Hansem Sohn
hansem@skku.edu

PROFESSIONAL APPOINTMENTS

Sungkyunkwan University 2023 - Present
Assistant Professor in Dept. of Biomedical Engineering
Institute for Basic Science, Center for Neuroscience Imaging Research

Massachusetts Institute of Technology 2015 - 2023
Postdoctoral Associate in Dept. of Brain & Cognitive Sciences

Yale University School of Medicine 2013 - 2015
Postdoctoral Associate in Dept. of Neurobiology

EDUCATION

Seoul National University 2008 - 2013
Ph.D. in Neuroscience

Korea Advanced Institute of Science and Technology (KAIST) 2006 - 2008
M.S. in Bio and Brain Engineering

Korea Advanced Institute of Science and Technology (KAIST) 2002 - 2006
B.S. in BioSystems (Magna Cum Laude)

RESEARCH INTERESTS

Time perception, Numerical cognition, Bayesian statistics, Human decision-making, artificial intelligence and neural network, Non-human primate electrophysiology, Neuroimaging (fMRI, EEG)

PUBLICATIONS

[19] Rajalingham R*, **Sohn H***, Jazayeri M (in revision) Dynamic tracking of objects in the macaque dorsomedial frontal cortex. https://doi.org/10.1101/2022.06.24.497529 (*Equal Contribution)

[18] Beiran M*, Meirhaeghe N*, **Sohn H**, Jazayeri M, Ostojic S (2023) Parametric control of flexible timing through low-dimensional neural manifolds. *Neuron*. S0896-6273(22)01089-3. https://doi.org/10.1016/j.neuron.2022.12.016. PMID 36640766

[17] Li J, Watters N, Wang YS, **Sohn H**, Jazayeri M (2022) Modeling Human Eye Movements with Neural Networks in a Maze-Solving Task. NeurIPS. https://arxiv.org/abs/2212.10367

[16] Keshtkaran MR*, Sedler AR*, Chowdhury RH, Tandon R, Basrai D, Nguyen SL, **Sohn H**, Mehrdad M, Miller LE, Pandarinath C (2022) A large-scale neural network training framework for generalized estimation of single-trial population dynamics. *Nature Methods*. 19: 1572-1577 PMID 36443486 (*Equal Contribution)

[15] **Sohn H**, Narain D (2021) Neural implementations of Bayesian computation. *Current Opinion in Neurobiology 70:121-129.* PMID34678599

[14] Pei FC*, Ye J*, Zoltowski DM, Wu A, Chowdhury RH, **Sohn H**, O'Doherty JE, Shenoy KV, Kaufman M, Churchland MM, Mehrdad M, Miller LE, Pillow JW, Park IM, Dyer EL, Pandarinath C (2021) Neural Latents Benchmark '21: Benchmarking latent variable models of neural population activity. NeurIPS. http://arxiv.org/abs/2109.04463 (*Equal Contribution)

[13] Meirhaeghe N, **Sohn H**, Jazayeri M (2021) A precise and adaptive neural mechanism for predictive temporal processing in the frontal cortex. *Neuron*. 109(18):2995-3011.e5. PMID34534456

[12] **Sohn H**, Jazayeri M (2021) Validating model-based Bayesian integration using prior-cost metamers. *Proc Natl Acad Sci U S A* 118 (25): e2021531118. PMID34161261

[11] **Sohn H***, Meirhaeghe N*, Rajalingham R, Jazayeri M (2020) A network perspective on sensorimotor learning. *Trends in Neuroscience* 44(3):170-181. PMID33349476 (*Equal Contribution).

[10] **Sohn H***, Narain D*, Meirhaeghe N*, Jazayeri M (2019) Bayesian computation through cortical latent dynamics. *Neuron* 103(5):934-947. PMID31320220 (*Equal Contribution).

[9] Kleinman MR, **Sohn H**, Lee D (2016) A two-stage model for concurrent interval timing in monkeys. *J Neurophysiol* 116(3):1068-1081. PMID27334954.

