<table>
<tr><td rowspan="6"></td><td>Speaker</td><td>Jeehyun Kwag</td></tr>
<tr><td>Talk Title</td><td>Computational Models and Applications of Grid Cells and Place Cells</td></tr>
<tr><td>Institution</td><td>Korea University</td></tr>
<tr><td>Department</td><td>Department of Brain and Cognitive Engineering</td></tr>
<tr><td>E-mail</td><td>jkwag@korea.ac.kr</td></tr>
<tr><td>Webpage</td><td>https://ncl.korea.ac.kr</td></tr>
</table>

1. Tentative Abstract

Hippocampo-entorhinal cortex system is believed to be critical for spatial information processing. Place cells found in the hippocampus spike selectively only when an animal is at one specific location within in an environment while grid cells found in the entorhinal cortex are place-selective cells that spike at multiple discrete locations. However, it remains unclear how the cellular and hippocampal and entorhinal cortex network architecture supports the generation such place cells and grid cells. Many computational models and physiological experiments have put forward theories and hypotheses that could to help explain the mechanism underlying the generation of place and grid cells. In this talk, I will present the recent progresses on the computational models of grid cells and place cells. Also, I will describe our ongoing work in our lab where we combine *in vitro* patch-clamp recordings and computational simulations of place cells and grid cells to demonstrate that how place cells and grid cells activities interact to achieve long-term storage of spatial information in the hippocampo-entorhinal cortex system.

2. Brief Biography

Jeehyun Kwag is currently an Assistant Professor at the Department of Brain and Cognitivie Engineering, Korea University. Jeehyun Kwag received her BA in Mathematics at University of Oxford in 2003. She continued her post-graduate study in MSc in Neuroscience (2004) and DPhil in Physiology at University of Oxford (2008), funded by Clarendon Scholarship awarded by University of Oxford. Upon completing her DPhil, she was elected as a Lecturer in Neuroscience at Keble College, University of Oxford, as well as being appointed as a post-doctoral researcher at the Department of Physiology, Anatomy and Genetics at University of Oxford until 2009.

Jeehyun Kwag joined Korea University as an Assistant Professor in 2010 where she leads the Neural Computation Laboratory.
Her research is focused on elucidating the mechanism underlying neural information processing and memory formation in the hippocampal neural networks using both electrophysiological recording techniques and realistic computational modelling of neural networks.

3. List of Representative Publications

1. M. Lengyel, J. Kwag, O. Paulsen, P. Dayan. Matching storage and recall: spike timing-dependent plasticity and phase response curves in the hippocampus. ***Nature Neuroscience*** 8:1677-1683 (2005).
2. J. Kwag and O. Paulsen. The timing of external input controls the sign of spike timing-dependent plasticity at local synapses. ***Nature Neuroscience*** 12:1219-1221 (2009).
3. J. Kwag, M. McLelland and O. Paulsen. Phase of firing as a local window for different neuronal computation: tonic and phasic mechanisms in the control of theta spike-phase. ***Frontiers in Human Neuroscience*** Fnhum.2011.00003 (2011).
4. J. Kwag and Ole Paulsen. Gating of NMDA receptor-mediated hippocampal spike timing-dependent potentiation by mGluR5. ***Neuropharmacology*** 63(4): 701-709 (2012).
5. H. J. Jang and J. Kwag. GABA(A) receptor-mediated feedforward and feedback inhibition differentially modulate hippocampal spike timing-dependent plasticity. ***Biochemical and Physical Research Communications*** 427(3): 466-472 (2012).
6. M. Borel, S. Guadagna, H. J. Jang, **J. Kwag** & O. Paulsen. Frequency dependence of CA3 spike phase response arising form h-current properties. ***Frontiers in Cellular Neuroscience*** 7:263 (2013).
7. J. Kwag, H.J. Jang, M. Kim and S. Lee. M-type potassium conductance controls the emergence of neural phase codes: a combined experimental and neuron modelling study. ***Journal of the Royal Society Interface*** doi:10.1098/rsif.2014.0604(2014).
8. H.J. Jang, K. Park, J. Lee, H. Kim, K.H. Han and J. Kwag. GABA(A) receptor-mediated feedforward and feedback inhibition differentially modulate the gain and the neural code transformation in hippocampal CA1 pyramidal cells. **Neuropharmacology** (2015) *In press*