MINI SYMPOSIUM

4th mini-symposium on Computations, Brains and Machines

July 11 (Monday), 2016
13:30 – 17:00
1F Seminar Room, BSI Central Building

13:30-13:35 Opening

13:35-14:20
Visual Recognition and Generation using Machine Learning
Dr. Tatsuya Harada
The University of Tokyo

14:20-15:05
Symbol Emergence in Robotics: Toward Robots that Learn to Communicate
Dr. Takayuki Nagai
The University of Electro-Communications

15:05-15:30 Break

15:30-16:15
Crowdsourcing for Big Data Analysis
Dr. Hisashi Kashima
Kyoto University

16:15-17:00
Semantic Understanding of Natural Language Texts
Dr. Yusuke Miyao (National Institute of Informatics/ The Graduate University for Advanced Studies)

17:00-18:00 Informal discussion (at Nakahara Lab/N201)

Host:
Hiro Nakahara Lab for Integrated Theoretical Neuroscience

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Visual Recognition and Generation using Machine Learning

Dr. Tatsuya Harada
The University of Tokyo

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For the automatic visual recognition, the semantic gap is the long lasting problem, which is the disparity between the visual appearance and linguistic representations. Recently, the high quality annotated image datasets have been developed since a large amount of images can be easily downloaded from the internet, and the images can be annotated cheaply by the crowd workers. To maximally utilize the high quality datasets, the strong computational power, and the efficient machine learning methods, the visual recognition system is showing signs of overcoming the semantic gap. Meanwhile, the image reconstruction and generation become hot topic in CV community. The recognition process can be regarded as the ultimate information compression, while the reconstruction and generation process can be regarded as the challenging trial to realize creative intelligent machines, since it is necessary to complement a lot of information to generate images from concepts. This talk covers topics about the visual recognition and generation, overviews the recent trend in those topics and introduces the techniques using machine learning.

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Symbol Emergence in Robotics: Toward Robots that Learn to Communicate

Dr. Takayuki Nagai
The University of Electro-Communications

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Human intelligence is deeply dependent on its physical embodiment, and its development requires interaction between its own body and surrounding environment. However, it is still an open problem that how we can integrate the lower level motor control and a higher level symbol manipulation system. One of our research goals is to make a computational model of human intelligence from the motor control to the higher level symbol manipulation.

In this talk, an unsupervised on-line learning algorithm, which uses a nonparametric Bayesian framework for categorizing multimodal sensory signals such as audio, visual, and haptic information by robots, is introduced at first. The robot uses its physical embodiment to grasp and observe an object from various viewpoints as well as listen to the sound during the observation. The basic algorithm for intelligence is to categorize the collected multimodal data so that the robot can infer future better and we call the generated categorizes as multimodal concepts. The latter half of this talk discusses an integrated computational model of human intelligence from the motor control to the higher level cognition. Again, the core idea is to segment and categorize multimodal data in various levels and to use such multimodal concepts for inference. Our claim here is that the integrated computational model of human intelligence can be built based on the idea of multimodal categorization.

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Crowdsourcing for Big Data Analysis

Dr. Hisashi Kashima
Kyoto University

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Automated data analysis techniques such as machine learning and data mining are certainly a core of big data analysis; however, at the same time, we cannot expect fully-automatic analysis of all of heterogeneous and unstructured real-world data, and therefore we cannot avoid a significant amount of manual data processing by humans. Crowdsourcing is a relatively new idea to outsource human intelligence tasks to a number of unspecified people via the internet, and is attracting considerable attention as a promising solution to dissolve the human bottleneck in the big data analysis. This talk will present an overview of approaches of crowdsourcing, and introduce some of our ideas and efforts for big data analysis using crowdsourcing.

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Semantic Understanding of Natural Language Texts

Dr. Yusuke Miyao
National Institute of Informatics
The Graduate University for Advanced Studies

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This talk introduces recent advancements in semantic understanding technologies in natural language processing. Fundamental NLP technologies such as morphological analysis and syntactic parsing, have improved significantly owing to machine learning techniques and widely available linguistic resources. This great success motivated NLP researchers to move the research focus into "semantics". However, it is not obvious what is the goal of semantic processing, and in reality many sub-topics somehow related to "semantics" are studied individually. This talk aims to give a panoramic view of recent research efforts on semantic understanding. First, we review a definition of "semantics" in the context of natural language processing, and discuss specific issues that must be solved in semantic understanding technologies. We then describe several approaches to semantic understanding, including logic-based inference, statistical paraphrasing methods, and semantic parsing. Finally, several applications of semantic understanding, such as question answering and reading comprehension, are described.

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