[8] Brascamp JW, **Sohn H**, Lee SH, Blake R (2013) A monocular contribution to stimulus rivalry. *Proc Natl Acad Sci U S A* 110(21): 8337-8344. PMID23610414

[7] **Sohn H**, Lee SH (2013) Dichotomy in perceptual learning of interval timing: calibrations of mean accuracy and precision differ in specificity and time course. *J Neurophysiol* 109:344-362. PMID23076112

[6] Latchoumane C, Kim I, **Sohn H**, Jeong J (2013) Dynamical nonstationarity of resting EEGs in patients with attention-deficit/hyperactivity disorder (AD/HD). *IEEE T Bio-med Eng* 60(1):159-163. PMID22955863

[5] Hong H*, **Sohn H***, Cha M, Kim S, Oh J, Chu MK, Namkoong K, Jeong J (2012) Increased frontomotor oscillations during tic suppression in children with Tourette syndrome. *J Child Neurol* (published online before print; *Equal Contribution). PMID22859696

[4] Kim YT, **Sohn H**, Kim S, Oh J, Peterson BS, Jeong J (2012) Disturbances of motivational balance in chronic schizophrenia during decision-making tasks. *Psychiat Clin Neuros* 66: 573-581. PMID23252923

[3] Kim YT, **Sohn H**, Jeong J (2011) Delayed transition from ambiguous to risky decision-making in alcohol dependence during Iowa gambling task. *Psychiat Res* 190:297-303. PMID21676471

[2] **Sohn H***, Kim I*, Lee W, Peterson BS, Hong H, Chae J, Hong S, Jeong J (2010) Linear and non-linear EEG analysis of adolescents with attention-deficit/hyperactivity disorder during a cognitive task. *Clin Neurophysiol* 121:1863-1870 (Cover Article; *Equal Contribution). PMID20659814

[1] **Sohn H**, Kim S (2006) Simple reinforcement learning models are not always appropriate. *J Neurosci* 26:11511-11512 (Journal Club). PMID17106946

RESEARCH GRANT

Brain & Behavior Research Foundation, NARSAD Young Investigator Grant (PI)
1/15/2021 – 1/14/2023 ($70,000 for 2 years)
Title: Laminar organization of context-dependent computation in frontal cortex

NSF, ERC-1028725, with Jazayeri as advisor (Co-I)
8/1/2019 – 7/30/2020 ($56,000)
Title: Using BBCIs to reveal neural network dynamics and strategies for control
Description/scope: Reverse engineer recurrent dynamics in the frontal cortex

ADVISING EXPERIENCE

Mentoring graduate student in research lab:
Bart Massi, Yale University School of Medicine (2013 April – 2015 May)
Nicolas Meirhaeghe, MIT (2017 September – 2021 August)
Qianli Xu, MIT (2019 September – November)
Vincent Tang, MIT (2020 March – May)

Mentoring undergraduates in research lab:
Sandy Wang, Boston University (2021 fall – 2022 spring)
Jason Li, MIT (2021 spring – 2022 fall)
Moon Ji Hyun from Brain Mind Behavior program, Seoul National University (2009 fall)
Steve Sungkyun Shin from Psychology, Dartmouth (2009 winter)

TEACHING EXPERIENCE

2008.3-2010.2 Teaching Assistant, Department of Psychology, Seoul National University
Graduate level cognitive neuroscience class
Led in-class discussions and evaluated writing assignments

2006.3-2008.2 Teaching Assistant, Department of BioSystems, Korea Advanced Institute of Science and Technology (KAIST)
Undergraduate Bioinstrumentation lab. Class
Prepared in-class demonstrations and advised student projects

PRESENTATIONS († denotes work with students)

Li J†, Watters N, Sohn H, Jazayeri M (2022) Modeling Human Eye Movements with Neural Networks in a Maze-Solving Task. Cognitive Computational Neuroscience (CCN).

