Sang Wan Lee

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Biosketch

Sang Wan Lee is currently an associate professor (tenured) in the Department of Brain and Cognitive Sciences at KAIST, and an affiliated faculty of KAIST Graduate School of AI, Department of Bio and Brain Engineering and KAIST Institute for Health, Science, and Technology. He is also a founding director of the KAIST Center for Neuroscience-inspired Artificial Intelligence.

He received his Ph.D. in Electrical Engineering and Computer Science from KAIST in 2009, working with Zeungnam Bien. He was a postdoctoral associate at MIT working with Tomaso Poggio, followed by a Della Martin postdoctoral scholar at Caltech, working with John O'Doherty and Shinsuke Shimojo. He is the recipient of the IBM Academic Research Award (2021), the Google Faculty Research Award (2016), KAIST Songam Distinguished Research Award (2019), and KAIST Institute Faculty Award (2019), KAIST International Cooperation Award (2022), and KAIST Global Research Collaboration Award (2023). Some of his research were featured in KAIST tech fair (2019-2023; five years in a row) and KAIST Breakthroughs (2020). His lab was selected as a SW StarLab in AI (2023) by the Ministry of Science and ICT, Korea. His research interests include computational neuroscience and neuroscience-inspired artificial intelligence.

Education

KAIST Feb. 2009
PhD (2009) and MS (2005) in Electrical Engineering (Advisor: Zeungnam Bien)

Yonsei University Feb. 2003
BS in Electrical Engineering (Cum Laude)

Academic Employment

KAIST Dec. 2015 - present
Director, KAIST Center for Neuroscience-inspired Artificial Intelligence (2019 - present)
Head, KAIST Brain and Cognitive Engineering Program (2022 - 2023)
Faculty,
- Department of Brain and Cognitive Sciences (2023 - present)
- Department of Bio and Brain Engineering (2015 - 2023)

Adjunct professor,
- Graduate School of Artificial Intelligence (2023 - present)
- Department of Bio and Brain Engineering (2013 - present)
- KAIST Institute for Artificial Intelligence (2017 - 2021)
- KAIST Institute for Health Science and Technology (2016 - present)
- Program of Brain and Cognitive Engineering (2015 - present)

Caltech Nov. 2011 - Nov. 2015
Della Martin Postdoctoral Scholar (Advisor: John O'Doherty and Shinsuke Shimojo)

MIT Aug. 2010 - Oct. 2011
Postdoctoral Associate (Advisor: Tomaso Poggio)

KAIST Feb. 2009 - July 2010
Postdoctoral Associate (Advisor: Christopher Fiorillo)

Honors and Awards (International)

IBM Academic Research Award 2021
IBM, USA.

Google Faculty Research Award 2016
Google, USA. (Research area: computational neuroscience. Sponsor: DeepMind)

Della Martin Fellowship in Mental Illness 2014
Della Martin Foundation, USA.

Honors and Awards (Domestic)

KAIST Global Research Collaboration Award 2023
KAIST, Republic of Korea

KAIST International Cooperation Award 2022
KAIST, Republic of Korea

KAIST Breakthroughs 2020
KAIST, Republic of Korea

KAIST Institute Faculty Award (Interdisciplinary Research) 2019
KAIST Institute for Artificial Intelligence, Republic of Korea

KAIST Core Technologies 2019
KAIST, Republic of Korea

KAIST Songam Distinguished Research Award 2019
KAIST, Republic of Korea

KIIS Young Investigator Award 2016
Korean Institute of Intelligent Systems, Republic of Korea

ICROS Young Investigator Award 2016
Institute of Control, Robotics and Systems, Republic of Korea

Annual Honor Roll Prize 2007
KAIST, Republic of Korea.

KBS Engineer Promotion Scholarship - 6^{th} period 2007
Korea Broadcasting System (KBS), Republic of Korea.
Prize given to only 30 students in the whole country.

KBS Engineer Promotion Scholarship - 5^{th} period 2006
Korea Broadcasting System (KBS), Republic of Korea.
Prize given to only 30 students in the whole country.

Sang-Ae Scholarship 2006 Fall 2006
Sang-Ae Scholarship Association, Republic of Korea.

Sang-Ae Scholarship 2006 Spring 2006
Sang-Ae Scholarship Association, Republic of Korea.

Honor Student Graduate Prize 2003
Yonsei University, Republic of Korea.

