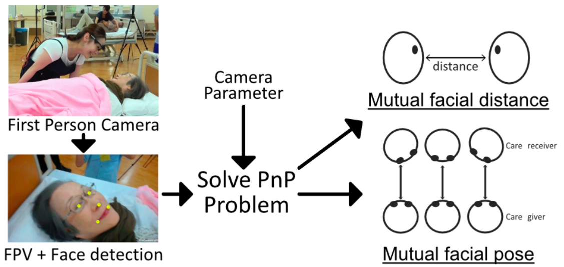
IST-7: Conversational informatics Group

Associate Professor Atsushi Nakazawa

Main Research Topic: Sensing human states and human-human communication

- Measurement of human communication behavior using image analysis
- Understanding people's emotions in response to affective images
- Understanding/expression of human behavior using motion capture data
- Understanding people's gaze and surrounding environment using corneal imaging
- Understanding human cognition and internal states using eye tracking
- Improvement of gesture recognition accuracy using sensor data and deep-learning-based data synthesis





Lab Information

Lab HP: http://www.ii.ist.i.kyoto-u.ac.jp/nakazawa-lab/
Address: Room 217, Research Building No. 7
Contact: nakazawa.atsushi@i.kyoto-u.ac.jp

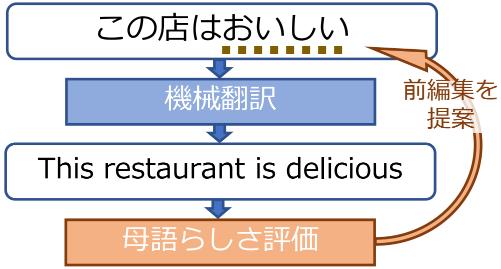
IST-8: Language Media Processing Group

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

Language is the most reliable medium of human intellectual activities. We aim to establish the technology and academic discipline for handling and understanding language, in a manner that is as close as possible to that of humans, using computers.

Cross-cultural Translation

Language technologies to overcome cultural barriers



この店はおいしい

機械翻訳

This restaurant is delicious

母語らしさ評価

前編集を提案

Vision and Language

Multimodal machine translation, visual grounding/captioning/question answering

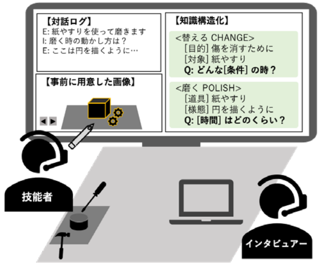
原言語：放せ！

目的言語：

Drop it !

Interview Support System

Translation from interview dialogue to writen languge and knowledge structure analysis



【対話ログ】
E: 紙やすりを使って磨きます
I: 磨く時の動かし方は？
E: ここは円を描くように…

【事前に用意した画像】

【知識構造化】
<替える CHANGE>
[目的] 傷を消すために
[対象] 紙やすり
Q: どんな[条件] の時？
<磨く POLISH>
[道具] 紙やすり
[様態] 円を描くように
Q: [時間] はどのくらい？

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 Kazuyoshi Yoshii,
Assistant Professor Koji Inoue, Program-Specific Assistant Professors Eita Nakamura & Keiko Ochi

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 lectures and meetings, and also natural language processing (NLP) for segmenting and extracting information structures.

Audio & Music

Source separation of mixed-source audio signals and automatic transcription of music audio signals.

Dialogue Systems

Spoken dialogue systems integrating verbal and non-verbal information for humanoid robots that behaves like and naturally interacts 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 Shohei Nobuhara, Assistant Professor Marc A. Kastner

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.

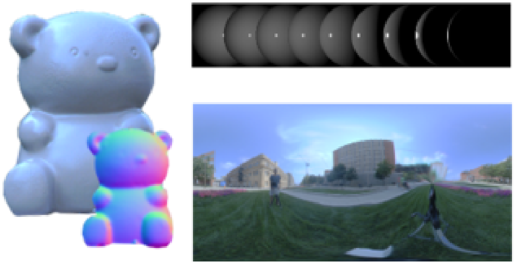
Perceiving People

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

Crowd tracking

Perceiving Things

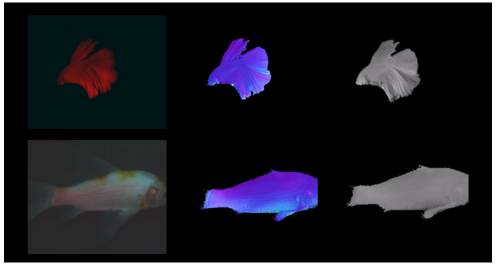
Estimation of physical and semantic information, such as illumination, reflectance, geometry, and material, from object and scene appearance.



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

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

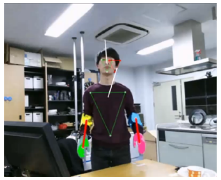
IST-11: Video Media Group

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

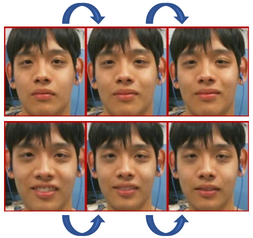
We design and implement human-centered cyber-physical systems with visual and somatic interactions, e.g., media that provide motion and action assist, media that provide communication support, and media that enable memory and experience sharing.

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.