Meirhaeghe N†, Sohn H, Jazayeri M (2021) A neural signature of anticipation in macaque frontal cortex. Computational and Systems Neuroscience (COSYNE).

Sohn H, Tang V†, Jazayeri M (2020) Laminar-specific sensorimotor integration of context in cortical dynamics. Computational and Systems Neuroscience (COSYNE).

Meirhaeghe N*†, Sohn H*, Jazayeri M (2020) Rapid sensorimotor adaptation through cortical input control. Computational and Systems Neuroscience (COSYNE) (*Equal Contribution).

Keshtkaran MR, Tandon R, Basrai D, Nguyen SL, Chowdhury RH, Sohn H, Mehrdad M, Miller LE, Pandarinath C (2020) AutoLFADS: A large-scale neural network training framework for generalized estimation of single-trial population dynamics. Computational and Systems Neuroscience (COSYNE).

Sohn H, Jazayeri M (2019) Laminar profile of context-dependent computation in dorsomedial frontal cortex. Annual Meeting of the Society for Neuroscience.

Meirhaeghe N*†, Sohn H*, Jazayeri M (2019) Calibrating temporal expectations through flexible tuning of neural dynamics. Annual Meeting of the Society for Neuroscience (*Equal Contribution).

Sohn H*, Narain D*, Meirhaeghe N*†, Jazayeri M (2019) Bayesian computation through cortical latent dynamics. Computational and Systems Neuroscience (COSYNE) (*Equal Contribution).

Meirhaeghe N*†, Sohn H*, Jazayeri M (2019) Flexible cortical dynamics in adaptive control of sensorimotor behavior. Computational and Systems Neuroscience (COSYNE) (*Equal Contribution).

Meirhaeghe N*†, Sohn H*, Jazayeri M (2018) Cortical dynamics associated with multiple timescales of sensorimotor adaptation. Annual Meeting of the Society for Neuroscience (*Equal Contribution).

Sohn H*, Narain D*, Meirhaeghe N†, Jazayeri M (2018) Bayesian computation through cortical latent dynamics. Motor Learning and Motor Control, Official satellite meeting of the Society for Neuroscience (*Equal Contribution, **selected as the best talk**).

Sohn H*, Narain D*, Jazayeri M (2018) Neural signature of Bayesian interval timing in dorsomedial frontal cortex. Computational and Systems Neuroscience (COSYNE) (*Equal Contribution).

Sohn H*, Narain D*, Jazayeri M (2017) Neural signature of Bayesian interval timing in dorsomedial frontal cortex. Annual Meeting of the Society for Neuroscience (*Equal Contribution).

Narain D*, Sohn H*, Jazayeri M (2017) Bayesian integration through latent dynamics. Cognitive Computational Neuroscience (CCN) (*Equal Contribution).

Sohn H, Jazayeri M (2017) Humans Learn Bayesian Prior And Loss Function Independently. Computational and Systems Neuroscience (COSYNE).

Massi B†, Sohn H, Seo H, Lee D (2015) Neurons in the primate dorsolateral prefrontal cortex encode summed quantities and choices during an arithmetic task. Annual Meeting of the Society for Neuroscience.

Massi B†, Sohn H, Ceneri N, Lee D (2014) Addition of numerical quantities in working memory by rhesus monkeys. Annual Meeting of the Society for Neuroscience.

Kleinman MR†, Sohn H, Lee D (2014) Two-stage model for concurrent interval timing in non-human primates. Annual Meeting of the Society for Neuroscience.

Sohn H, Kim S, Lee D (2013) Preparatory activity in frontal eye field related to strategic adjustments during a stop-signal task. Annual Meeting of the Society for Neuroscience.

Kleinman MR†, Sohn H, Lee D (2013) Clustering of visual, motor, reward, and timing signals in the supplementary eye field during a concurrent interval timing task. Annual Meeting of the Society for Neuroscience.

