# SungJun **Cho**

MSc Candidate at the University of Oxford

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## Education

### University of Oxford — *Oxford, UK*

MSc Candidate in Psychiatry — *Oct 2022 - Present*

- Supervisor: Mark Woolrich
- Thesis: Inferring brain network dynamics of simultaneous MEG-EEG data in 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
- GPA: 3.77 / 4.00

## 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.

# Publictions

## Journal Articles

**[1]** **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]

**[2]** 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**, 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*.

**[2]** **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]

**[3]** **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]

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

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

**[6]** 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*.

# Skills

## Cognitive & Systems Neuroscience

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

## Computational & Data Science

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

# Honors & Awards

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

# 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.