NTU - Tohoku U 7th Symposium on AI and Human Studies

March 2nd (Sat.), 2024

Barry Lam Hall, Room 201, NTU

Time (TW)	Topic	Speaker	Moderator
09:00 - 09:10	***Opening***	**Satoshi Shioiri** (塩入諭 , Tohoku U)	**Li-Chen Fu** (傅立成 , NTU)
09:10 - 09:35	Explicit and Implicit Effect of Visual Attention	**Satoshi Shioiri** (塩入諭 , Tohoku U)	**Hsiu-Ping Yueh** (岳修平 , NTU)
09:35 - 10:00	Exploring the Association between dCNN and Visual Cortical Responses for Image Statistics	**Chien-Chung Chen** (陳建中 , NTU)	
10:00 - 10:25	Impact of Spintronics-Based Nonvolatile Hardware for Edge AI Applications	**Takahiro Hanyu** (羽生貴弘 , Tohoku U)	
10:25 - 10:50	Low-Complexity NN Technology: Model and Precision Search, Acceleration Circuit, and Applications	**Tzi-Dar Chiueh** (闕志達 , NTU)	
10:50 - 11:10	***Break***		
11:10 - 11:35	Consideration of perceptual cues for vertical sound localization using multilayer neural networks of sound event localization and detection	**Shuichi Sakamoto** (坂本修一 , Tohoku U)	**Chia-Huei Tseng** (曾加慧 , Tohoku U)
11:35 - 12:00	Deep-learning-based Speech Enhancement with Its Application to Assistive Oral Communications Devices	**Yu Tsao** (曹昱 , Academia Sinica)	
12:00 - 13:20	***Lunch***		
13:20 - 13:45	Enriching Telecommunication with Nonverbal Information	**Yoshifumi Kitamura** (北村喜文 , Tohoku U)	**Nobuyuki Sakai** (坂井信之 , Tohoku U)
13:45 - 14:10	Interactive Tangible Computing	**Bing-Yu Chen** (陳炳宇 , NTU)	
14:10 - 14:35	Functional PCA of human population in Tokyo	**Yasumasa Matsuda** (松田安昌 , Tohoku U)	
14:35 - 15:00	Out-Of-Sample Exchange Rate Prediction: An Application of Instrumented Principle Component Analysis	**Jui-Chung Yang** (楊睿中 , NTU)	
15:00 - 15:20	***Break***		
15:20 - 15:45	Why Do We Misunderstand "Who Did What"? Approaches from Linguistics and Psychology	**Rei Emura & Masatoshi Koizumi** (江村玲 / 小泉政利 , Tohoku U)	**Masatoshi Koizumi** (小泉政利 , Tohoku U)
15:45 - 16:10	A Pilot Study on LLMs-based Chinese Word Sense Discrimination and its Applications	**Zhao-Ming Gao** (高照明 , NTU)	
16:10 - 16:50	Students' Presentation	4 Students:	**Sun Sai** (孫賽 , Tohoku U)
	Rethinking Degradation: Radiograph Super-Resolution via Generative Model	**Yongsong Huang** (黃永松 , Tohoku U)	
	Estimation of mental states in the context of e-learning by using machine learning techniques	**Guan-yun Wang** (王冠云 , Tohoku U)	
	Domain Analysis of Social Robotics: From 2017 to 2023	**Yuan-Ling Shih** (石媛菱 , NTU)	
	Sentiment Analysis and Schizophrenia Evaluation via Multi-Modality Information	**An-Sheng Liu** (劉安陞 , NTU)	
16:50 - 17:00	***Closing***	**Li-Chen Fu** (傅立成 , NTU)	**Satoshi Shioiri** (塩入諭 , Tohoku U)

Registration

AIROBO 台大人工智慧與機器人研究中心

RIEC

MAHC Medical and Health Care 全幅健康照護子中心

AI Yotta Advanced Institute for Yotta Informatics

TAIHUCAIS

Li-Chen Fu

Center for Artificial Intelligence and Advanced Robotics
Chair Professor, National Taiwan University, Taipei, Taiwan