Brascamp JW, Sohn H, Lee SH, Blake R (2013) Perceptual suppression during stimulus rivalry diminishes contrast adaptation at eye-specific processing stages. Vision Sciences Society (VSS) Annual Meeting.

Sohn H, Lee SH (2012) Neural substrates of interval timing in the human brain. Annual Meeting of the Society for Neuroscience.

Sohn H, Lee SH (2012) Neural substrates of interval timing in the human brain. Asia-Pacific Conference on Vision.

Lim D†, Sohn H, Lee SH (2012) Dual-bound model and the role of time bound in perceptual decision making. Asia-Pacific Conference on Vision.

Sohn H, Lee SH, Blake R (2012) Complementary Spatial Interactions between Binocular Rivalry and Stimulus Rivalry. Vision Sciences Society (VSS) Annual Meeting <http://f1000.com/posters/browse/summary/1090354>.

Sohn H, Lee SH (2011) Learning a Bayesian prior in interval timing. Computational and Systems Neuroscience (COSYNE) Available from Nature Precedings <http://dx.doi.org/10.1038/npre.2011.5804.1>.

Sohn H, Lee SH (2009) Dichotomy in perceptual learning of interval timing: calibrations of accuracy and reliability differ in specificity and time course. Annual Meeting of the Society for Neuroscience.

Sohn H, Lee SH (2008) Long-term perceptual learning of interval timing by visuospatial information of motion. Annual Meeting of the Society for Neuroscience.

Sohn H, Jeong J (2008) Dissociable Neural Mechanisms underlying Delay Discounting of Financial Gain and Loss. 14th Annual Meeting of the Organization for Human Brain Mapping.

Sohn H, Jeong J (2007) Differential Neural Mechanisms underlying Temporal Discounting of Financial Gain and Loss. Annual Meeting of the Society for Neuroeconomics.

Kim YT, Sohn H, Jeong J (2007) Impairments in Decision-making under Ambiguity and Risk in Alcohol Dependence. Annual Meeting of the Society for Neuroeconomics.

Kim JB†, Sohn H, Yun K, Lim J, Kim W, Jeong J (2007) Neuropsychological Mechanisms of Odd-pricing Effect. Annual Meeting of the Society for Neuroeconomics.

Sohn H, Shi W-X, Peterson BS, Jeong J (2007) Nonlinear Dynamics underlying Slow Oscillation in Dopamine Neurons of the Ventral Tegmental Area. Computational and Systems Neuroscience (COSYNE).

Sohn H, Lee W*, Kim I*, Jeong J (2006) Approximate Entropy (ApEn) Analysis of the EEG in Attention-Deficit/Hyperactivity Disorder (AD/HD) during Cognitive Tasks. World Congress on Medical Physics and Biomedical Engineering. (*Equal Contribution)

INVITED TALKS

Brain Science Institute, KIST, South Korea, 8/23/2022
Neuro@noon seminar, Sungkyunkwan University, South Korea, 10/24/2021
Interdisciplinary program in neuroscience, Seoul National University, 9/14/2021
Dept. of Biological Sciences, Seoul National University, South Korea, 4/16/2021
Decision making journal club (Lee lab), Johns Hopkins University, 12/22/2020
Stanford Vision Brunch, 10/28/2020
Halassa Lab, MIT, Dept. of Brain & Cognitive Sciences, 7/6/2018
Harnett Lab, MIT, Dept. of Brain & Cognitive Sciences, 6/6/2018
Jazayeri Lab, MIT, Dept. of Brain & Cognitive Sciences, 1/26/2015

Lee Lab, Yale University, Dept. of Neurobiology, 5/17/2012

OTHER TRAINING & RESEARCH EXPERIENCES

2011.8-2011.11 Department of Psychology, Vanderbilt University, USA
On the Origins of Spatial Grouping between Binocular and Stimulus Rivalry
Visiting Graduate Student Supervised under Randolph Blake