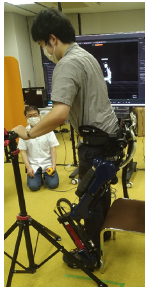
Attention estimation

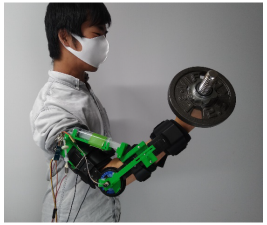


Internal state estimation from facial expression

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.



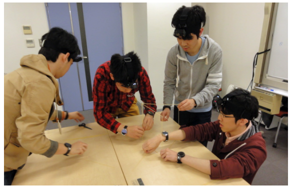


Motion assists through estimating user’s intention

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

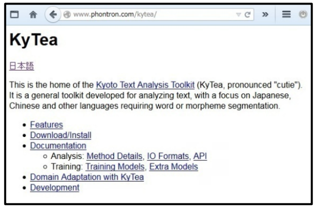
IST-13: Text Media Group

Professor Shinsuke Mori, Assistant Professor Hirotaka Kameko

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.

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.


www.phontron.com/kytea/

KyTea

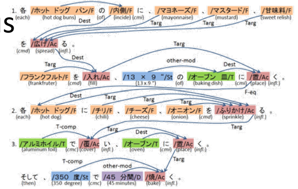
日本語

This is the home of the Kyoto Text Analysis Toolkit (KyTea, pronounced "cutie"). It is a general toolkit developed for analyzing text, with a focus on Japanese, Chinese and other languages requiring word or morpheme segmentation.

- Features
- Download/Install
- Documentation
  - Analysis: Method Details, IO Formats, API
  - Training: Training Models, Extra Models
- Domain Adaptation with KyTea
- Development

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.


F-part-of
1. 各 /ホット ドッグ パン/F の /内側/F に 、 /マヨネーズ/F 、 /マスタード/F 、 /甘味料/F
(each) (hot dog buns) (of) (incide) (cmi) (mayonnaise) (mustard) (sweet relish)
Dest
Targ
Targ
Targ
を /広げ/Ac る 。
(cmd) (spread) (infl.)
Dest
Targ
Targ
other-mod
Dest
/フランクフルト/F を /入れ/Ac 、 /13 × 9 "/St の /オーブン 皿/T に /置/Ac く 。
(frankfruter) (cmd) (fill) (13 x 9 ") (of) (baking dish) (cmi) (place) (infl.)
F-eq
Dest
Targ
Targ
Targ
2. 各 /ホット ドッグ/F に /チリ/F 、 /チーズ/F 、 /オニオン/F を /ふりかけ/Ac る 。
(each) (hot dog) (chili) (cheese) (onion) (cmd) (sprinkle) (infl.)
Targ
T-comp
Targ
Dest
3. /アルミホイル/T で /覆/Ac い 、 /オーブン/T に /置/Ac く 。
(aluminum foil) (cmc) (cover) (infl.) (oven) (cmi) (place) (infl.)
Targ
T-comp
other-mod
そして 、 /350 度/St で /45 分間/D /焼/Ac く 。
(then) (350 degree) (cmc) (45 minutes) (bake) (infl.)

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.

先手玉に８七歩成からの
即詰みがあります。
カメラ

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

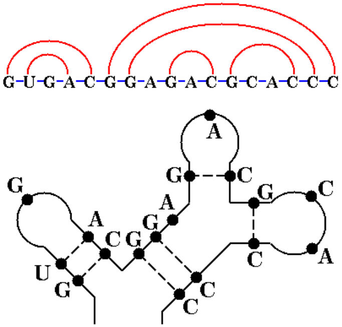
IST-14: Biological Information Networks Group

Professor Tatsuya Akutsu, Associate Professor Takeyuki Tamura, Assistant Professor Tomoya Mori

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.

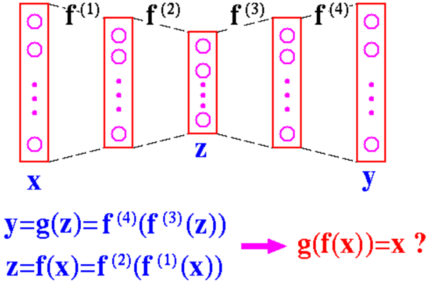
Prediction of Functions of Protein/RNA data

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


G-U-G-A-C-G-G-A-G-A-C-G-C-A-C-C-C
A
G
C
G
C
G
A
A
C
G
G
C
U
C
A
G
C
C

Discrete Models of Neural Networks

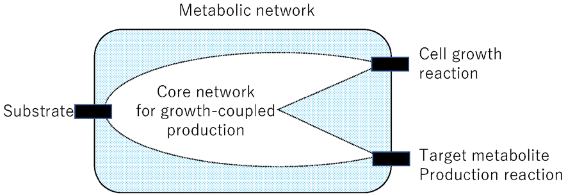
We mathematically analyze the relationship between the compression ratio and #nodes/layers of autoencoders.


$f^{(1)}$
$f^{(2)}$
$f^{(3)}$
$f^{(4)}$
x
z
y

$$y=g(z)=f^{(4)}(f^{(3)}(z))$$
$$z=f(x)=f^{(2)}(f^{(1)}(x))$$
$$\rightarrow g(f(x))=x\ ?$$

Design of Metabolic Networks as Cell Factories

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


Metabolic network
Cell growth reaction
Core network for growth-coupled production
Substrate
Target metabolite Production reaction

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

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