High Honor Student Prize 2002
Yonsei University, Republic of Korea.

Conference Awards

Best Paper Award (1 best and 1 outstanding paper award) 2020
2020 Korean Artificial Intelligent Association conference

Best Poster Award 2019
2019 The Korean Society for Cognitive Science Conference.

Outstanding Poster Award (2 posters) 2018
2018 Korean Human Brain Mapping Conference.

Outstanding Paper Award 2018
2018 Korea Intelligent Information System Spring Conference.

Best Paper Award 2017
18^{th} International Symposium on Advanced Intelligent Systems.

Outstanding Poster Award 2017
2017 Korea Society of Human Brain Mapping Fall Conference.

Outstanding Paper Award 2017
2017 Korea Intelligent Information System Fall Conference.

Outstanding Paper Award 2017
2017 Korea Intelligent Information System Spring Conference.

Outstanding Paper Award 2016
2016 Korea Intelligent Information System Fall Conference.

Outstanding Paper Award 2016
2016 Korea Intelligent Information System Spring Conference.

Outstanding Paper Award 2005
6^{th} International Symposium on Advanced Intelligent Systems.

Session Best Presentation Award 2004
Joint 2^{nd} International Conference on Soft Computing and Intelligent Systems and
5^{th} International Symposium on Advanced Intelligent Systems.

Best Paper Award (Session: Neural Networks I) 2004
8^{th} World Multi-conference on Systems, Cybernetics and Informatics.

Research Grants

SW StarLab: System-3 level RL 2023 - 2030
PI. Nearly $1.8 million grant.

Microsoft Research Asia: Neural value alignment 2023
PI. $40K grant.

IITP research team grant: Development of brain-inspired AI 2019 - 2022
PI. Nearly $3.25 million grant.

NRF, Korea: Development of metacognitive AI for rapid learning 2019 - 2023
PI. Nearly $2.1 million grant.

Samsung Research Funding: Adaptive AI-human co-evolution 2020 - 2023
PI. Nearly $1 million grant.

Samsung Research Funding: AI-human co-evolution engine 2016 - 2019
PI. Nearly $1.1 million grant.

NRF, Korea: Young researcher program 2017 - 2022
PI. Nearly $250K grant.

KT: Brain-like abstraction and reasoning engine 2021 - 2023
PI. Nearly $300K grant.

Enliple: Deep RL-based for AD frame optimization 2020
PI. Nearly $200K grant.

ETRI: Hippocampal transfer learning 2021 - 2025
PI. Nearly $500K grant.

ETRI: Beyond X-verse 2023 - 2027
PI. Nearly $500K grant.

AI Innovation Hub: Self-evolving HW intelligence 2021-2025
Co-investigator. Nearly $300K grant.

NRF, Korea: AI-based big data analysis technology for brain science 2021 - 2023
Co-PI. Nearly $300K grant.

NRF, Korea: Brain researcher program 2016 - 2019
Co-PI. Nearly $150K grant.

IITP Research grant: Robotics 2018 - 2020
Co-PI. Nearly $270K grant.

IITP Research grant: BCI 2017 - 2023
Co-PI. Nearly $700K grant.

IITP Research grant: AI 2016 - 2020
Co-PI. Nearly $1 million grant.

NRF, Korea: Postdoc grant 2010 - 2011
PI. $24K grant. Mentors: Christof Koch (Caltech) and Tomaso Poggio (MIT)

Invited Talks (International)

(University/Research Institute)
Mayo Clinic, special seminar, USA, June 13, 2022.
IBM Research, online seminar, USA, Feb 22, 2021.
Caltech, SDN special seminar, USA, July 11, 2019.
Shanghai Jiao Tong Univ, KAIST-SJTU faculty workshop, China, Oct 18, 2018.
NYU Shanghai, Neuroscience Seminar Series, China, Sep 14, 2018.
National Institutes of Health (NIH), NIMH seminar, US, Mar 8, 2018.
University of Leeds, School of computing seminar, UK, Feb 22, 2018.
Osaka University, CiNet monthly seminar, Japan, Dec 20, 2017.
Caltech, CNS regular seminar, USA, Dec 6, 2017.
University College London, ICN seminar, UK, July 20, 2017.
Google DeepMind, UK, June 23, 2016.
University of Cambridge, UK, June 21, 2016.
California Institute of the Arts, USA, Feb. 12, 2014. (Lecture)
Columbia University, USA, August 10, 2011.
Princeton University, Neuroscience Institute, USA, June 24, 2011.
Columbia University, Center for Theoretical Neuroscience, USA, June 20, 2011.
Caltech, Koch group talk, USA, Jan. 28, 2010.
University of Cambridge, Carvendish Laboratory, UK, Dec. 9, 2008.