2011.7 Computational and Cognitive Neurobiology Summer School, Cold Spring Harbor Asia, China
Continuous attractor network model for Bayesian estimation in reaching
Project with Philip Sabes from UCSF

2008.1-2008.2 Lab. For Integrated Theoretical Neuroscience
RIKEN Brain Science Institute, Japan
Visiting Graduate Student Supervised under Hiroyuki Nakahara

2005.7-2005.8 Nonlinear and Complex Systems Laboratory, Department of Physics, Pohang University of Science and Technology (POSTECH)
Research participation course; Nonlinear dynamics and chaos
Visiting Undergraduate Student Supervised under Swan Kim

PROFESSIONAL SERVICES

Ad hoc reviews: Nature Communications, PNAS, Journal of Neuroscience, eNeuro, PLoS Computational Biology, Journal of Vision, Frontiers in Decision/Behavioral Neuroscience (Review Editor), Clinical Neurology and Neurosurgery, Bio-Medical Materials and Engineering, Swiss National Science Foundation

AWARDS AND FELLOWSHIPS

2020.9 Brain & Behavior Young Investigator grant (formerly NARSAD)
2015.9 Finalist (2nd) on Ripple promising investigator research award to win a complete 96-ch Grapevine neural interface system
2012.2 Selected as Promising Young Neuroscientists in meeting with Minister of Education, Science, and Technology of South Korea
2008.9 Seoul Science Fellowship (covered graduate school tuition)
Funded by Seoul Metropolitan Government
2008.1 Winter Institute Program for visiting RIKEN Brain Science Institute (including all costs and stipend)
Funded by National Research Foundation of Korea
2005.8 Undergraduate research scholarship from School of Interdisciplinary Bioscience and Bioengineering in Pohang University of Science and Technology (POSTECH), South Korea (including all costs and stipend)
2002.3-2008.2 Merit-based National Scholarship, KAIST (covered undergrad tuition and monthly stipend)

RELEVANT COURSEWORK

2008.3-2010.2 Principles of Neural Sciences, Advanced Vision Science, Cognitive Neuroscience Lab., Neuroimage Processing, Seminars in Visual Neuroscience, Math Modeling of Cognitive Processes, Movement (by Jeff Schall at Vanderbilt; audited)
2006.3-2008.2 Computational Neuroscience, Neural Networks, Game Theory, Probability and Statistics, Neuroimaging of the Brain

2002.3-2006.2 Neuroscience: Neuroscience, Neural Information Processing Algorithm, Cognitive Neuroscience, Psychology
Computer science: Intro to Computer Science, Data Structure, Algorithm, Signal and System, Digital System
Math: Calculus Ⅰ&Ⅱ, Linear algebra, Engineering Math, Probability and Statistics, Mathematical modeling and simulation, System Modeling

PERSONAL

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REFERENCES

Mehrdad Jazayeri, Ph. D. (Postdoctoral Mentor)
Associate Professor
Department of Brain & Cognitive Sciences & McGovern Institute for Brain Research, MIT
43 Vassar Street, Cambridge, MA 02139, USA
mjaz@mit.edu

Daeyeol Lee, Ph. D. (Postdoctoral Mentor)
Professor
Department of Neuroscience,
Johns Hopkins University School of Medicine
3400 N. Charles St., Baltimore, MD 21218, USA
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Sang-Hun Lee, Ph.D. (Ph.D. Advisor)
Professor
Department of Brain & Cognitive Sciences,
Seoul National University
599 Gwanak-ro, Gwanak-gu, Seoul 151-742, Republic of Korea
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Jaeseung Jeong, Ph.D. (M.S. Advisor)
Professor
Department of Bio and Brain Engineering
Korea Advanced Institute of Science & Technology (KAIST)
373-1 Guseong-dong, Yuseong-gu, Daejeon, 305-701, Republic of Korea
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