Biography

Li-Chen Fu received B.S. degree from National Taiwan University, Taiwan, R.O.C., in 1981, and M.S. and Ph.D. degrees from University of California, Berkeley, U.S.A. in 1985 and 1987, respectively. Since 1987, he joined National Taiwan University, and has been awarded Irving T. Ho Chair Professor and NTU Chair Professor since 2007 and 2020, respectively. Currently, he serves as Director of NTU Center for Artificial Intelligence (AI) and Advanced Robotics. So far, he has received numerous academic recognitions, such as Distinguished Research Awards from National Science Council, Taiwan, R.O.C., Macronix Chair Professorship, Academic Award as well as National Chair Professorship from Ministry of Education, Taiwan, R.O.C., IEEE Fellow in 2004, and IFAC Fellow in 2017. He is now serving as Editor-in-Chief of the Asian Journal of Control as well as Advisory Committee member of Asian Control Association, and has served as Vice-President of IEEE Control Systems Society from 2017~2018. His research interests include social robotics, smart home, visual detection and tracking, virtual reality, and control theory & applications.

Satoshi Shioiri

Research Institute of Electrical Communication
and Graduate School of Information Sciences,
Tohoku University, Sendai, Japan

Talk: Explicit and Implicit Effect of Visual Attention

Abstract

Visual attention is considered as internal process to select information for deeper processing in the brain. Since vast amount of information is inputted through the eyes, selection of information that is important at the time is crucial for living, and a number of different aspects of visual attention have been studies. Among them, top-down control of attention is important as a clue to understand active processes of brain function. In contrast to bottom-up attention, which is oriented to the salient stimulation such as sudden lightning, top-down attention is controlled by a person, or by will, so the processing result differs even for the same stimulation with different top-down attention controls. It is obvious that top-down attention is explicit because that is controlled by will. However, there may be implicit effect of attention even attention is being controlled by top-down attention and there is no stimulation to attract bottom-up attention. We have investigate attention modulation at the location outside the focus of attention, attention modulation around a hand, and attention modulation at the goal of hand movements as well as implicit learning effect that could be related to controlling attention. All of them can be classified as implicit attention. We will discuss possible differences of explicit and implicit attention.

Biography

SATOSHI SHIOIRI received the B.S. degree in mechanical engineering from Tokyo Institute of Technology, in 1981 and the M.S. and PhD. degrees a in Physical Information Engineering from Tokyo Institute of Technology, in 1983 and 1986. From 1986 to 1989, he was a postdoctoral fellow at University of Montreal, from 1989 to 1990 he was a postdoctoral fellow at Advanced Telecommunications Research Institute International, Kyoto. He was an assistant professor, an associate professor, and professor in Chiba University from 1990 to 2004. He has been a professor in Tohoku University since 2004.His research interests include motion perception, depth perception, color perception, visual attention, eye movement and vision for action.

Moderator

Hsiu-Ping Yueh

Department of Bio-Industry Communication and Development

National Taiwan University, Taipei, Taiwan

Biography

Hsiu-Ping Yueh is a Distinguished Professor with the Department of Psychology and the Department of Bio-Industry Communication & Development at National Taiwan University, and is an affiliate research fellow of Center for Artificial Intelligence and Advanced Robotics of NTU. Her research centers on how psychology play the role while people are using technology for learning, communication, and interaction. She has devoted to research and development of many kinds of learning technologies, and also developed extensive works and research in different smart living technologies related to Gerontechnology, cognitive aging, and human-robot interaction with social robot that assist human life.

Chien-Chung Chen

Department of Psychology,
National Taiwan University, Taipei, Taiwan

Talk: Exploring the Association between dCNN and Visual Cortical Responses for Image Statistics

Abstract

There are deep convolution neural networks (dCNNs) outperforming human in object recognition. It is noticed that the filters in the first layers of those dCNNs resemble the sensitivity profiles of the neurons in different areas along the human visual pathways (Yamins & di Carlo, 2016). Thus, there might be a correlation between the functions of different areas of the brain and layers of a dCNN. Previous studies using categorical stimuli yielded mixed results. Here, we explored this relationship with continuous variables in image statistics. We analyzed the fMRI data from the BOLD5000 and NSC databases, which contains the BOLD activations for tens of thousands natural images in multiple observers. We extracted images statistics, including mean luminance, contrast, skewness, slope of the power spectrum, orientation bias, mean and variance of hue, complexity and openness, from each image. The images were then sorted with one of the of image statistics. We then computed the representative similarity matrices among the images based on the features of each image defined (1) other image statistics; (2) BOLD activation of each voxel in 10 brain areas; and (3) filter responses of several layers of a VGG16 model pretrained for ImageNet. We then used a linear model to test how much variability in each RS matrix can be explained by other RS matrices. We found that each image statistics can only account for the BOLD activation in a limited number of brain areas, suggesting a tuning function in each brain area. Each layer of the VGG16 model can only associate with one or two brain areas, suggesting the functional selectivity of these brain areas.

