SungJun Cho

DPhil student at the University of Oxford
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Citizenship: Republic of Korea

Research Interests

computational neuroscience, neural oscillations, machine learning, sequence modelling

Education

Oct 2024 – Present
DPhil Clinical Neurosciences
University of Oxford, Oxford, UK
Supervisors: Mark Woolrich, Oiwi Parker Jones
Thesis: *Developing interpretable attention-based generative models for neuroimaging data*

Oct 2022 – Dec 2023
MSc (by Research) Psychiatry
University of Oxford, Oxford, UK
Supervisors: Mark Woolrich, Chetan Gohil, Mats van Es
Thesis: *Inferring brain network dynamics of MEG and EEG in healthy aging and Alzheimer's disease* [PDF]

Sep 2016 – Jun 2020
BS Neuroscience; BA Philosophy
University of Chicago, Chicago, USA
Supervisors: Wim van Drongelen
Thesis: *Theoretical modeling of neuronal networks: Paroxysmal depolarization and ictal wave propagations in focal epileptic seizures*

Honors & Awards

2026 **London AI Hackathon** – {Tech: Europe}
First place, n8n challenge track; top three, Superlinked challenge track.

2026 **Commendation, OxCIN Open Science Ambassador's Award** – University of Oxford

2024-2028 **Medical Sciences Graduate School Studentship** – University of Oxford
Funded by the Medical Research Council, Hertford Claire Clifford Lusardi Scholarship, and Nuffield Department of Clinical Neurosciences.

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

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

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

2016-2019 **Dean's List (3x)** – University of Chicago

Publications

Asterisk (*) denotes equal contributions as a co-first or co-senior author.

Journal Articles

[J1] **Cho S**, Huang R, Gohil C, Parker Jones O, Woolrich MW. (2026). Modelling Discrete States and Long-Term Dynamics in Functional Brain Networks. *Imaging Neuroscience*, 4:IMAG.a.1237. [PDF]

[J2] **Cho S**, van Es M, Woolrich M, Gohil C. (2024). Comparison between EEG and MEG of static and dynamic resting-state networks. *Human Brain Mapping*, 45(13):e70018. [PDF] * Selected as Wiley Top Cited & Viewed Article

[J3] **Cho S***, Han HB*, Jung D, Kim J, Choi JH. (2024). Mouse Escape Behaviors and mPFC-BLA Activity Dataset: Understanding Flexible Defensive Strategies Under Threat. *Scientific Data*, 11:861. [PDF]

[J4] **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]

[J5] 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 Proceedings

[C1] Lee H, Lee G, Kim J, **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]

Submitted Manuscripts & Preprints

[M1] Mantegna F, Elvers G, Jayalath D, Landau G, Kim T, Özdogan M, Kurth L, Kwon T, **Cho S**, Ballyk B, Fung A, Somaiya P, Mantilla-Ramos Y, Abdelhedi H, Jerbi K, Farquhar G, Shillingford B, Woolrich M, Parker Jones O. (2026). The 2026 PNPL Competition: Word-Classification and Efficient Cross-Subject Generalisation in LibriBrain100.

[M2] Mantegna F, Jayalath D, Elvers G, Kim T, Ballyk B, **Cho S**, Kwon T, Kurth L, Özdogan M, Landau G, Somaiya P, Voets N, Woolrich M, Parker Jones O. (2026). LibriBrain100: One Hundred Hours of Broad and Deep MEG Data for Neural Speech Decoding at Scale.

[M3] Elvers G, Landau G, Mantegna F, Özdogan M, Kim T, Kwon T, **Cho S**, Ballyk B, Kurth L, Jayalath D, Somiya P, Gohil C, Shillingford B, Farquhar G, Jiang M, Gulcehre C, de Zuazo X, Abdelhedi H, Ramos YM, Jerbi K, Woolrich M, Voets N, Parker Jones O. (2026). Benchmarking Non-Invasive Speech BCIs: Lessons Learned from the 2025 PNPL Competition.

[M4] Wei Y, Smith SM, Gohil C, Huang R, Griffin B, **Cho S**, Adaszewski S, Fraessle S, Woolrich MW, Farahibozorg S. (2026). Bi-cross-validation: a data-driven method to evaluate dynamic functional connectivity models in fMRI. bioRxiv, 2026.04.02.716067. [PDF]

[M5] **Cho S**, Gohil C, Huang R, Parker Jones O, Woolrich MW. (2026). A Systematic Evaluation of Sample-Level Tokenization Strategies for MEG Foundation Models. arXiv, 2602.16626. [PDF]

[M6] Huang R, **Cho S**, Gohil C, Parker Jones O, Woolrich M. (2025). MEG-GPT: A transformer-based foundation model for magnetoencephalography data. arXiv, 2510.18080. [PDF]

Research experience

Oct 2024 – Present

DPhil Student
Oxford Centre for Human Brain Activity, Oxford, UK
Oxford Robotics Institute, Oxford, UK
PI: Mark Woolrich, Oiwi Parker Jones

- Currently leading a project on designing a transformer-based foundation model for non-invasive brain electrophysiological data, with an emphasis on mechanistic interpretability.
- Developed a categorical variational autoencoder to extract latent representations and dynamic patterns of functional brain networks from neuroimaging data.

