

TAEKJUN KIM, Ph.D.

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Acting Instructor, Department of Biological Structure, Washington National Primate Research Center, University of Washington

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Summary of qualifications

Dedicated vision scientist with 10+ years research experience using neurophysiological recordings, computational modeling, and human psychophysics. Reliable, self-motivated professional with the ability to learn new things quickly to achieve challenging goals. Deep and broad knowledge of visual information processing in the brain. Highly trained in all aspects of the research process including experimental design, data collection, analysis (e.g., statistics, machine learning, data visualization), presentation and the preparation of the final reports.

Research Interests: neural basis of visual perception

• object detection/recognition • motion perception • binocular vision • spatiotemporal sensitivity

Machine learning and statistical analyses

• Hypothesis testing • Regression • Classification • Clustering • Dimensionality reduction • Cross-validation
• Numpy • Scipy • Matplotlib • Pandas • Scikit-learn • PyTorch • PsychoPy • Psychophysics Toolbox

Programming languages

• Python • Matlab • SQL

Education

Ph.D. in Vision Science, University of California, Berkeley, CA Aug 2010 – Dec 2014

M.A. in Biological Psychology, Seoul National University, Korea Mar 2006 – Aug 2008

B.A. in Psychology, Seoul National University, Korea Mar 2000 – Feb 2006

Research Experience

Washington National Primate Research Center, University of Washington **Seattle, WA**

Supervisors: Prof. Anitha Pasupathy and Prof. Wyeth Bair

Acting Instructor

Oct 2019 – Present

- Investigating neural mechanisms underlying visual crowding effects using electrophysiology, psychophysics and convolutional neural networks
- Mentoring graduate students and research assistants on experimental design, data analysis (object segmentation, global motion processing), and programming (Matlab, Python)
- Studied visual texture processing in the visual cortex using electrophysiology and machine learning, finding that distinct texture sensations are associated with different temporal dynamics (published in *J. Neurosci.*, 2022)
- Wrote two review papers on the topic of visual information processing in the ventral visual pathway (published in *Annu. Rev. Vis. Sci.*, 2020; *Curr. Opin. Neurobiol.*, 2019)

Senior Fellow

Oct 2015 – Sep 2019

- Devised metrics to quantify the perceptual qualities of natural texture images. Studied how object shape and texture properties are jointly processed in the visual cortex using electrophysiology / computational modeling, finding that there are separate specializations in mid-level cortical processing for visual attributes of shape and texture (published in *J. Neurosci.*, 2019).
- Advised and collaborated on a research project investigating neural correlates of global motion processing in the non-human primate visual cortex (*submitted*)

University of California, Berkeley

Berkeley, CA

Supervisor: Prof. Ralph D. Freeman

Assistance Specialist

Jan 2015 – Sep 2015

- Designed a human psychophysics experiment to demonstrate that binocular integration can occur during substantial differences in left and right eye signal strength. Wrote Matlab / Python code for visual stimulus generation (Psychophysics toolbox, PsychoPy), data acquisition, and analysis (published in *Eur.*

Graduate Researcher

Aug 2010 – Dec 2014

- Analyzed a database of cortical neurons to determine the degree of non-linearity of direction selectivity for cells within different laminae of the visual cortex (published in *Eur. J. Neurosci.*, 2016)
- Investigated the effects of non-invasive transcranial magnetic stimulation (TMS) on tuning properties of visual cortical neurons (published in *Brain Stimul.*, 2015).
- Conducted neurophysiological experiments to reveal segregated activity of feedforward, feedback and horizontal pathways in visual cortex (published in *Neuroscience*, 2014)
- Led lab and discussion sections for first-year optometry students in *Geometrical Optics* class

Seoul National University

Seoul, Korea

Supervisor: Prof. Choongkil Lee

Research Associate

Sep 2008 – Jun 2010

- Studied the spatiotemporal selectivity of V1 response using Gabor stimuli that were sequentially presented with a variable stimulus onset asynchrony. Wrote Matlab code for visual stimulus generation (Psychophysics toolbox), data acquisition (DAQ toolbox), and analysis (published in *PLoS One*, 2012; *PLoS One*, 2015)

Graduate Researcher

Mar 2006 – Aug 2008

- Conducted a human psychophysics study to examine the spatial localization error in visual short-term memory task (published in *KCBPA*, 2014)
- Led lab and discussion sections for psychology students in *Neuroscience* and *Biopsychology* classes.

