

Jaeyoung Yoon, Ph.D.

[jy.yoon@tch.harvard.edu](mailto:jy.yoon@tch.harvard.edu) | 3 Blackfan St. CLS 13030.15, Boston, MA 02115, USA

EDUCATION AND TRAINING

<b>Research Fellow, Boston Children’s Hospital / Harvard Medical School</b> F.M. Kirby Neurobiology Center / Department of Neurology	Aug 2023 – present
<b>Postdoctoral Fellow, Massachusetts Institute of Technology</b> McGovern Institute for Brain Research	Aug 2019 – Jul 2023
<b>Postdoctoral Associate, Seoul National University</b> Medical Research Center	Mar 2019 – Jul 2019
<b>Ph.D., Seoul National University</b> Biological Sciences, College of Natural Sciences / Physiology, College of Medicine ( <i>joint affiliation</i> ) (2016 – 2019: Military service, Republic of Korea Army)	Mar 2013 – Feb 2019
<b>B.S., Seoul National University</b> Biological Sciences, College of Natural Sciences	Mar 2009 – Feb 2013

AWARDS AND HONORS

Pioneers Grant, Harvard Brain Science Initiative (HBI), Harvard University ( <i>application under review</i> )	2025
Travel/Research Award, Mind-Brain-Behavior Initiative, Harvard University (1.99 k USD)	2024
Best Presenter Award, F.M. Kirby Neurobiology Center, Boston Children’s Hospital (BCH)	2024
Y. Eva Tan Fellowship, Massachusetts Institute of Technology (MIT) (130.00 k USD)	2021 – 2023
Molecular Therapeutics Impact Report 2020 – 2022, MIT (featured)	2022
BK21 / BK21+ Fellow, National Research Foundation of Korea (NRF) (~21.26 k USD)	2013 – 2017
Lecture and Research Scholarship & Merit-based Scholarships, Seoul National University (SNU)	2013 – 2014
Superior Academic Performance Scholarships, SNU	2009 – 2011

SELECTED PUBLICATIONS

**Yoon J\***, Terauchi A, Castro Palacin A, Cohen A, Umemori H, Ferguson B\*. (2025). Thalamocortical synaptic hyperconnectivity in the human neocortex with ASD. (*under review*) (\* **co-corresponding author**)

**Yoon J\***, Ferguson B\*. (2025). Selective modulation of excitation-inhibition balance by human cortical electric stimulation. (*under review*) (\* **co-corresponding author**)

Cho E, Kwon J, Lee G, Shin J, Lee H, Lee SH, Chung CK\*, **Yoon J\***, Ho WK\*. (2024). Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy. *Nature Communications*. DOI: 10.1038/s41467-024-51065-7 (\* **co-corresponding author**)

**Yoon J.** (2024). Geometrical determinant of nonlinear synaptic integration in human cortical neurons. *arXiv*. DOI: 10.48550/arXiv.2408.05633

**Yoon JY**, Lee HR, Ho WK, Lee SH. (2020). Disparities in short-term depression among prefrontal cortex synapses sustain persistent activity in a balanced network. *Cerebral Cortex*. DOI: 10.1093/cercor/bhz076

**Yoon JY**, Choi S. (2017). Evidence for presynaptically silent synapses in the immature hippocampus. *Biochemical and Biophysical Research Communications*. DOI: 10.1016/j.bbrc.2016.12.044

**Yoon J.** (2025a). Acute human brain slice preparation for ex vivo electrophysiology and imaging. *protocols.io*. DOI: 10.17504/protocols.io.ewov124qogr2/v1 (*embargoed until 2026-05-01*)

**Yoon J.** (2025b). 2-photon glutamate uncaging with pulse splitter for ex vivo electrophysiology. *protocols.io*. DOI: 10.17504/protocols.io.eq2lyxpjwgx9/v1 (*embargoed until 2026-05-01*)

Lee BJ, et al. (2025). A specific association of presynaptic K<sup>+</sup> channels with Ca<sup>2+</sup> channels underlies K<sup>+</sup> channel-mediated regulation of glutamate release. (*under review*)