Oct 2022 – Dec 2023

MSc Student
Oxford Centre for Human Brain Activity, Oxford, UK
PI: Mark Woolrich

- Studied 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.

Jul 2020 – Oct 2021

Postgraduate Researcher
Korea Institute of Science and Technology, Seoul, S. Korea
PI: Jee Hyun Choi

- 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.

Nov 2018 – Jun 2020

Undergraduate Research Assistant
University of Chicago, Chicago, USA
PI: Stephanie Cacioppo

- Investigated the Flibanserin-induced brain responses and the effects of menopausal status in hypoactive sexual desire disorder (HSDD).

Oct 2018 – Jun 2020

Undergraduate Research Assistant
University of Chicago, Chicago, USA
PI: Wim van Drongelen

- Theoretically modelled travelling ictal waves in the focal epileptic seizures assuming the paroxysmal depolarisation shift in parvalbumin inhibitory interneurons.

Jul 2018 – Sep 2018

Undergraduate Visiting Scholar
Seoul National University, Seoul, S. Korea
PI: Jun Soo Kwon

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

Nov 2016 – Jul 2017

Undergraduate Research Assistant
University of Chicago, Chicago, USA
PI: Jasmin Cloutier & Jennifer Kubota

- Studied how internal perceptions of the social status and personal prejudices influence the neural processing of attention and decision making.

Jul 2015 – Aug 2015

High School Research Assistant
Samsung Medical Center, Seoul, S. Korea
PI: DukRyul Na

- Examined the effect of intra-arterial administration of the mesenchymal stem cells on transgenic mice with Alzheimer's disease.

Industry experience

Oct 2021 – May 2022

ML/DL Research Intern (AutoML Team)
Lunit Inc., Seoul, S. Korea
PI: HyunJae Lee

- 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 HPO frameworks (Optuna, Ray Tune, W&B) and large-scale cloud computing.

Talks & Presentations

Conference Posters

[P1] MEG-GPT-2: A Generative Foundation Model for MEG with Neuroscientifically Meaningful Representations *(BIOMAG 2026)* * Selected for oral presentation

[P2] MEG-GPT-2: A Generative Foundation Model for MEG with Structured Neural Representations *(ICML 2026 Foundation Models for Structured Data)*

[P3] Learnable Sample-Level Tokenisation for MEG Foundation Models *(MEG-UKI 2025)* * Selected for oral presentation

[P4] Discrete Representation of Long-Range Brain Network Dynamics via Generative Modelling *(MNA 2025)* [PDF]

[P5] Correspondence of dynamic resting-state networks in source space EEG and MEG *(OHBM 2024)*

[P6] Comparison of resting-state EEG and MEG in detecting the effects of healthy aging *(MEG-UKI 2023)* [PDF]

[P7] Decision-matrix based algorithm selection maximizes detection accuracy of transient neural oscillatory bursts *(KSBNS 2022)* [PDF]

[P8] Transient beta and gamma bursts in simulations and the mouse basolateral amygdala during the open field test *(SfN 2021)* [PDF]

[P9] Comparison of burst detection algorithms for characterizing transient neural oscillatory events *(KSBNS 2021)* [PDF]

[P10] Neural Differences in Hypoactive Sexual Desire Disorder: An ERP Microstate Study *(CNS 2020)*

[P11] Dynamics sustaining focal seizures: a dual function of inhibition and interactions across scales *(SfN 2019)*

Invited Talks

[T1] OHBA Software Library (OSL) for MEG & EEG *(Oxford Centre of Integrative Neuroimaging, Open Science Session, 2026)*

[T2] Imaging Analysis Demonstration for MEG & EEG: From pre-processing and source reconstruction to dynamic modelling *(Oxford-Surrey Neuroimaging & Sleep Research Exchange, 2026)*

[T3] DyNeStE: Discrete Representation of Long-Range Brain Network Dynamics via Generative Modelling *(Oxford Centre of Integrative Neuroimaging, 2025)*

Teaching

2025 **OHBA Software Library Workshop**, *University of Oxford*
Teaching Assistant

2020 **MATH 15200 Calculus II**, *University of Chicago*
Course Assistant

2018 **BIOS 10130 Core Biology (Nervous System)**, *University of Chicago*
Teaching Assistant

Technical Skills

Theory

signal processing, machine learning, Bayesian analysis, biophysical modelling

Programming Languages

Python, MATLAB, R, Bash

Research Software

TensorFlow, Keras, PyTorch • NumPy, SciPy, Pandas, scikit-learn • Git, Docker, Optuna, Ray Tune, W&B • FSL (FreeSurfer, MRtrix3), Brainstorm, MNE, FieldTrip

Experiment & Data

LFP, EEG, MEG, MRI, DTI (in mouse or human)

Languages

English (native), Korean (native), Chinese - Mandarin (professional), French (basic)

Open-Source Software

osl-dynamics

A Python toolkbox providing generative model-based methods for analysing dynamics in neural time-series data.

osl-foundation

A Python toolbox offering a TensorFlow-based tokeniser and the foundation model for parcellated MEG data.

Science Communication

Apr 2024 How scientists are building a library of the brain's dysfunctional pathways, *The Oxford Scientist*

Mar 2024 Redefining mental health: the rise of computational psychiatry, *The Oxford Scientist*