Publications

- Bigelow, A. W., Namima, T., **Kim, T.**, Bair, W., Pasupathy, A. A missing link in cortical visual motion processing: object and long range motion (*submitted*).
- Kim, T.**, Bair, W., & Pasupathy, A. (2022). Perceptual texture dimensions modulate neuronal response dynamics in visual cortical area V4. *Journal of Neuroscience*, 42(4), 631-642.
- Pasupathy, A., Popovkina, D. V., & **Kim, T.** (2020). Visual functions in primate area V4. *Annual Review of Vision Science*, 6, 363-385.
- Pasupathy, A., **Kim, T.**, & Popovkina, D. V. (2019). Object shape and surface properties are jointly encoded in mid-level ventral visual cortex. *Current opinion in neurobiology*, 58, 199-208.
- Kim, T.**, Bair, W., & Pasupathy, A. (2019). Neural coding for shape and texture in macaque area V4. *Journal of Neuroscience*, 39(24), 4760-4774.
- Kim, T.**, & Freeman, R. D. (2017). Binocular function during unequal monocular input. *European Journal of Neuroscience*, 45(4), 601-609.
- Kim, T.**, & Freeman, R. D. (2016). Direction selectivity of neurons in the visual cortex is non-linear and lamina-dependent. *European Journal of Neuroscience*, 43(10), 1389-1399.
- Kim, K., **Kim, T.**, Yoon, T., & Lee, C. (2015). Covariation between spike and LFP modulations revealed with focal and asynchronous stimulation of receptive field surround in monkey primary visual cortex. *PloS one*, 10(12), e0144929.
- Kim, T.**, Allen, E. A., Pasley, B. N., & Freeman, R. D. (2015). Transcranial magnetic stimulation changes response selectivity of neurons in the visual cortex. *Brain stimulation*, 8(3), 613-623.
- Kim, E. Y., **Kim, T.**, & Lee, C. (2014). Repulsive bias in egocentric localization. *The Korean Journal of Cognitive and Biological Psychology*, 26(4), 295-316.
- Kim, T.**, & Freeman, R. D. (2014). Selective stimulation of neurons in visual cortex enables segregation of slow and fast connections. *Neuroscience*, 274, 170-186.
- Kim, T.**, Kim, H. R., Kim, K., & Lee, C. (2012). Modulation of V1 spike response by temporal interval of spatiotemporal stimulus sequence. *PloS one*, 7(10), e47543.

Conference Presentations

- Kim, T.**, Pasupathy, A. Visual saliency alleviates crowding in macaque area V4 but not V2, *Society for Neuroscience 2022*.
- Takasaki, K., Chatterjee, S., Dylla, C. J. M., **Kim, T.**, MacLennan, B., Balaram, P., Pasupathy, A., Reid, R. C., Waters, J., & Bair, W. Multi-photon imaging in the visual cortex of the anesthetized macaque, *Society for Neuroscience 2022*.

Kim, T., Pasupathy, A. Neural correlates of visual crowding in macaque area V4, *Vision Sciences Society* 2022.

Bigelow, A. W., Namima, T., **Kim, T.**, Bair, W., & Pasupathy, A. A single neuron correlate for long-range motion in ventral visual area V4, *Society for Neuroscience Global Connectome* 2021

Bair, W., Pospisil, D. A, Bigelow, A. W., Popovkina, D. V., & **Kim, T.** Insights from a deep convolutional neural network into mid-level representation in visual cortex, *Computational and Systems Neuroscience* 2020.

Bigelow, A. W., **Kim, T.**, Bair, W., & Pasupathy, A. Long-range apparent motion tuning in ventral visual area V4, *Society for Neuroscience* 2019

Kim, T., Bair, W., & Pasupathy, A. Response dynamics in primate V4 are modulated by perceptual dimensions of visual textures, *Society for Neuroscience* 2019

Kim, T., Bair, W., & Pasupathy, A. Neural representation of perceptual texture dimensions in macaque area V4, *Computational Neurosciences* 2018

Kim, T., Bair, W., & Pasupathy, A. Neural responses to shape and texture stimuli in macaque area V4, *Vision Sciences Society* 2017

Kim, T., & Freeman, R. D. Transcranial magnetic stimulation (TMS) changes response selectivity of neurons in visual cortex, *Society for Neuroscience* 2013

Kim, T., & Freeman, R. D. Activation of classical and surround regions of cortical receptive fields enables selective study of neural connections, *Society for Neuroscience* 2011

Kim, K., **Kim, T.**, & Lee, C. Stimulus-dependency of local field potential in surround interaction of primate V1, *Society for Neuroscience* 2010

Kim, K., **Kim, T.**, & Lee, C. Temporal interval selectivity of the primate V1 neurons: summation of surround interaction revealed by single cell activity and local field potential, *Society for Neuroscience* 2009

Kim, T., & Lee, C. Spatial and temporal effects of response modulation of the primate V1 neurons for sequential stimuli, *Society for Neuroscience* 2008

Kim, T., Kim, H. R., & Lee, C. Response selectivity of V1 neurons for spatiotemporal sequence of stimulus orientation, *Society for Neuroscience* 2007

Kim, T., Kim, E., & Lee, C. Variable foveal bias of spatial memory, *Asian Conference of Vision* 2006

Teaching Experiences

Graduate Student Instructor for “Geometrical Optics”	University of California, Berkeley, CA	Fall 2010 – 2011
Teaching Assistant for “Neuroscience”	Seoul National University, Korea	Fall 2006 – 2009
Teaching Assistant for “Biopsychology”	Seoul National University, Korea	Spring 2007 – 2009

Extra-Curricular Activities

Military Service in Korea Army	Dec 2001 – Feb 2004
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References available upon request