Biography

Professor Chen, Chien-Chung received his Ph. D. from University of California, Santa Barbara, working with Dr. John Foley on computational modeling of human spatial vision and color vision. Afterward, he completed his post-doctoral training with Dr. Christopher W. Tyler at the Smith-Kettlewell Eye Research Institute working on various topics in spatial vision, theories of psychophysics, and, later on, functional magnetic resonance imaging and event-related potential on early visual functions. After he joined the faculty of National Taiwan University, his main research focus has been on the effects of long-range interactions between image elements on the responses of human visual system. He developed several computational models to explain how the visual system organizing separated image elements into coherent objects.

Takahiro Hanyu

Research Institute of Electrical Communication,
Tohoku University, Sendai, Japan

Talk: Impact of Spintronics-Based Nonvolatile Hardware for Edge AI Applications

Abstract

Spintronics devices have potential advantages such as non-volatility, fast read/write, and high endurance under good back-end-of-the-line compatibility. They offer the possibility of not only replacing ordinary RAMs, but also realizing low-power and high-performance VLSI processors including edge AI hardware. This is achieved through a new logic-circuit style called "nonvolatile (NV) logic-in-memory architecture," which merges nonvolatile storage elements into CMOS logic-gate circuits. This pa-per explains the advantages of employing spintronics de-vices combined with CMOS circuits, and how to contribute this technology towards edge AI applications.

Biography

Takahiro Hanyu received the B.E., M.E. and D.E. degrees in Electronic Engineering from Tohoku University, Sendai, Japan, in 1984, 1986 and 1989, respectively. He is currently a full professor and the director (from April, 2022 to present) in the Research Institute of Electrical Communication, Tohoku University. His general research interests include nonvolatile logic circuits and their applications to ultra-low-power and/or highly dependable VLSI processors, and post-binary computing and its application to brain-inspired VLSI systems and edge AI hardware.

He received the Sakai Memorial Award from the Information Processing Society of Japan in 2000, the Judge's Special Award at the 9th LSI Design of the Year from the Semiconductor Industry News of Japan in 2002, the Special Feature Award at the University LSI Design Contest from ASP-DAC in 2007, the APEX Paper Award of Japan Society of Applied Physics in 2009, the Excellent Paper Award of IEICE, Japan, in 2010, Ichimura Academic Award in 2010, the Best Paper Award of IEEE ISVLSI 2010, the Paper Award of SSDM 2012, the Best Paper Finalist of IEEE ASYNC 2014, and the Commendation for Science and Technology by MEXT, Japan in 2015. Dr. Hanyu is a Senior Member of the IEEE.

Tzi-Dar Chiueh

Dean, Graduate School of Advanced Technology
Distinguished Professor, Electrical Engineering Department
National Taiwan University, Taipei, Taiwan

Talk: Low-Complexity NN Technology: Model and Precision Search, Acceleration Circuit, and Applications

Abstract

Quantization represents a popular NN complexity-reduction technology that leverages the (im)precision-tolerant nature of neural network training and inference. Our ongoing efforts have delivered main-stream NNs with only 1-bit weights, e.g., binary-weighted CNNs and transformers, while maintaining satisfactory accuracy performance. A variety of applications have been used to demonstrate the power of our proposed simple and effective Neural Architecture Search scheme (TPC-NAS). They include CNNs and transformers for Imagenet and object detection, transformers for natural language processing applications, and CNNs for vision processing.

The low-complexity NN technology has also been applied to build a PE-based CNN/transformer hardware accelerator in Xilinx FPGA SoC. Corresponding training and inference software framework has been developed based on PyTorch, effectively making the proposed deep learning accelerator a solid foundation for an easy-to-deploy DL implementation platform. Lastly, the presentation will showcase a few real-time neural network tasks accomplished through the proposed DL platform.

