

# 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 –	<b>DPhil Clinical Neurosciences</b>
Present	UNIVERSITY OF OXFORD, OXFORD, UK
	Supervisors: Mark Woolrich, Oiwi Parker Jones
	Thesis: <i>Developing interpretable attention-based generative models for neuroimaging data</i>
Oct 2022 –	<b>MSc (by Research) Psychiatry</b>
Dec 2023	UNIVERSITY OF OXFORD, OXFORD, UK
	Supervisors: Mark Woolrich, Chetan Gohil, Mats van Es
	Thesis: <i>Inferring brain network dynamics of MEG and EEG in healthy aging and Alzheimer's disease</i> <a href="#">[PDF]</a>
Sep 2016 –	<b>BS Neuroscience; BA Philosophy</b>
Jun 2020	UNIVERSITY OF CHICAGO, CHICAGO, USA
	Supervisors: Wim van Drongelen
	Thesis: <i>Theoretical modeling of neuronal networks: Paroxysmal depolarization and ictal wave propagations in focal epileptic seizures</i>

## Honors & Awards

2024-2028	<b>Medical Sciences Graduate School Studentship</b> – University of Oxford Funded by the Medical Research Council, Hertford Claire Clifford Lusardi Scholarship, and Nuffield Department of Clinical Neurosciences.
2023	<b>Hertford College Graduate Travel Grant</b> – University of Oxford
2020	<b>Dean's Fund for Undergraduate Research - Conference</b> – University of Chicago
2019	<b>Liew Family College Research Fellowship</b> – University of Chicago
2016-2019	<b>Dean's List (3x)</b> – University of Chicago

## Publications

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

## JOURNAL ARTICLES

- [J1] **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. [\[PDF\]](#)
- [J2] **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. [\[PDF\]](#)
- [J3] **Cho S**, Choi JH. (2023). A guide towards optimal detection of transient oscillatory bursts with unknown parameters. *Journal of Neural Engineering*, 20(4):046007. [\[PDF\]](#)
- [J4] 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. [\[PDF\]](#)

## MANUSCRIPTS IN SUBMISSION & PREPRINTS

- [M1] 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. [\[PDF\]](#)
- [M2] **Cho S**, Huang R, Gohil C, Parker Jones O, Woolrich MW. (2025). Modelling Discrete States and Long-Term Dynamics in Functional Brain Networks. bioRxiv, 2025.09.25.678554. [\[PDF\]](#)

## Research experience

Oct 2024 –

### DPhil Student

OXFORD CENTRE FOR HUMAN BRAIN ACTIVITY, 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 – **Postgraduate Researcher**  
 Oct 2021 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 – **Undergraduate Research Assistant**  
 Jun 2020 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 – **Undergraduate Research Assistant**  
 Jun 2020 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 – **Undergraduate Visiting Scholar**  
 Sep 2018 SEOUL NATIONAL UNIVERSITY, SEOUL, S. KOREA  
 PI: Jun Soo Kwon
- Analysed functional and structural connectivity of the hippocampal-medial pre-frontal circuitry in schizophrenia using human fMRI and DTI data.
- Nov 2016 – **Undergraduate Research Assistant**  
 Jul 2017 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 – **High School Research Assistant**  
 Aug 2015 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 – **ML/DL Research Intern (AutoML Team)**  
 May 2022 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] Learnable Sample-Level Tokenisation for MEG Foundation Models (*MEG-UKI 2025*) \* Selected for oral presentation
- [P2] Discrete Representation of Long-Range Brain Network Dynamics via Generative Modelling (*MNA 2025*) [\[PDF\]](#)
- [P3] Correspondence of dynamic resting-state networks in source space EEG and MEG (*OHBM 2024*)
- [P4] Comparison of resting-state EEG and MEG in detecting the effects of healthy aging (*MEG-UKI 2023*) [\[PDF\]](#)
- [P5] Decision-matrix based algorithm selection maximizes detection accuracy of transient neural oscillatory bursts (*KSBNs 2022*) [\[PDF\]](#)
- [P6] Transient beta and gamma bursts in simulations and the mouse basolateral amygdala during the open field test (*SfN 2021*) [\[PDF\]](#)
- [P7] Comparison of burst detection algorithms for characterizing transient neural oscillatory events (*KSBNs 2021*) [\[PDF\]](#)
- [P8] Neural Differences in Hypoactive Sexual Desire Disorder: An ERP Microstate Study (*CNS 2020*)
- [P9] Dynamics sustaining focal seizures: a dual function of inhibition and interactions across scales (*SfN 2019*)

### INVITED TALKS

- [T1] Learnable Sample-Level Tokenisation for MEG Foundation Models (*Oxford Robotics Institute, 2025*)
- [T2] DyNeStE: Discrete Representation of Long-Range Brain Network Dynamics via Generative Modelling (*Oxford Centre of Integrative Neuroimaging, 2025*)

## Teaching

2025	<b>OHBA Software Library Workshop</b> , <i>University of Oxford</i> Teaching Assistant
2020	<b>MATH 15200 Calculus II</b> , <i>University of Chicago</i> Course Assistant
2018	<b>BIOS 10130 Core Biology (Nervous System)</b> , <i>University of Chicago</i> 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)

## Science Communication

Apr 2024	<a href="#">How scientists are building a library of the brain's dysfunctional pathways</a> , <i>The Oxford Scientist</i>
Mar 2024	<a href="#">Redefining mental health: the rise of computational psychiatry</a> , <i>The Oxford Scientist</i>