(Symposium/Conference)
Microsoft Research Asia x KAIST BCS Workshop, Daejeon, Nov 22, 2023.
NYU-KAIST Brain Science and Engineering Workshop, NYC, Oct 16, 2023.
KSBNS Workshop, Pusan, Sep 8, 2023.
Microsoft Research Brain and Neuroscience Workshop, online, June 20, 2023.
UK-RI Neurotechnology+, online, April, 2023. (Short lecture)
Oxford VR Pain Workshop, UK, Dec 14, 2022.
KAIST Workshop on Human-like AI, Daejeon, Oct 5, 2022.
KAIST-Boston Symposium on Digital Therapeutics, online, Dec 10, 2021.
AI medicine and novel drug target discovery, online, Feb 23, 2021.
Next-generation AI Workshop: Human-level Intelligence, online, Nov 5, 2020.
Int' Worshop on Pain in Bodily Defense and Autonomy, Osaka, Jan 21, 2020.
Annual Symposium of KSCN - Neuroscience and AI, Seoul, Dec 2, 2019.
KAIST-Harvard Joint Workshop on Neuroscience-inspired AI, Daejeon, Oct 30, 2019.

China-Korea Frontier Symposium on AI and Brain Science, Shanghai, Oct 18, 2019.
AVISON Biomedical Symposium, Korea, May 31, 2019.
Int' Workshop on Brain Networks (APCTP), Korea, May 14, 2019.
KAIST Workshop on Brain in the Age of AI, Korea, May 1, 2019.
CIMeC-KAIST Symposium, Italy, April 15, 2019.
Systems Neuroscience Spring School 2019, Japan, Mar 12, 2019.
The 30th Conference of SMIT-IBEC, Korea, Nov 8, 2018.
Daegu International Future Auto EXPO, Korea, Nov 2, 2018.
KAIST half-day workshop on brain-inspired AI, Korea, Oct 24, 2018.
Osong KBioHealth, BioExcellence and BioSymposium, Korea, Sep 14, 2018.
AI Worldcup, Lectures on AI flagship, Korea, Aug 20, 2018.
OIST-KAIST Joint Symposium, Korea, June 18, 2018.
IITP International Conference on AI, Seoul, Dec 12, 2017.
Joint Workshop on Neurobiology and Neuroinformatics, Japan, Nov 30, 2017.
NUS-KAIST Joint Symposium, Singapore, OCT 16, 2017.
The 20th Annual Meeting of the KSBNS, Korea, Aug 30, 2017.
Aslla Symposium, Korea, May 28, 2017.
Trento-KAIST Bilateral Symposium, Korea, May 23, 2017.
AVISON Biomedical Symposium, satellite workshop, Korea, May 19, 2017.
International Biomedical Engineering Conference, Korea, Nov 12, 2016.
KAIST Int' Workshop on Neural Computation, Korea, Nov 2, 2016.
The 20th Int' Conf on Biomagnetism, Korea, Oct 6, 2016.
KAIST Int' Workshop on Computational Psychiatry, Korea, Oct 5, 2016.
The 19th Annual Meeting of KSBNS, Korea, Sep 29, 2016.
The 17th Int' Symposium on Intelligent System, Japan, Aug 27, 2016.

Invited Talks (Domestic)