Biography

Tzi-Dar Chiueh received B.S. and Ph.D. degrees in electrical engineering from National Taiwan University and California Institute of Technology in 1983 and 1989, respectively. He is now a Distinguished Professor in the Department of Electrical Engineering and Graduate Institute of Electronics Engineering and Dean of the Graduate School of Advanced Technology at National Taiwan University. His research interests include algorithms, architecture, and integrated circuits for baseband communication systems and neural networks.

Dr. Chiueh was the recipient of the Outstanding Research Award from the National Science Council, Taiwan, in 2004-2007. In 2009, he received the Outstanding Industry Contribution Award from the Ministry of Economic Affairs, Taiwan. In 2017, he also received the Outstanding Technology Transfer Contribution Award from the Ministry of Science and Technology, Taiwan. He was awarded the Himax Chair Professorship and the Macronix Chair Professorship at NTU in 2006 and 2021, respectively. Prof. Chiueh is an IEEE Fellow.

Moderator

Chia-Huei Tseng

Research Institute of Electrical Communication,
Tohoku University, Sendai, Japan

Biography

Chia-Huei Tseng received B.S. and B.M. degrees from National Taiwan University, Taiwan, and Ph.D. degrees from University of California, Irvine, U.S.A. She was a faculty member at National Cheng-kung University, National Taiwan University, University of Hong Kong, and now an associate professor at Tohoku University.

She used psychophysical, neurophysiological, and computational modeling to examine cognitive functions such as learning, perception, and attention. Since her joining to Research Institute of Electrical Communication at Tohoku University in 2016, she worked with engineers in new areas such as interpersonal implicit communication, human-robot interaction, and cross-cultural understanding. She is also a member in the Interdisciplinary ICT Research Center for Cyber and Real Space since 2023.

Shuichi Sakamto

Research Institute of Electrical Communication
and Graduate School of Information Sciences,
Tohoku University, Sendai, Japan

Talk: Consideration of Perceptual Cues for Vertical Sound for Vertical Sound Localization Using Multilayer Neural Networks of Sound Event Localization and Detection

Abstract

Head-related transfer functions (HRTF) are acoustic transfer functions between the sound source position and the listener's ears. Because frequency characteristics of the HRTFs vary systematically as a function of the elevation angle, they are used as important cues for sound localization in the median plane. However, frequency characteristics vary also depending on the sound source. Therefore, it is interesting to investigate how humans can use this information for sound localization and sound source identification without using prior knowledge about the position of the sound source or the type of sound source. Recently, machine-learning-based sound event localization and detection (SELD) models have been proposed. SELD models are simultaneously doing directional of arrival (DOA) estimation and sound event detection (SED). We considered that SELD models might learn the same cues related to frequency characteristics that humans use for sound localization and sound event identification when median-plane binaural signals are used as training data. In this talk, I introduce our preliminary results to investigate perceptual cues of median-plane sound localization using SELD models.

Biography

Shuichi Sakamoto received his B.S., M.Sc. and Ph.D. degrees from Tohoku University, in 1995, 1997, and 2004, respectively. He is currently a professor at the Research Institute of Electrical Communication, Tohoku University. He was a Visiting Researcher at McGill University, Montreal, Canada during 2007–2008 and an honorary associate at University of Sydney, Australia in 2017.
His research interests include human multi-sensory information processing including hearing, speech perception, and development of high-definition 3D audio recording systems. He is a member of Acoustical Society of Japan (ASJ), Acoustical Society of America (ASA), The Institute of Electronics, Information and Communication Engineers (IEICE), The Virtual Reality Society of Japan (VRSJ), and others.

Yu Tsao

Research Fellow (Professor) and Deputy Director with the Research Center for Information Technology Innovation, Academia Sinica, Taipei, Taiwan

Talk: Deep-learning-based Speech Enhancement with Its Application to Assistive Oral Communications Devices

Abstract

Speech enhancement (SE) serves as a key component in most speech-related applications. The goal of SE is to enhance the speech signals by reducing distortions caused by additive and convoluted noises in order to achieve improved human-human and human-machine communication efficacy. In this talk, we will review the system architecture and fundamental theories of deep learning-based SE approaches. Next, we will present more recent advances, including end-to-end and goal-driven based SE systems as well as the SE systems with improved architectures and feature extraction procedures. The reinforcement learning and generative adversarial network (GAN)-based SE methods will also be presented. Finally, we will discuss some applications based on the deep learning SE systems, including impaired speech transformation and noise reduction for assistive hearing and speaking devices.

