SungJun Cho

DPhil Student at the University of Oxford

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Education

University of Oxford — *Oxford, UK*

DPhil in Clinical Neurosciences — *Oct 2024 - Present*

- Supervisor: Mark Woolrich, Oiwi Parker Jones
- Thesis: Developing interpretable attention-based generative models for neuroimaging data

University of Oxford — *Oxford, UK*

MSc (by Research) in Psychiatry — *Oct 2022 - Dec 2023*

- Supervisor: Mark Woolrich, Mats van Es, Chetan Gohil
- Thesis: Inferring brain network dynamics of MEG and EEG in healthy aging and Alzheimer's disease

University of Chicago — *Chicago, IL*

BS in Neuroscience & BA in Philosophy — *Sep 2016 - Jun 2020*

- Supervisor: Wim van Drongelen
- Thesis: Theoretical modeling of neuronal networks: Paroxysmal depolarization and ictal wave propagations in focal epileptic seizures

Employments

AutoML Team | Lunit Inc. — *Seoul, S.Korea*

ML/DL Research Intern (PI: HyunJae Lee) — *Oct 2021 - May 2022*

- Conducted research focused on improving hyperparameter optimization (HPO) algorithms to solve medical image segmentation problems.
- Led an AutoML project to increase the accuracy of the chest X-Ray products using several HPO frameworks (Optuna, Ray Tune, W&B) and large-scale cloud computing.

Jee Lab | Korea Institute of Science and Technology — *Seoul, S.Korea*

Postgraduate Researcher (PI: Jee Hyun Choi) — *Jul 2020 - Oct 2021*

- Compared and evaluated the performance of burst detection algorithms in precisely capturing neural oscillatory bursts from electrophysiological signals.
- Studied behavioral correlates of neural oscillations in the mouse basolateral amygdala and prefrontal cortex, utilizing convolutional neural networks to estimate rodent postures.

Research Experiences

Analysis Group | Oxford Centre for Human Brain Activity — *Oxford, UK*

MSc Candidate (PI: Mark Woolrich) — *Oct 2022 - Present*

- Studying the efficacy of M/EEG-derived static and dynamic changes in whole-brain network features as a predictive biomarker of Alzheimer's disease during its prodromal phase.

Brain Dynamics Lab | University of Chicago — *Chicago, IL*

Undergraduate Research Assistant (PI: Stephanie Cacioppo) — *Nov 2018 - Jun 2020*

- Led acquisition, preprocessing, and analysis of ERP data acquired from control subjects and hypoactive sexual desire disorder (HSDD) patients to investigate the Flibanserin-induced brain responses.
- Investigated how the menopausal status influences spatiotemporal neural activation patterns among HSDD patients during decision-making processes.

van Drongelen Epilepsy Lab | University of Chicago — *Chicago, IL*

Undergraduate Research Assistant (PI: Wim van Drongelen) — *Oct 2018 - Jun 2020*

- Theoretically modelled ictal machinery of the focal epileptic seizures to understand the mechanism of the paroxysmal depolarization shift in parvalbumin inhibitory interneurons.
- Modified and developed a UI software package for synchronous analyses of mouse respiration data and patch-clamp recordings (measured from medullary neurons).

Clinical Cognitive Neuroscience Center | Seoul National University — *Seoul, S.Korea*

Undergraduate Visiting Scholar (PI: Jun Soo Kwon) — *Jul 2018 - Sep 2018*

- Analyzed functional and structural connectivity of the hippocampal-medial prefrontal circuitry in schizophrenia using human fMRI and DTI data.

Impression Formation Social Neuroscience Lab | University of Chicago *Chicago, IL*

Undergraduate Research Assistant (PI: Jasmin Cloutier & Jennifer Kubota) *Nov 2016 - Jul 2017*

- Managed psychological experiments to investigate how people internally perceive and evaluate the social status of the others based on their personal prejudices.
- Analyzed behavioral data to study how external motivation to respond without prejudice alters the neural processing of attention and decision making in response to the individuals' perceived race and status.

Cognitive Neurology and Dementia Lab | Samsung Medical Center *Seoul, S.Korea*

Clinical Intern & Research Assistant (PI: DukRyul Na) *Jul 2015 - Aug 2015*

- Assisted genetic and immunological experiments examining the effect of intra-arterial administration of the mesenchymal stem cells on transgenic mice with Alzheimer's disease.

Publications

Journal Articles

[1] **Cho S**, van Es M, Woolrich MW, Gohil C. (Submitted). Comparison between EEG and MEG of static and dynamic resting-state networks. *Human Brain Mapping*.

[2] **Cho S***, Han H*, Jung D, Kim J, Choi JH. (Submitted). Mouse Escape Behaviors and mPFC-BLA Activity Dataset: Understanding Flexible Defensive Strategies Under Threat. *Scientific Data*.

