# Curriculum Vitae


## Hyeonsu Lee, Ph.D.

hyeonsu.lee@kist.re.kr / hyeonsu.lee.93@gmail.com
website: https://hyeonsu-lee-93.github.io/


## RESEARCH INTEREST

Computational neuroscience, Neural circuit dynamics and plasticity, Brain-inspired AI, NeuroAI, Mathematical modeling, Dynamical systems modeling, Quantitative data analysis

## EDUCATION

| | | | | |
|---|---|---|---|---|
| 2018.02 ~ 2024.08 | **Ph.D.** | Bio and Brain Engineering (Advisor: **Se-Bum Paik**) | **KAIST** | Korea |
| 2016.03 ~ 2018.02 | **M.S.** | Bio and Brain Engineering (Advisor: **Se-Bum Paik**) | **KAIST** | Korea |
| 2011.02 ~ 2016.02 | **B.S.** | Mathematical Sciences<br>Business and Technology Management (Minor) | **KAIST** | Korea |

## RESEARCH EXPERIENCE

| | | |
|---|---|---|
| 2024.10 ~ Present | Postdoctoral researcher (Advisor: **Jaeson Jang**) | **KIST** |
| 2016.03 ~ 2024.08 | Graduate researcher (Advisor: **Se-Bum Paik**) | **KAIST** |
| 2015.01 ~ 2016.02 | Research intern | **KAIST** |
| 2014.04 ~ 2014.11 | Researcher | **ybrain** |
| 2013.07 ~ 2013.08 | Research intern | **KAIST** |

## PUBLICATIONS

1 Cho S, **Lee H**, Baek S & Paik SB, “Neuromimetic metaplasticity for adaptive continual learning without catastrophic forgetting”, Neural Networks (2025)

2 **Lee H***, Choi W*, Lee D & Paik SB, “Comparison of visual quantities in untrained neural networks”, Cell Reports (2023)

3 Jeong M*, **Lee H***, …, Paik SB†, Lim BK† & Kim D†, “Interhemispheric cortico-cortical pathway for sequential bimanual movements in mice”, eNeuro (2021)

4 Bae JW*, Jeong H*, …, **Lee H**, Paik SB & Jung MW, “Parallel processing of working memory and temporal information by distinct types of cortical projection neurons”, Nature Communications (2021)

5 **Lee H**, Choi W, Park Y & Paik SB, “Distinct role of flexible and stable encodings in sequential working memory”, Neural Networks (2020)

6 Song M*, Kang MS*, **Lee H**, Jeong Y & Paik SB, “Classification of spatiotemporal neural activity patterns in brain imaging data”, Scientific Reports (2018)

## PRE-PRINT / UNDER REVIEW

1 Cho Y*, **Lee H***, Deneuville E & Jang J, “Learning from Natural Images Untangles Number Sense” (Under review)

2 Choi W, **Lee H** & Paik SB, “Slow rhythmic eye motion predicts periodic alternation of bistable perception”, bioRxiv (2020)

(* Co-first, † Co-corresponding author)

## SELECTED CONFERENCE PRESENTATIONS

1 *Cognitive Computational Neuroscience* (**CCN**) 2026, Cho Y*, **Lee H***, Deneuville E & Jang J,
"Separating numerosity and proportion representations through pretraining"

2 *Society for Neuroscience* (**SfN**) 2025, **Lee H**, Baek S, Choi W, Jang J & Paik SB,
"Spontaneous social tipping and trend cycles driven by randomness"

3 *Computational and Systems Neuroscience* (**Cosyne**) 2022, Choi W*, **Lee H*** & Paik SB,
"Spontaneous emergence of magnitude comparison units in untrained deep neural networks"

4 *Society for Neuroscience* (**SfN**) 2018, **Lee H**, Choi W, Park Y & Paik SB,
"Resource overwrite model for sequential working memory in human" (Oral)

## PATENTS

Paik SB, **Lee H**, Park Y, **US Patent**, US 11,467,728 B2 (2022) "Storage device using neural network and operating method for automatic redistribution of information and variable storage capacity based on accuracy-storage capacity tradeoff thereof"
* 신경망을 이용한 기억 장치 및 그의 정확성-저장용량 트레이드오프에 기반한 정보의 자동적 재분배 및 가변적 용량 구현을 위한 동작 방법

Paik SB, Cho S, **Lee H**, Baek S, KR Patent, 10-2024-0199987 (2024) "Method for addressing catastrophic forgetting in artificial neural networks using neuromimetic metaplasticity rules observed in natural brains"
* 생물학적 두뇌의 메타가소성 법칙을 적용하여 인공신경망 학습에서 파괴적 망각을 해결하는 방법 및 장치

## AWARDS

Poster Presentation Awards, Brain Science Institute of KIST, 2025

Best Presentation Awards, Korean Society for Brain and Neural Sciences (KSBNS), 2017

Poster Presentation Awards, Korean Society for Computational Neuroscience (cbrain), 2017

Best TA awards, Bio and Brain Engineering, KAIST, 2018

## SKILLS

Brain-inspired AI, Python, MATLAB, Illustrator,

Neural network modeling & simulation, Data analysis, Mathematical modeling, Dynamical systems modeling,

LLM simulation, Multi-agent simulation, Human psychophysical experiment, Eye-tracking

## CONFERENCE PRESENTATIONS

### International

1 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2026, Cho Y*, **Lee H***, Deneuville E & Jang J,
"Training on natural images disentangles interfering numerical codes in deep neural networks"

2 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2026, Cho Y*, Choi S*, **Lee H** & Jang J,
"Reducing high-density EEG channels while preserving depression-related ERP signatures"