Biography

Yu Tsao (Senior Member, IEEE) received the B.S. and M.S. degrees in electrical engineering from National Taiwan University, Taipei, Taiwan, in 1999 and 2001, respectively, and the Ph.D. degree in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, GA, USA, in 2008. From 2009 to 2011, he was a Researcher with the National Institute of Information and Communications Technology, Tokyo, Japan, where he engaged in research and product development in automatic speech recognition for multilingual speech-to-speech translation. He is currently a Research Fellow (Professor) and the Deputy Director with the Research Center for Information Technology Innovation, Academia Sinica, Taipei, Taiwan. He is also a Jointly Appointed Professor with the Department of Electrical Engineering, Chung Yuan Christian University, Taoyuan, Taiwan. His research interests include assistive oral communication technologies, audio coding, and bio-signal processing. He is currently an Associate Editor for the IEEE/ACM TRANSACTIONS ON AUDIO, SPEECH, AND LANGUAGE PROCESSING and IEEE SIGNAL PROCESSING LETTERS. He was the recipient of the Academia Sinica Career Development Award in 2017, national innovation awards in 2018– 2021, Future Tech Breakthrough Award 2019, Outstanding Elite Award, Chung Hwa Rotary Educational Foundation 2019–2020, and NSTC FutureTech Award 2022. He is the corresponding author of a paper that received the 2021 IEEE Signal Processing Society (SPS), Young Author, Best Paper Award.

Moderator

Nobuyuki Sakai

Department of Psychology SAL.
Yotta Informatics Research Center,
Tohoku University, Sendai, Japan

Biography

Prof. Sakai is a professor of Department of Psychology, Tohoku University. He graduated from Graduate School of Human Sciences, Osaka University in 1998 and received PhD degree for the study about behavioral neuroscience on learning and eating behavior in rats. Then he worked at Hiroshima Shudo University and National Institute of Advanced and Industrial Science and Technology (AIST) as post-doc. He was an associate professor in Kobe Shoin Women's University and taught eating psychology for registered dietitians and for students in home economics. He moved to Sendai in October 2011, and keeps studying sensory science, multimodal flavor perception, and consumer psychology. He is serving as an Academic Editor of the Plos One, the Foods, the Nutrition, the Frontiers in Nutrition, the Japanese Journal of Health Psychology, and the Tohoku Psychological Folia. He is also a board member of the Japanese Association for Studying Taste and Smell, and the councilor of the Japanese Psychological Association. He is also acting as a director of Society for Research on Umami Taste and organizing some events for appealing the function of the Japanese Cuisine (Washoku) and Umami Taste.

Yoshifumi Kitamura

Research Institute of Electrical Communication,
Interdisciplinary ICT Research Center for Cyber and Real Spaces
Tohoku University, Sendai, Japan

Talk: Enriching Telecommunication with Nonverbal Information

Abstract

In future telecommunications, it is expected that people will be able to communicate with each other in the cyber/virtual space with objects and information from the physical/real space they are located. The successful key to realize such rich telecommunication is to unlock “communication with nonverbal information” by appropriately conveying the subtleties of “non-spoken signals,” which plays an important role in our daily interpersonal understanding. In this talk, the future of rich telecommunication through appropriate transmission and reception of nonverbal information will be discussed.

Biography

Yoshifumi Kitamura is Deputy Director and Professor at Research Institute of Electrical Communication, Tohoku University. From 2023, he also serves as Director of the Interdisciplinary ICT Research Center for Cyber and Real Spaces. His research interests include interactive content design, human computer interactions, 3D user interfaces, virtual reality, and related fields. He has been active in academic and professional communities, and serves in positions such as Japan Liaison for IFIP TC-13 (Human-Computer Interaction) (2012-), the Liaison for Japan and Chair of ACM SIGCHI Asian Development Committee (2015-2021), Chair of Japan ACM SIGCHI Chapter (2016-2021), Steering Committee Chair of ACM VRST, SIGGRAPH Asia 2015 Conference Chair, and ACM CHI 2021 General Chair

Bing-Yu Chen

Director of College of Design and Innovation
National Taiwan University, Taipei, Taiwan

