2020 AP-CCN

The 1st Asia-Pacific Computational and Cognitive Neuroscience (AP-CCN) Conference

September 26-27, 2020 National Tsing Hua University, Taiwan

Computational neuroscience has advanced rapidly in recent years owning to the availability of the sheer amount of neural recordings and connectomic data. It is the perfect time for developing a collaborative forum that promotes research in computational neuroscience in the Asia-Pacific area. The mission of the the Asia-Pacific Computational and Congnitive Neuroscience (AP-CCN) Conference is to promote computational neuroscience, and to facilitate interactions and collaborations between theoreticians and experimentalists.

Invited Speakers

Michael Breakspear (keynote)
Systems Neuroscience Group
The University of Newcastle (UON), Callaghan
NSW Australia

Yang Dan (keynote)
Dept. of Molecular & Cell Biology
University of California, Berkeley, USA

Erik De Schutter (keynote)
Computational Neuroscience Unit
Okinawa Institute of Science and Technology
Graduate University, Japan

Shigeyoshi Fujisawa (keynote)
Systems Neurophysiology
RIKEN Center for Brain Science, Japan

Ya-Hui Chou
Institute of Cellular and Organismic Biology
Academia Sinica, Taiwan R.O.C.

Jeffrey Erlich
Neural and Cognitive Science
NYU Shanghai, China/NYU, USA

Anmo J Kim
Department of Biomedical Engineering
Hangyang University, Korea

Cheng-Chang Lien
Institute of Neuroscience
National Yang-Ming University, Taiwan R.O.C.

BT Thomas Yeo
Electrical & Computer Engineering
National University of Singapore, Singapore

Committee

Justin Dauwels — Neuroengineering Program and School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore

Jaeseung Jeong — Department of Bio and Brain Engineering, Korea Advanced Institute of Science and Technology | KAIST, Korea

Chung-Chuan Lo — Institute of Systems Neuroscience and Department of Life Sciences, National Tsing Hua University, Taiwan R.O.C.

Taro Toyoizumi — Neural Computation and Adaptation, Riken Center for Brain Science, Japan

Xiao-Jing Wang — Neural Science, Physics and Swartz Center for Theoretical Neuroscience, New York University, U.S.A/ New York University Shanghai, China

Conference Information

Abstract submissions : Jun 01, 2020 ~ Jun 30, 2020
Registration : Aug 01, 2020 ~ Sep 20, 2020
Conference : Sep 26, 2020 ~ Sep 27, 2020

Website : www.ap-ccn.org
Venue : James D. Watson Hall (B1 Auditorium), Life Science Building II,
National Tsing Hua University, Taiwan R.O.C.
No. 101, Section 2, Kuang-Fu Road, Hsinchu, Taiwan 30013

Organizer : Taiwanese Society for Computational Neuroscience (台灣計算神經科學學會)
Co-organizers : National Center for Theoretical Sciences, Physics Division, Taiwan R.O.C.
Institute of Systems Neuroscience, National Tsing Hua University, Taiwan R.O.C.
Brain Research Center, National Tsing Hua University, Taiwan R.O.C.
Sponsors : Ministry of Science and Technology, Taiwan R.O.C.
Ministry of Education, Taiwan R.O.C.

STCN
NCTS 國家理論科學研究中心 National Center for Theoretical Sciences
MOST 科技部 Ministry of Science and Technology
Brain Research Center NTHU
教育部

Poster Presentations *(in order of the abstract no.)*

0009 Effect of Diverse Recoding of Granule Cells on Optokinetic Response in A Cerebellar Ring Network, Woochang Lim

0010 Cognitively-modulated risk aversion in human decision-making, Yi-Hsin Su

0011 Roles of coordination between stabilizing circuits and updating circuits in spatial orientation working memory, Rui Han

[poster award] 0012 Morphological Classification of Drosophila Neurons by a Cnn Autoencoder, Kai-Yi Hsu

0013 Morpho-physiological Properties of Hippocampal Dentate Granule Cells in the Blm-s Knockout Mice, Chia-Wei Yeh

0014 Temporal expectation signal in the basal forebrain predicts decision speed, Shih-Chieh Lin

[poster award] 0018 Identification of Neuronal Polarity by Node-based Machine Learning, Chen-Zhi Su

[poster award] 0021 A computational model of social observance and cognitive difficulty accounts for development of ownership behavior, Youngjo Song

0022 Evaluating Methods for Predicting Neuronal Connections in Drosophila Brain, Ren Chiuan Wang

0027 Glutamate and GABA co-transmission at the supramammillary-dentate gyrus synapses promotes spike-timing precision and long-term potentiation, Musa Iyiola Ajibola

0028 A spiking neural circuit model of spatial orientation working memory in fruit flies, Hsuan-Pei Huang

0029 The Brain Information Flow Format, Naoya Arakawa

Effect of Diverse Recoding of Granule Cells on Optokinetic Response in a Cerebellar Ring Network

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We consider a cerebellar ring network for the optokinetic response (OKR), and investigate the effect of diverse recoding of granule (GR) cells on OKR by varying the connection probability p_c from Golgi to GR cells. For an optimal value of p_c^* (= 0.06), individual GR cells exhibit diverse spiking patterns which are in-phase, anti-phase, or complex out-of-phase with their population-averaged firing activity. Then, these diversely-recoded signals via parallel-fibers (PFs) from GR cells are effectively depressed by the error teaching signals via climbing fibers (CFs) from the inferior olive which are also in-phase ones. Synaptic weights at in-phase PF–Purkinje cell (PC) synapses of active GR cells are strongly depressed via strong long-term depression (LTD), while those at anti- and out-of-phase PF–PC synapses are weakly depressed through weak LTD. This kind of "effective" depression at PF-PC synapses causes a big modulation in firing of PCs, which then exert effective inhibitory coordination on vestibular nucleus (VN) (which evokes OKR). For the firing of VN neuron, the learning gain degree L_g, corresponding to the modulation gain ratio (i.e., normalized modulation divided by that at the 1st cycle), increases with increasing learning cycle, and it saturates at about the 300th cycle. By varying p_c, we find that a plot of L_g versus p_c forms a bell-shaped curve with a peak at p_c^* (where the diversity degree D in firing of GR cells is also maximum). The more diverse in recoding of GR cells, the more effective in motor learning for the eye-movement.

Keywords: OKR, Cerebellar ring network, Granule cells, Diverse recoding, Motor learning

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