Computational Neuroscience Winter School, Daejeon, Jan 31, 2024.
Goodrich CEO Forum, Seoul, Jan 29, 2024.
Woori Bank, Hwasung, Jan 10, 2024.
Pukyong National University AI Workshop, online, Dec 1, 2023.
Muwoo CEO Forum, Seoul, Nov 23, 2023.
Dongwoo FINE-CHEM Co., Ltd., online, Nov 23, 2023.
Yonsei Medical School, Seoul, Nov 21, 2023. (Special lecture)
Future SW Technology Forum, Seoul, Oct 10, 2023.
ETRI IT-Brain School, Daejeon, Oct 26, 2023.
Samsung DS Division TSP, Suwon, Sep 21, 2023.
KAIST Global Institute for Talented Education, Daejeon, Sep 2, 2023.
KAIST Tech fair, Seould, August 31, 2023.
Hunet CEO Lecture, online, July 26, 2023.
KOLON BENIT Co., Ltd., online, July 13, 2023.
Dongrae High School, Pusan, July 10, 2023.
Hanyang University IDEC lecture, online, July 6-7, 2023.
Sejong Science High School, Sejong, July 4, 2023.
ETRI IT-Brain School, Daejeon, June 27, 2023.
KAIST Leadership Innovation Day, June 19, 2023.
Guro Library, Seoul, June 15,22,29, 2023. (Lecture series)
Hanwha Aerospace, Daejeon, June, 14,16,21, 2023. (Lecture series)
KAIST CS for All, Daejeon, May 24, 2023.
ETRI Gwang-ju AI, online, Mar 22, 2023.
Korea 3M Research Institute, Hwaseong, April 27, 2023.
Seould Sungnae Library, online, April 25, 2023.
Samsung Foundation Journalist Workshop, Seoul, April 22, 2023.
Samsung Banking World IT Show, Seoul, April 20, 2023.
Samsung HR, Suwon, April-June, 2023.
LG Electronics Brain Eng School, Seoul, April, 2023. (Short lecture series)
DGIST, Gwangju, Mar 29, 2023.
Korea Brain Week, Daejeon, Mar 17, 2023.
Korea CHO Forum, Seoul, Mar 7, 2023.

Korea Cognitive and Biological Psychiatry conference, Seoul, Feb 16, 2023.
Computational Neuroscience Winter School, online, Feb 7, 2023.
Samsung Future Technology Working Group, Seoul, Feb 3, 2023.
Pusan University Distinguished Lecture, online, Dec 28, 2022.
Saramin HR Workshop, online, Dec 2, 2022.
KAIST Graduate School of AI Colloquim, Seoul, Oct 28, 2022.
National Library of Korea, Seoul, Oct 24, 2022.
ETRI, IT-Brain School, Daejeon, Oct 18, 2022.
KIST BSI Seminar, Seoul, Oct 12, 2022.
KAIST Tech fair, Seoul, Sep 27, 2022.
Samsung Medicine TED imaging and talk, Seoul, Sep 22, 2022.
Hanyang University, online, Aug 17-18, 2022. (IDEC lecture)
IBS-KAIST Faculty Workshop, Daejeon, July 19, 2022.
ETRI, IT-Brain School, Daejeon, June 30, 2022.
Korea Brain Engineering Society Workshop, Jeju, June 27, 2022.
IT21 Global Conference, online, June 9, 2022.
Korea Brain Research Institute, Daegu, May 27, 2022.
Hanyang University, online, April 14, 2022.
Seoul National University College of Medicine, online, Mar 16, 2022.
Korean Association of Public Health Doctor Winter Conference, online, Feb 24, 2022.
Computational Neuroscience Winter School, Daejeon, Feb 16, 2022. (Tutorial)
Korean Brain Reseach Forum, Dec 22, 2021.
Annual Symposium of Korean Society of Computational Neuroscience, online, Nov 26, 2021.
Dongguk Univ AI Graduate School, online, Oct 29, 2021.
ETRI, IT-Brain School, Daejeon, Oct 21, 2021.
Seoul National University Interdisciplinary Program in Neuroscience, online, Oct 20, 2021.
KAIST Math Colloquium, online, Oct 14, 2021.
Hanyang University ERICA, online, August 9-11, 2021. (IDEC lecture)
Samsung Advanced Institute of Technology, online, July 26, 2021.
KIST PSI Forum, online, July 26, 2021.
KT-KAIST AI research center workshop, online, July 22, 2021.
ETRI, Special seminar, Daejeon, July 1, 2021.
ETRI, IT-Brain School, Daejeon, June 16, 2021.
Korean Institute of Intelligent Systems Spring Conference, Seoul, April 23, 2021.
Seoul National Univ., Symposium on Adaptive Intelligence, Seoul, Dec 4, 2020.
Kyung Hee Univ., Dept of Biomedical Science, online, Nov 19, 2020.
Korea Human Brain Mapping Symposium, online, Nov 6, 2020.
Annual Conf. of Korean Clinical Psychology Association, online, Oct 16, 2020.
Hanyang University, online, Sep 28, 2020. (IDEC lecture)
ETRI, IT-Brain School, Daejeon, Sep 15, 2020.
Institute for Basic Science, Center for Cognition and Sociality, July 29, 2020.
GIST AI Summer School, Gwangju, July 22, 2020.
BCI Tech Workshop, Kyeongju, July 9, 2020.
Yonsei Univ College of Medicine, Clinical Science Dept, Seoul, June 9, 2020.
UNIST, Ulsan, Dept of Biomedical Eng, Ulsan, Oct 26, 2019.
IT-Brain Workshop, Daejeon, Oct 26, 2019.
KIST Connectomics Regular Seminar, Seoul, Oct 23, 2019.
KAIST Core Tech Transfer Day, Seoul, Sep 17, 2019
National Science and Technology Human Resources Development Center, Daejeon, Aug 23, 2019.
Seoul National University College of Medicine, Seoul, Aug 13, 2019.
Korean Artificial Intelligence Association Summer School, Daejeon, Aug 12, 2019.
Korean Society of Imaging Informatics in Medicine Conference, Seoul, July 27, 2019.
THE AI KOREA Conference, Seoul, July 26, 2019.
Korea Computer Congress (BCI workshop), Jeju, June 26, 2019.
KAIST Workshop on Brain-inspired AI with Human-like Intelligence, Daejeon, June 24, 2019.
Korean Society of Cognitive Science Conference, Seoul, May 25, 2019. (Diaglog session)
KAIST AI+Engineering Forum, Daejeon, May 17, 2019.
Seoul National University, Dept of Psychology, Seoul, Apr 30, 2019.