Talk: Interactive Tangible Computing

Abstract

In this talk, I will first introduce our school, National Taiwan University, as well as my research background and interests of interactive tangible computing. Then, I will focus on introducing our recent projects related to the human-computer interaction (HCI), including a GUI (Graphical User Interface) solution - RealityLens (ACM UIST 2022), NUI (Natural User Interface) solutions - GuideBand (ACM CHI 2021) and FrictShoes (IEEE VR 2022 - TVCG), TUI (Tangible User Interface) solutions - Glissade (ACM CHI 2022) and NFCStack (ACM DIS 2022 and ACM UIST 2022), and a IUI (Intelligent User Interface) solution - OmniScribe (ACM UIST 2022), and AUI (Accessible User Interface) solutions - Daedalus in the Dark (ACM UIST 2021 and ACM CHI 2023) and TacNote (ACM UIST 2023).

Biography

Bing-Yu Chen, aka Robin Chen, received the B.S. and M.S. degrees in Computer Science and Information Engineering from National Taiwan University, Taipei, Taiwan, in 1995 and 1997, respectively, and the Ph.D. degree in Information Science from The University of Tokyo, Tokyo, Japan, in 2003. He is currently a Distinguished Professor with Department of Computer Science and Information Engineering, Department of Information Management, and Graduate Institute of Networking and Multimedia of National Taiwan University (NTU). He is also the Dean of NTU College of Design and Innovation (D-School) since 2019, and was an Associate Dean and the EiMBA Director of the NTU College of Management (B-School) during 2013-2019, an Associate Director of the NTU IoX Research Center (formerly Intel-NTU Connected Context Computing Center) during 2012-2021, the Director of NTU Creativity and Entrepreneurship Program (CEP) during 2016-2022. His current research interests include Human-Computer Interaction, Computer Graphics, Image Processing, and Innovation and Entrepreneurship Education. He is a senior member of ACM and IEEE.

Yasumasa Matsuda

Graduate School of Economics and Management,
Tohoku University, Sendai, Japan

Talk: Functional PCA of Human Population in Tokyo

Abstract

In this talk, we will examine how is the population dynamics in Tokyo before and after the pandemics. Do considerable amounts of population in central Tokyo move to suburbs in the pandemic as we often hear in news reports? We have collected human population data from “NTT DoCoMo Spatial Statistics”, which provides human population within 1-km squares of pixels all over Japan every one hour. We focus on the data at 4:00am to examine the nighttime populations in Tokyo. Monthly averaging the daily panel, we obtain the monthly time series of 2400 pixels of human populations in Tokyo, which covers roughly areas within 50 km radius from Tokyo Station. Regarding the monthly panel as a surface time series, a discrete time observation of spatial valued functional data, we apply functional principal component analysis (fPCA) to examine populational features before and after the pandemic. We find that the tendency to avoid the central Tokyo increased at the beginning of the pandemic, but it gradually decreases to reach the original level before the pandemic at the latest time point of Dec. 2023.

Biography

Yasumasa Matsuda received his B.S., M.Sc. and Ph.D. degrees from Tokyo Institute of Technology, in 1991, 1994, and 1999, respectively. He is currently a professor at Graduate School of Economics and Management, Tohoku University. His research interests include machine learning applications with large scale data esp. in the fields of social sciences. He is a member of Japan Statistical Society (JSS), International Statistical Institute (ISI), and others.

Jui-Chung Yang
Department of Economics,
National Taiwan University, Taipei, Taiwan

Talk: Out-Of-Sample Exchange Rate Prediction: An Application of Instrumented Principal Component Analysis

Abstract

Building a prediction model for foreign exchange (FX) market prices is remarkably challenging. Following Kelly et al. (2019), we utilize the Instrumented Principal Component Analysis (IPCA), a flexible factor model, to reduce the dimensionality of diverse information sets encompassing FX data and various risk factors from G10 countries, all while maintaining model traceability and accommodating time-varying factor loadings. Our results demonstrate IPCA's superior out-of sample predictability compared to the random-walk model and conventional PCA. Furthermore, our test identifies the medium-term interest rate differential and FX idiosyncratic volatility as crucial components for predicting FX returns.

Biography

Jui-Chung Yang is an associate professor in the Department of Economics at National Taiwan University. He is particularly interested in econometrics and environmental economics.