[3] **Cho S**, Choi JH. (2023). A guide towards optimal detection of transient oscillatory bursts with unknown parameters. *Journal of Neural Engineering*, 20(4):046007. [pdf]

[4] Tryba AK, Merricks E, Lee S, Pham T, **Cho S**, Nordli Jr. DR, Eissa TL, Goodman R, McKhann G, Emerson R, Schevon C, van Drongelen W. (2019). The role of paroxysmal depolarization in focal seizure activity. *Journal of Neurophysiology*, 122(5): 1861-1873. [pdf]

Conference Papers

[1] Lee H, Kim J, Lee G, **Cho S**, Kim D, Yoo D. (2023). Improving Multi-fidelity Optimization with a Recurring Learning Rate for Hyperparameter Tuning. In Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV): 2309-2318. [pdf]

Conference Posters

[1] **Cho S**, Gohil C, van Es M, Woolrich MW. (2024). Correspondence of dynamic resting-state networks in source space EEG and MEG. *Organization for Human Brain Mapping 2024*.

[2] **Cho S**, van Es M, Gohil C, Woolrich MW. (2023). Comparison of resting-state EEG and MEG in detecting the effects of healthy aging. *MEG UKI 2023*. [pdf]

[3] **Cho S**, Choi JH. (2022). Decision-matrix based algorithm selection maximizes detection accuracy of transient neural oscillatory bursts. *Korean Society for Brain and Neural Sciences 2022*. [pdf]

[4] **Cho S**, Lee J, Choi JH. (2021). Transient beta and gamma bursts in simulations and the mouse basolateral amygdala during the open field test. *Society for Neuroscience 2021*. [pdf]

[5] **Cho S**, Choi JH. (2021). Comparison of burst detection algorithms for characterizing transient neural oscillatory events. *Korean Society for Brain and Neural Sciences 2021*.

[6] **Cho S**, Siewsrichol W, Cacioppo S. (2020). Neural Differences in Hypoactive Sexual Desire Disorder: An ERP Microstate Study. *Cognitive Neuroscience Society 2020*. [pdf]

[7] van Drongelen W, Tryba AK, Pham T, Merricks E, Bhansali A, Pesce L, **Cho S**, Lee S, Eissa TL, Nordli Jr. DR, Schevon CA. (2019). Dynamics sustaining focal seizures: a dual function of inhibition and interactions across scales. *Society for Neuroscience 2019*.

*: Equal contribution

Honors & Awards

2024-28 **Medical Sciences Graduate School Studentship***, University of Oxford

2023 **Hertford College Graduate Travel Grant**, University of Oxford

2020 **Dean's Fund for Undergraduate Research - Conference**, University of Chicago

2020 **Micro-Metcalf Internship Award**, University of Chicago

2019 **Liew Family College Research Fellowship**, University of Chicago

2018-19 **Jeff Metcalf Internship Award**, University of Chicago

2016-19 **Dean's List (3x times)**, University of Chicago

*: Funded by the Medical Resarch Council, Hertford Claire Clifford Lusardi Scholarship, and Nuffield Department of Clinical Neurosciences.

Skills

Cognitive & Systems Neuroscience

Data LFP, EEG, MEG, MRI, DTI (in mouse or human)
Experiments stereotactic surgery, optogenetics, histology, viral injection, psychological battery, LFP/EEG/MEG measurements
Languages English, Korean, Chinese (Mandarin), French

Computational & Data Science

Programming Python, MATLAB, R, Bash, Julia, SQL
Research Software FSL (FreeSurfer, MRtrix3), Brainstrom, MNE, FieldTrip, Tensorflow, PyTorch
DevOps & Platforms Qualtrics, Amazon MTurk, GitHub, Docker, Google Cloud Platform
Theory signal processing, machine learning, Bayesian analysis, biophysical modeling

Teaching

2020 **MATH 15200 Calculus II**, *Course Assistant*, University of Chicago
2018 **BIOS 10130 Core Biology (Nervous System)**, *Teaching Assistant*, University of Chicago

Other Academic Experiences

Deep Learning Summer School — *Online*

Neuromatch Academy — *2021*

- Investigated the effect of hyperparameter tuning and reward shaping on reinforcement learning using a Deep Q-Network trained on OpenAI Gym environments.

Phonology Laboratory — *Chicago, IL*

Department of Linguistics, University of Chicago — *2020*

- Designed and implemented an online experiment to explore the relationship between pitch and voice onset time in human speech perception.

Directed Reading Program — *Chicago, IL*

Department of Mathematics, University of Chicago — *2019*

- Studied persistent homology and its application to the field of neuroscience and computer science under the context of algebraic topology.

Physician Shadowing Program — *Chicago, IL*

University of Chicago Medicine — *2018-19*

- Shadowed Prof. Helene Rubeiz at the Department of Neurology and Prof. Nishant Agrawal at the Department of Surgery to observe various neuromuscular diseases and otolaryngology surgeries.
- Visited operating room under the guidance of Prof. Ross Milner (1/23/19): Endovascular Abdominal Aneurysm Repair (EVAR) of renal arteries.