Korea Institute of Drug Safety & Risk Management , Anyang, April 11, 2019.
The fourth industrial revolution and AI Korea, Seongnam, Feb 20, 2019.
National Information Society Agency, Daegu, Feb 13, 2019.
Korean Intellectual Property Office, Daejeon, Dec 14, 2018.
DJU Smart Healthcare R&D Center, Daejeon, Nov 1, 2018.
Korean Society for Biological Psychiatry Conference, Seoul, Oct 26, 2018.
Korean Society for AI and Medicine, Gangneung, July 28, 2018. (Panel discussion)
Korea Brain-Machine Interface Workshop, Gangneung, June 6, 2018.
Korean Society of Cognitive Science Conference, Seoul, June 2, 2018.
Brain Awareness Week, Daejeon, Mar 18, 2018.
Computational Neuroscience Winter School, Daejeon, Feb 7, 2018.
Brain and AI Symposium, Gangwon, Jan 31, 2018.
Yonsei University College of Medicine, Seoul, Jan 25, 2018.
IBS Center for Neuroscience Imaging Research, SKK Univ., Suwon, Nov 23, 2017.
Samsung Annual Forum, Seoul, Nov 17, 2017.
Open KAIST, Daejeon, Nov 3, 2017.
KAIST Institute for Artificial Intelligence workshop, Daejeon, Oct 11, 2017.
Seoul National University College of Medicine, Seoul, Sep 8, 2017.
Samsung DMC, Seoul, Aug 7, 2017.
ETRI, Daejeon, July 12, 2017.
Samsung Future Technology Foundation, Seoul, June 22, 2017.
Hanyang University ERICA, Ansan, May 31, 2017. (IDEC lecture)
Korean Society for Cognitive Science Conference, Seoul, May 27, 2017. (Tutorial)
Korean Society for Cognitive Science Conference, Seoul, May 27, 2017. (Session)
NVIDIA Deep Learning Day, Seoul, May 25, 2017. (Keynote)
Hanyang University, Seoul, April 10, 2017.
KAIST, Biological Science Dept, Daejeon, Mar 7, 2017.
KAIST Global Institute for Talented Education, Daejeon, Feb 13, 2017.
Computational Neuroscience Winter School, Pohang, Feb. 9, 2017.
KAIST Global Institute for Talented Education, Daejeon, Jan 9, 2017.
Seoul National University, Dept of ECE, Seoul, Nov 24, 2016.
The 3rd Fall Conference on Chemoreception, Ansan, Oct 28, 2016.
The 4th DJU Interdisciplinary Research Forum, Daejeon, Oct 20, 2016.
Biomedical Image Processing Summer School, Seoul, Aug 24, 2016.
KAIST Convergence Technology Strategy special lecture, Daejeon, June 6, 2016.
Daejeon University, Daejeon, June 1, 2016.
Hyundai Motor Company, Anyang, May 20, 2016.
Hanyang University, Ansan, May 11, 2016. (IDEC lecture)
Korea Human Brain Mapping Symposium, Daejeon, May 6, 2016.
National Rehabilitatino Center, Seoul, April 20, 2016.
Korea University, Dept. of Psychology, Seoul, April 8, 2016.
Korea University, Dept. of Brain Eng, Seoul, Mar.16, 2016. (Colloquim talk).
KAIST Math Dept. Seminar, Daejeon, Mar.10, 2016.
ICROS Spring Conference, Pyongchang, Mar.10, 2016.
Neuromorphic Brain Modelling Workshop, Pyongchang, Feb.16, 2016.
Computational Neuroscience Winter School, Pohang, Jan. 27, 2016.
Seokyeong University, Seoul, Jan. 22, 2016.
Young Computational Neuroscientist Workshop, Seoul, Dec. 14, 2015.
KAIST, Dept of Bio and Brain Eng, Daejeon, Dec. 4, 2015.
Seoul National University, Dept of EE Seminar, Seoul, June 8, 2015.
Dongguk University, Seoul, June 3, 2015.
KAIST (Dept of Bio and Brain Eng.), Daejeon, June 1, 2015.
Dongguk University, Seoul, July 6, 2012.
Yonsei University, Seoul, July 4, 2012.
KAIST, Dept of EE Seminar, Daejeon, July 3, 2012.
UNIST, Dept of ECE, Ulsan, June 28, 2012.
UNIST, Dept of ECE, Ulsan, Oct. 9, 2009.
ETRI, Machine Learning Lecture, Daejeon, July 14, 2009.