He M, et al. (2025). Human cortical neuron-based assays to study axon regeneration. (*in preparation*)

## SELECTED INVITED TALKS

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"Electrophysiological hallmarks of epilepsy and autism in the human neocortex". *China-Japan-Korea Neuroscience Meeting*. Incheon, Korea. (Aug 2025)

"Thalamocortical synaptic hyperconnectivity in the human neocortex with ASD". *F.M. Kirby Neurobiology Center, BCH & Harvard Medical School (HMS)*. Boston, MA, USA. (May 2025)

"Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy". *New England Bioscience Society*. Boston, MA, USA. (Sep 2024)

"Synaptic integration in human dendrites". *Department of Physiology, College of Medicine, SNU*. Seoul, Korea. (Dec 2023)

"Subcellular connectivity and synaptic integration in cortical pyramidal neurons". *McGovern Institute for Brain Research (MIBR), MIT*. Cambridge, MA, USA. (Jul 2021)

## TECHNICAL EXPERIENCE

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**Acute human brain slice preparation & ex vivo electrophysiology (patch clamp):** 2019 – present

- Whole-cell (somatic, dendritic, paired) or excised (outside-out, nucleated, inside-out) patch clamp in human cortex (temporal, frontal, occipital, parietal, insular; L2/3, L5, L6; PN, FSIN, nFSIN, glia)
- Human brain slice preparation, from > 80 adult and pediatric patients diagnosed with tumor or epilepsy; healthy and patched at soma and distal apical dendrite up to 132 h post-resection

**ex vivo electrophysiology (patch clamp) in general applications:** 2013 – present

- Electrophysiology setup at BCH/HMS (CLS 13052), MIT MIBR (46-6178), SNU medical (2-726), and SNU (504-201)
- Patch clamp in rodent brain slices (mouse, rat), human brain slice culture, and human cortical organoids
- Single-cell RNA (scRNA) sequencing with patch clamp (Patch-seq)
- Computational modeling of cellular and network biophysics, with optogenetic or electric stimulation

**2-photon excitation microscopy (2PEF):** 2013 – present

- MIT MIBR 2-photon core facility (46-6178) setup and management, including user training (6 postdocs from MIT & Broad Institute of MIT and Harvard trained during 2019 – 2023)
- 2-photon glutamate uncaging (2PGU), with 8x pulse splitter for enhanced 2PEF; setup and application
- Intracellular calcium imaging, structural imaging, subcellular channelrhodopsin-assisted circuit mapping (sCRACM)

**Data analysis and processing:** 2013 – present

- Software development for electrophysiology and 2-photon imaging data analysis (<https://github.com/flosfor/pvbs>)
- Contribution to abfload: MATLAB function for processing .abf file format (<https://github.com/fcollman/abfload>)

**Teaching experience:** 2013 – present

- Teaching Assistant, Data Analysis in Neuroscience / Biology Lab 1 & 2 / Biological Sciences Research Lab 1 & 2, SNU
- Laboratory personnel training (SNU, MIT, BCH, HMS)

**Other research and laboratory experience:** 2013 – present

- *ad hoc* reviewer for *Nature Communications*, *Neuron*, *Cell Reports*, and *Frontiers in Synaptic Neuroscience*
- Technical assistance for *in vivo* patch clamp and Neuropixels setup at MIT MIBR (46-6171)
- Plasmid DNA purification, viral vector packaging, immunohistochemistry, expansion microscopy, stereotaxic surgery

## LANGUAGES

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English (bilingual), Korean (bilingual), Italian (proficient, C2), French (intermediate), MATLAB (proficient)

## MEMBERSHIPS

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Society for Neuroscience (SfN), Korean Physiological Society, Korean Society for Brain and Neural Sciences (KSBNs), Japan Neuroscience Society, US Chess Federation (USCF; chess.com rating ≤ 2131)

## REFERENCES

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Suk-Ho Lee, MD PhD (SNU), Won-Kyung Ho, MD PhD (SNU), Sukwoo Choi, PhD (SNU), Brielle Ferguson, PhD (HMS), Chinfai Chen, MD PhD (HMS), Gloria Choi, PhD (MIT)