Rei Emura

Graduate School of Arts and Letters,
Tohoku University, Sendai, Japan

Masatoshi Koizumi

Talk: Why Do We Misunderstand “Who Did What”?: Approaches from Linguistics and Psychology

Abstract

We occasionally misinterpret “who did what” when reading sentences. One factor contributing to this misinterpretation is the ambiguity inherent in sentence structures. Confronted with ambiguous sentences, our initial analysis may be incorrect, leading to subsequent revisions. Discussions have taken place regarding how the persistence of the initial incorrect memory can result in misunderstandings.

The present study aims to investigate how the length of ambiguous regions influences the persistence of incorrect memory. Experiments conducted in Japanese for native Japanese speakers revealed that longer ambiguous regions expedite the decay of incorrect memory. This finding contrasts with the results of previous studies, pointing to an opposite direction in the outcomes. These findings contribute to our understanding of the dynamics of memory and comprehension in the context of sentences with ambiguity.

Biography

Rei Emura received her B.A. and M.A. from Tohoku University, Japan, in 2019 and 2023, respectively. She is a Ph.D. student of Psycholinguistics at Tohoku University, Japan. Her research interests are in an interface of comprehension of sentence structures to working memory. She is one of the authors of *Issues in Japanese Psycholinguistics from Comparative Perspectives (Mouton-NINJAL Library of Linguistics Series)*.

Masatoshi Koizumi received his B.A. from International Christian University, Japan, in 1988, M.A. from Ohio State University, U.S.A., in 1991, and Ph.D. from Massachusetts Institute of Technology, U.S.A., in 1995. He is a professor of linguistics and brain science at Tohoku University, Japan. His research interests are in grammatical theory and neuro-cognition of language. He is author of *Constituent Order in Language and Thought* (Cambridge University Press), *Phrase Structure in Minimalist Syntax* (Hituzi Syobo), and journal articles in *Language*; *Linguistic Inquiry*; *Journal of Cognitive Neuroscience*; *Language, Cognition and Neuroscience*; and so on. He is currently working on a field-based cognitive neuroscientific study of word order in language and order of thinking from the object-before-subject language perspective. He is an academic editor of *PLOS ONE* and an editorial board member for *Language Acquisition*.

Zhao-Ming Gao

Department of Foreign Languages and Literatures,
National Taiwan University

Talk: A Pilot Study on LLMs-based Chinese Word Sense Discrimination and its Applications

Abstract

Recent advancements in generative artificial intelligence (AI) have revolutionized approaches to numerous challenging issues in natural language processing (NLP), significantly outperforming the accuracy levels attainable with conventional techniques. In this presentation, we delve into a pilot study centered on the nuanced task of word sense discrimination in the Chinese language, leveraging the capabilities of large language models (LLMs). Our methodology harnesses the power of one-shot prompting within the framework of GPT 4.0, a cutting-edge model, to discern the contextual meaning of Chinese words within sentences. We assess whether a word retains the same meaning across different sentences by analyzing the semantic explanations generated by GPT 4.0. These explanations are then processed through a Sentence Transformer to compute the cosine similarity between their vector representations, or embeddings, thereby determining the similarity or disparity in meanings.

Our initial findings are promising, indicating that this approach markedly surpasses the accuracy rates of traditional NLP methodologies. Throughout this talk, we will provide a comprehensive analysis of our method's evaluation, highlighting its effectiveness, potential ramifications, and diverse applications. These applications span across fields such as lexicography, facilitating language learning, and contributing to broader linguistic research, showcasing the transformative potential of generative AI in tackling complex linguistic challenges.

Biography

Dr. Zhao-Ming Gao earned his Ph.D. in Language Engineering from the University of Manchester Institute of Science and Technology (UMIST) in 1998. He joined the Department of Foreign Languages and Literatures at National Taiwan University in 1999, where he now serves as a professor. Dr. Gao has contributed as a reviewer for various conferences and journals, including COLING, PACLIC, Lexical Resources and Evaluations, and Computer-Assisted Language Learning. Dr. Gao specializes in developing corpus-based computational tools and has published extensively in the fields of corpus linguistics, computer-assisted translation, and intelligent computer-assisted language learning.