Professional Services

Academic society

Program committee, *Organization for Computational Neurosciences (OCNS)* (2022-2024)
Senior topic editor, Frontiers in neuroscience, (2022-present)
Editorial board, *Frontiers in Human Neuroscience* (2021-present)
Director of general affairs, *Korean Society for Computational Neuroscience* (2016-present)
Board member, *Korean Insitute of Inteliigent Systems* (2016-present)
Board member, *Korean Society of Human Brain Mapping* (2017-2018)
Board member, *KIISE Artificial Intelligence Society* (2016-present)
Steering committee, *Machine Intelligence and Robotics Research Group* (2017-2020)

Conference

General chair:
Annual symposium of Korean Society for Computational Neuroscience (KSCN) 2021
Annual symposium of Korean Society for Computational Neuroscience (KSCN) 2019

Organizer:
Microsoft Research Asia x KAIST BCS Workshop 2023
AI-Human Alignment Problem 2022
Next-generation AI: Toward Human-level Intelligence 2020
Google DeepMind talk series: Neuroscience-inspired AI 2019
KAIST-Harvard Joint Worshop on Neuroscience-inspired AI 2019
KAIST Half-day Workshop on Brain-inspired AI 2018
KAIST Computational Psychiatry Seminar Series 2017
KAIST International Workshop on Computational Psychiatry 2016
KAIST Neural Computation Workshop 2016

Conference committee:
Organizing committee, *AI World Cup* (2018-2019)
Organizing committee, *KSCN Winter School* (2017-present)
Finance chair, *Intl. Conference on Robot Intelligence Technology and Applications 2019*
Session chair, *SNU-KAIST Joint Symposium on Adaptive Intelligence 2020*
Session chair, *Annual conference of Korean Society of Biological Psychiatry 2018*
Special session chair, *IEEE/IEIE Intl' Conference on Consumer Electronics Asia 2018*
Program committee, *IEEE International Winter Conference on BCI (2016-present)*
Program committee, *Advanced Course & Symposium on AI and Neuroscience 2021-2022*
Program committee, *The 21st Intl. Conference on Control, Automation, and Systems 2021*
Program committee, *Intl. Conf on Robot Intelligence Technology and Applications 2017-2018*
Program committee, *Perception, Action, and Cognitive Systems Symposium 2017*

Service (Government)

Review Board, National Research Foundation of Korea (2020-present)
Planning committee, Brain engineering society of Korea (2019-present)
Planning committee, IITP: AI section (2019)

Service (KAIST)

