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## Information processing of neural network *in vivo*

Our knowledge of neural network behind sensory input processing and decision making has been experiencing a huge expansion. But it is still based on old doctrines from many decades ago. Recent developments of information theory, non-linear dynamics and network science have potentials to provide new insight of information processing in cortex. For instance, a brain has huge error/noise tolerance, redundant information processing area/pathway and efficient neural network that demands new understanding of it. To support this endeavor, it is mandatory to develop a new experimental apparatus which can control and monitor behaviors of many mice automatically in a dissimilar way. We are trying to apply newly developed controllers (Arduino, RaspberryPi, BeagleBone etc.) to automate experiments with complex protocol and combine them to *in vivo* imaging devices such as two-photon microscope and miniscope. Along with that, we are trying to apply more insightful but mathematically rigorous measures to data sets from those tools.

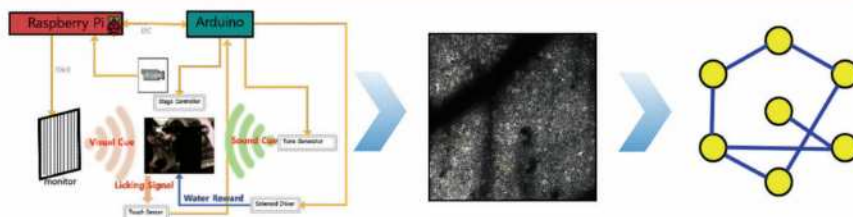
Aim

Understanding information processing in neural network

Tool

New behavioral device + 2P imaging + Network analysis

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### Curriculum Vitae

2016~Present : Principal Investigator, KBRI  
 2013~2016 : Postdoctoral Fellow, MPFI, USA  
 2012~2013 : Postdoctoral Fellow, Korea Univ., Korea

### Academic Credential

2012 : Ph.D., Physics, Korea Univ.  
 2004 : M.S., Physics, Korea Univ.  
 1995 : B.S., Physics, Korea Univ.

### Awards/Honors

2005 : Seoul Science Fellowship

### Research keywords

*In vivo* imaging, Time-series analysis, Network analysis.

### Key techniques

*In vivo* calcium imaging, Device & circuit design/fabrication, Time-series analysis.

### Research Interests/Topics

- Development of apparatus for multimodal stimuli driven behavior analysis in rodents.
- Application of advanced imaging techniques for brain research.
- Analysis of neuronal time-series data from *in-vivo* experiment.

### Research Publications (selected)

- Yang YS, Son SJ, **Choi JH**, Rah JC. Synaptic transmission and excitability during hypoxia with inflammation and reoxygenation in hippocampal CA1 neurons. *Neuropharmacol.*, 138:20-31, 2018.
- Kim T, Oh WC, **Choi JH**, Kwon HB. Emergence of functional subnetworks in layer 2/3 cortex induced by sequential spikes *in vivo*. *PNAS*, 113(10), 2016.
- Kim JH, Heo R, **Choi JH**, Lee KJ. Dynamic transitions among multiple oscillators of synchronized bursts in cultured neural networks. *J Stat Mech.*, 2014.
- **Choi JH** Kim JH, Heo R, Lee KJ, Modulating the precision of recurrent bursts in cultured neural network. *PRL*, 108(13), 2012.