Moderator

Sai Sun

Rontier Research Institute for Interdisciplinary Sciences
Research Institute of Electrical Communication,
Tohoku University, Sendai, Japan

Biography

Dr. Sai Sun is currently serving as a tenure-track assistant professor at Tohoku University in Japan, a position she has held since 2020. Prior to this role, she worked as a postdoctoral researcher at the psychophysics lab led by Prof. Shinsuke Shimojo at the California Institute of Technology from 2017. Dr. Sun got her PhD in Psychology from South China Normal University in Guangzhou. Her research focuses on the intersection of psychophysics, social-cognitive neuroscience, neuroeconomics, and neuromodulation. In recognition of her research contributions, she was named a Prominent Researcher at Tohoku University in 2022 and received the Outstanding Young Researcher Award in 2023. Dr. Sun is a key member of the Tohoku Initiative for Fostering Global Researchers for Interdisciplinary Sciences (TI-FRIS). Her research is supported by various funding sources including JSPS Kakenhi, the Young Leader Overseas Program, and the Creative Interdisciplinary Program at Tohoku University

Student Session

Yongsong Huang
Graduate School of Engineering,
Tohoku University, Japan

Talk: Rethinking Degradation: Radiograph Super- Resolution via Generative Model

Abstract

High-resolution musculoskeletal radiographs provide more details that are crucial for medical diagnosis, particularly for diagnosing primary bone tumors and bone stress injuries. However, radiographic image quality is affected by many factors, like scanning time, patients' poses, and motions. Existing SR algorithms fail to fully consider the degradation factors mentioned above. Imperfect degenerate models put the algorithm at risk of domain shift. First, we present a practical medical degradation model that considers various degradation factors beyond downsampling. To the best of our knowledge, this is the first composite degradation model proposed for radiographic images.

Furthermore, we propose AID-SRGAN, which can simultaneously denoise and generate high-resolution (HR) radiographs. In this model, we introduce an attention mechanism into the denoising module to make it more robust. Our dataset and code will be made available at: https://github.com/yongsongH/AIDSRGAN-MICCAI2022.

Student Session

Guan-Yun Wang
Graduate School of Information Sciences,
Tohoku University, Sendai, Japan

Talk: Estimation of Mental States in the Context of E-learning by Using Machine Learning Techniques

Abstract

Nowadays, many universities and schools offer digital learning courses, programs, and lectures. Although students can independently complete their learning online, it is difficult for teachers to track students' learning processes. In this presentation, I will introduce how to estimate students' mental states during learning using machine learning approaches. Students' reactions and behaviors were recorded via videos. In our experiment, students were asked to use an e-learning website to complete a problem-solving task, while their upper bodies were captured by the webcam mounted on their computers' monitors. OpenFace, an open-source software, was used to extract features from the videos. Light Gradient Boosting Machine (LightGBM), a fast and efficient machine learning framework, was implemented to classify mental states, including engagement and help-seeking states. SHapley Additive exPlanations (SHAP) were used to explain the importance and contribution of these features. The results showed that students' engagement levels could be estimated based on their head pose and action units (AUs). Additionally, help-seeking states, indicating whether students require assistance to facilitate their learning, could also be estimated using these features. This research contributes to the development of intelligent tutoring systems that can provide personalized learning support in e-learning environments. Furthermore, it informs the design of AI functions capable of automatically detecting and responding to students' mental states, thereby enhancing the effectiveness of online education.

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Talk: Domain Analysis of Social Robotics: From 2017 to 2023

Abstract

2023, marked as the year of AI. The field of AI and robotics has taken a huge leap in this year with technical breakthroughs and pivotal applications. Although receiving lots of attention in the year, the areas is not built in one day. In the past 20 years, many endeavors have been put to study AI and robotics and how it could be implemented in human society. With a specific focus on social robotics, robots developed to interact with human beings, we analyze the co-occurrence keyword network of academic articles from 2017 to 2023 to systematically overview the field and explore the trend of the domain of social robotics. The study would discuss the development history and the future trends of the domain.

Student Session

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Talk: Sentiment Analysis and Schizophrenia Evaluation via Multi-Modality Information

Abstract

Facing significant personal and healthcare burdens, millions manage schizophrenia. We propose a novel multimodal sentiment analysis framework analyzing text, audio, and video, achieving state-of-the-art performance and showing promise in real-world applications. This technology has the potential to assist mental health professionals and provide emotional support for eldercare, offering broader societal benefits.

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