Curriculum review committee (Chair person), Program of BCE, KAIST (2022-present)
Curriculum review committee, Program of BCE , KAIST (2019-2021)
Curriculum review committee, Department of Bio and Brain Engineering, KAIST (2022-present)
Department planning committee (cognitive psychological science), KAIST (2021)
Board of directors, Machine intelligence and robotics research institute (MIR), KASIT (2021)
Board of directors, KAIST Institute for AI (2019-2021)
Master planning committee, College of engineering, KAIST (2020-2021)
Board of directors, Moon Soul Chung fund, KAIST (2019-2021)
Planning committee, KAIST AI research hub (2020)

Department planning committee (Graduate school of AI), KAIST (2019)
Organizing committee, KAIST AI World Cup (2017-2018, 2019)
Planning committee, college of engineering, KAIST (2017-2019)

Service (Department)

Committee chair, Department advertising committee (2020-2021)
Department advertising committee (2019-2020)
Faculty search committee (2020)
Department planning committee (2015-2019)

Service (Industry)

Advisory Board, FunEduLab Co.,ltd (2019-present)
Non-executive Director, Humelo (2018-present)

Journal review

Science Robotics
Science Advances
Nature Human Behavior
Cell Reports
PLOS Computational Biology
Journal of Neuroscience
The Neuroscientist
Behavioral Brain Research
Frontiers in Computational Neuroscience
Neuroimage
IEEE Transactions on Neural Networks and Learning Systems
IEEE Transactions on Cybernetics
IEEE Computer
IEEE Transactions on Fuzzy Systems
Autonomous Robots

Teaching

Graduate courses
How AI and the brain work (BCS441), 2024-present.
Neuroscience-inspired Artificial Intelligence, KAIST (BCS541), 2023-present.
Brain-inspired Artificial Intelligence, KAIST (BCE772), 2020-2022.
Brain and Cognitive Engineering II, KAIST (BCE501), 2018-present.
Frontiers in brain-inspired AI, KAIST (BiS800), Spring 2018.
Brain and Cognitive Engineering II, KAIST (BCE501), Fall 2017.
Frontiers in brain-inspired AI, KAIST (BiS800), Spring 2017.
Decision neuroscience, KAIST (BCE800), Spring 2017.
Brain and Cognitive Engineering II, KAIST (BCE501), Fall 2016.
Recent Trends in Brain and Cognitive Engineering, KAIST (BCE801), Spring 2016.
Abstraction machines, KAIST (BiS800), Spring 2016.

Undergraduate courses
Brain-inspired Artificial Intelligence, KAIST (BiS429), 2021-present.
Bio data structure, KAIST (BiS232), 2016-2020.
Advanced Intelligence, KAIST (BiS400C), Spring 2019.

Short-term courses
Different modes of learning and the brain, Caltech (CNS176), May 2015.
Different modes of learning in the human brain, Caltech (CNS102A), Feb 2015.
Kernel-based Pattern Analysis, ETRI, July 2009.
Matrix Algebras for Engineers and Linear Pattern Analysis, ETRI, July 2009.
Support Vector Machines, KAIST (EE682 Intelligent Control Theory), November 2008.

Kernel Methods, University of Bremen (01-038 Machine Learning Theory), May-June 2008.

MENTORING (KAIST)

Postdoctoral researchers

Dr. Yujin Cha (Research assistant professor; PhD, KAIST)
Dr. Taekwan Kim ('21-present)
Dr. Minryung Song ('20-present)
Dr. Jungwon Ryu ('19-present)
Dr. MyoungHoon Ha ('19-present)
Dr. Anil Yaman ('20-'21; now an assistant professor at Vrije Universiteit Amsterdam)
Dr. JeeHang Lee ('17-'20; now an assistant professor at Sangmyung Univ, Seoul Campus)
Dr. Fengkai Ke ('17-'18; now a lecturer at Hubei University of Technology)