3 Federation of European Neuroscience Societies **(FENS)**, Cho Y*, **Lee H***, Deneuville E & Jang J,
"Pretraining on natural images separates numerosity and proportion representations"

4 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2025, **Lee H**, Baek S, Jang J & Paik SB,
"Spontaneous social change driven by Stochastic Individual Behavior"

5 *Society for Neuroscience* (**SfN**) 2023, **Lee H** & Paik SB,
"Emergence of aesthetic preferences in untrained deep neural networks"

6 *Society for Neuroscience* (**SfN**) 2023, Kim G, Kang M, **Lee H**, Park Y, Song M & Paik SB,
"Random imitation as an efficient survival strategy in multi-agent systems"

7 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2023, Kang M, Kim G, **Lee H**, Park Y, Song M & Paik SB, "Random imitation as an evolutionary strategy in a multi-agent system"

8 *Society for Neuroscience* (**SfN**) 2022, **Lee H***, Choi W*, Lee D & Paik SB,
"Quantity comparison in untrained deep neural networks"

9 *Society for Neuroscience* (**SfN**) 2022, Kang M, **Lee H**, Park Y, Song M & Paik SB,
"Random imitation for evolution in multi-agent systems"

10 *Annual Computational Neuroscience Meeting* (**CNS**) 2022, **Lee H***, Choi W*, Lee D & Paik SB,
"Comparison of visual quantities in untrained deep neural networks"

11 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2022, **Lee H***, Choi W*, Lee D & Paik SB,
"Visual quantity comparison in untrained deep neural networks"

12 *Society for Neuroscience* (**SfN**) 2021, **Lee H***, Choi W* & Paik SB,
"Visual proportion sense in untrained deep neural networks"

13 *Korean Society for Brain and Neural Sciences* (**KSBNS**) 2020, Bae JW, …, **Lee H,** Paik SB & Jung MW,
"Distinct types of cortical projection neurons for working memory and timing"

14 *Annual Computational Neuroscience Meeting* (**CNS**) 2020, Choi W, **Lee H** & Paik SB,
"Rhythmic eye movement predicts active perception of ambiguous visual stimulus"

15 *Society for Neuroscience* (**SfN**) 2019, Jeong M, **Lee H**, …, Lim BK, Paik SB & Kim D,
"Neuronal ensemble encoding bimanual motor coordination in mice"

16 *Annual Computational Neuroscience Meeting* (**CNS**) 2018, **Lee H**, Choi W, Park Y & Paik SB,
"A dynamic resource model for sequential working memory"

17 *Society for Neuroscience* (**SfN**) 2017, **Lee H***, Park Y* & Paik SB,
"Pre-allocation of memory resources improves working memory performance in a sequential memory task"

18 *Annual Computational Neuroscience Meeting* (**CNS**) 2017, **Lee H**, Choi W & Paik SB,
"Pre-allocation of working memory modulates memory performance"

19 *Society for Neuroscience* (**SfN**) 2016, Choi W, **Lee H** & Paik SB,
"Local disinhibition modulates brain functions by mediating global network state"

20 *Society for Neuroscience* (**SfN**) 2016, Song M*, Kang M*, **Lee H**, Lee H, Jeong Y† & Paik SB†,
"Spatio-Temporal Classification of Neural Activity Patterns in Dynamic Brain Imaging Data"

21 *Annual Computational Neuroscience Meeting* (**CNS**) 2016, Song M, **Lee H** & Paik SB,
"Quantitative Classification of Neural Network Activity Patterns in Imaging Data"

## Domestic

1 *Korean Society for Computational Neuroscience Meeting* (**cbrain**) 2026, Cho Y*, **Lee H***, … & Jang J,
"Natural image pre-training disentangles distinct quantity representations"

2 *Korean Society for Computational Neuroscience Meeting* (**cbrain**) 2026, Cho Y*, Choi S*, **Lee H** & Jang J,
"Reducing high-density EEG to extract a minimal ERP feature set for depression classification"

3 *Korean Society for Computational Neuroscience Meeting* (**cbrain**) 2025, **Lee H**, Baek S, Jang J & Paik SB, "Emergent Cycles in Social Behavior from Stochastic Individuals"

4 *Korean Society for Cognitive Science Meeting* (**KSCS**) 2018, **Lee H**, Choi W, Park Y & Paik SB, "Sequential overwrite model can explain the serial-position effects in working memory"

5 *Korean Physical Society Meeting* (**KPS**) 2018, **Lee H**, Choi W, Park Y & Paik SB, "A theory of resource allocation for sequential memory in human"

6 *Annual Korean Society for Computational Neuroscience Meeting* (**cbrain**) 2017, **Lee H**, Choi W & Paik SB, "Working memory resource allocation improves the sequential memory performance"

7 *Korean Physical Society Meeting* (**KPS**) 2017, **Lee H**, Choi W & Paik SB, "A comparative study on simultaneous versus sequential presentation of stimuli for working memory performance"

8 *Korean Physical Society Meeting* (**KPS**) 2016, Song M, **Lee H** & Paik SB, "Computational Classification of Neural Network Activity Patterns for Imaging Data"

9 *Korean Society for Computational Neuroscience Meeting* (**cbrain**) 2015, **Lee H***, Song M* & Paik SB, "Classification of the Neural Activity Patterns by Spatio-Temporal Correlation Index"

10 *Korean Physical Society Meeting* (**KPS**) 2015, **Lee H**, Jang J & Paik SB, "A Biologically Inspired Adaptive Model for Efficient Image Compression"