Younghyun Oh

Postdoctoral Researcher, Combine Lab
Center for Neuroscience Imaging Research (IBS)
Sungkyunkwan University, Suwon, South Korea

bio7420@skku.edu
ORCID 0009-0000-1067-7793
Google Scholar · GitHub

Research interests

Hierarchical organization of the brain · Neuromodulation for adaptive processing · Biophysical whole-brain modeling · Neuroanatomy across species · Artificial intelligence and cybernetics

Education

2022–26 Ph.D., Biomedical Engineering, Sungkyunkwan University, South Korea
Thesis: "Directed Signal-Flow Hierarchy and the Generative Architecture of Human Cortical Function"
Supervisor: Seok-Jun Hong. Degree awarded August 2026.

2018–21 M.Sc., Neuroscience, University of Bonn, Germany
Thesis: "Neural mechanisms of the perception of aliveness across stimulus classes and visual characteristics"
Supervisor: Johannes Schultz.

2012–18 B.Sc., Biology, Chungnam National University, South Korea
Studies interrupted by compulsory military service, 2013–15 (Republic of Korea Marine Corps).

Research appointments

2026– Center for Neuroscience Imaging Research, Institute for Basic Science / Sungkyunkwan University, South Korea
Postdoctoral Researcher, Combine Lab (*PI: Seok-Jun Hong*)

2022–26 Center for Neuroscience Imaging Research, Institute for Basic Science / Sungkyunkwan University, South Korea
Doctoral Researcher, Combine Lab (*PI: Seok-Jun Hong*)

2021–22 Sungkyunkwan University, South Korea
Research Intern

2019–21 Center for Economics and Neuroscience, University of Bonn, Germany
Master's Researcher (*PI: Johannes Schultz*)

2016, 17 Korea Research Institute of Bioscience and Biotechnology, South Korea
Research Intern

Publications

* co-first author † co-corresponding author Full list: Google Scholar

2026 **Oh, Y.**, Ann, Y., Lee, J.-J., Ito, T., Froudist-Walsh, S., Paquola, C., Milham, M., Spreng, R. N., Margulies, D., Bernhardt, B., Woo, C.-W.†, Hong, S.-J.† State-dependent signal flow hierarchy in the human cerebral cortex. *Nature Neuroscience*. doi:10.1038/s41593-026-02389-8

2026 Lee, S.*, **Oh, Y.***, An, H., Yoon, H., Friston, K. J., Hong, S.-J.†, Woo, C.-W.† Life-inspired interoceptive artificial intelligence for autonomous and adaptive agents. *Nature Machine Intelligence*. doi:10.1038/s42256-026-01296-8

2025 Han, M.-J.*, **Oh, Y.***, Ann, Y., Kang, S., Baeg, E., Hong, S.-J., Sohn, H.†, Kim, S.-G.† Whole-brain effective connectivity of the sensorimotor system using 7T fMRI with electrical microstimulation in non-human primates. *Progress in Neurobiology* 250, 102760. doi:10.1016/j.pneurobio.2025.102760

Invited and contributed talks

2026 Bridging anatomical and effective hierarchies via neural mass modeling. Organization for Human Brain Mapping, Bordeaux, France (*oral*)

2025 Intrinsic effective connectivity as the basis of functional specialization. Organization for Human Brain Mapping, Brisbane, Australia (*oral*)

2024 State-dependent functional hierarchy revealed by integrated effective connectivity. Gradients of Brain Organization Workshop, Suwon, South Korea (*invited*)

2022 Ensemble learning for whole brain mapping of directed functional connectivity. Gradients of Brain Organization Workshop, Cambridge, UK (*flash talk*)

Conference posters

2026 Intrinsic effective connectivity as the generative backbone of functional specialization. Organization for Human Brain Mapping, Bordeaux, France

2024 State-dependent functional hierarchy revealed by integrated effective connectivity. Organization for Human Brain Mapping, Seoul, South Korea

2022 Ensemble learning for whole brain mapping of directed functional connectivity. Organization for Human Brain Mapping, Glasgow, UK

Awards and funding

2026 Doctoral graduate representative, Sungkyunkwan University commencement (representing the PhD graduates of science and engineering)

2025 Merit Abstract Award, Organization for Human Brain Mapping

2018–19 MSc Neurosciences Program Scholarship, University of Bonn, Germany

2016–18 Doosan Yonkang Foundation Scholarship, South Korea (undergraduate)

Supervision and mentoring

2025– Sungmin Ji, M.Sc. student, Sungkyunkwan University, South Korea — day-to-day supervision at the student's request, continuing to February 2027 across the doctoral and postdoctoral periods. Directed his initial implementation work on the macaque biophysical modelling pilot I designed, and provide broader training in literature review, neuroimaging analysis and computational modelling.

Technical skills

Biophysical modelling Dynamic mean-field models; neural mass models; Hopf (Stuart–Landau) oscillator models

Machine learning Differentiable whole-brain biophysical models; recurrent neural network training; task-optimised network models; partially observable Markov decision processes; variational inference; reinforcement learning

Network modelling Dynamic causal modelling; Granger causality and vector autoregression; probabilistic graphical models; Bayesian network analysis; functional connectivity analysis

Neuroimaging fMRIPrep and HCP minimal preprocessing pipelines; Connectome Workbench; fMRI denoising pipelines; statistical analysis (SurfStat, task GLM analysis, HRF deconvolution, etc.)

Professional memberships

Organization for Human Brain Mapping (2022–present)