Graduate students

Su Jin An (PhD student; BCE)
Jun Yeol Kim (PhD student; BBE)
Jung Bae Park (MS; now a ML engineer at Bucketplace)
Changhwa Lee (MS-PhD student, BCE)
Juno Kim (MS-PhDstudent, BCE)
Young Ho Kang (MS-PhD student, BCE)
Haram Joo (MS-PhD student; BBE)
Jae Won Choi (MS-PhD student; BBE)
Jaehoon Shin (PhD student; BBE)
Yoondo Sung (MS student; BBE)
Shin Young Joo (MS student; currently a ML engineer at Naver AI Lab)
Heejun Kim (MS student; BBE)
Myeong hyeon Kim (MS student; BBE)
Minsu Abel Yang (MS-PhD student; BBE)
Xu Xin (MS student; BBE)
Yeeun Ryoo (PhD student)
Jeongwon Lee (PhD student)
Sunghwa Ryu (MS student)
Youngha Cho (MS-PhD student)
Nayeong Jeong (MS student)
DoHyoung Lee (MS student)
Niklas Koeppe (MS-PhD student)
Jung Young Kim (MS-PhD student)
Niklas Koeppe (MS-PhD student)
ELRHARBI-FLEURY Yannis (MS-PhD student)
Adriana Staudova (MS-PhD student)
Wansoo Kim (MS-PhD student)
Dongjae Kim (MS-PhD student, BCE, '21; now postdoc at NYU)
Minryung Song (PhD student; BBE, '20; now postdoc at KAIST)
Geon Yeong Park (PhD student)
Jun Hyung Choi (MS student; BBE, '20)
Jihyea Lee (MS student, BCE '17)
Suyeon Heo (MS student, BCE 19; currently at CHA university medical school)

Undergraduate dissertation (graduation research)

Taek-Min Kim ('21),
Hyoungkyu Song ('19) Suhyun Yang ('19)
Yoondo Sung ('18) Yewon Kang ('18),
Enoch Kang ('17) Jaehoon Shin ('17),
Ji Eun Lim ('17) Yooju Shin ('17)
Jun Yeol Kim ('16) Juno Kim ('16)

Undergraduate Research Participation program (URP)

Jae Heon Lee ('21) Gyubin Lee ('21),
Sanghwan Kim ('19) Jeongseok Hwang(19),
Geon Yeong Park ('18) Lei Chen ('17)

Researchers/intership

Mingoo Song (KAIST, 18-19)
DoHyun Kim (SNU, '20) Wooseok Jung (Oxford, '20)
Younghoon Kim (SNU CM, '18,'19,'20) Young Ho Kang (Univ of Manchester, '17-'18)
Sang Hyun Yi (Seoul National Univ, '17-'18) Chloe Kwon (CMU, '17 summer)
Minho Shin (DGIST, '17 winter) Hyoung Jin Kim (Seoul National Univ, '16 winter)

Waterloo co-op

Jonathan Chow (Waterloo, '20)
Namrata Sharma (Waterloo, '19) Shuangyi Tong (Waterloo, '18)

Leeds-KAIST undergrad research exchange programme

Cait Meredith (Univ of Leeds, '19) Charles Weston (Univ of Leeds, '17)

Undergraduate individual study

Jaeyong Shin ('24), Seokyung Kim ('24), Je Hyun Herh ('24),
Minjun Kang ('23), Minseo Bang ('23), Inhyeok Jeong ('23),
Junyup Kim ('23), Khushi Parashar ('23), Jaeyoung Shin ('23),
Dongyoon Hahm ('23), Jimin Heo('23), Ye Gon Kim (22),
Minjun Kang (22), Yena Choi (22), Inhyeok Jeong (22),
Junyup Kim (22), Khushi Parashar (22), Yu hwan Kim (22),
Ye Gon Kim ('21), Inhyeok Jeong ('21), Seongho Keum ('21),
Minsik Kim ('21), Minsu Abel Yang ('21), Jae Heon Lee ('21),
Haeun Lee (20), Haram Kwon ('20), Yujin Nam ('20),
Illia Churin ('20), Minsu Abel Yang ('20), Jisu Choi ('20),
Jae Heon Lee ('20), Tae Uk Ham ('19), Hanung Lee ('19),
Chaeyoung Moon ('19), Jiseong Park ('19), Wanhee Cho ('19),
Woochan Lee ('19), Jeongseok Hwang ('19), Biniam Tamiru ('19),
Dong Seong Kim ('18), Hyoung Kyu Song ('18), Kyongwook Lee ('18),
Alisher Tortay ('18), Manh Tuan Do ('18), Yoondo Sung ('18),
Yewon Kang ('18), Seung-Wook Hwang ('18), Haram Joo ('17),
Geon Yeong Park ('17), Yoondo Sung ('17), Min seon Kim ('17),
Haeorm Park ('17), Jaehoon Shin ('17), Yewon Kang ('17),
Yoondo Sung('17), Jun Yeol Kim ('16), Jung Bae Park ('16),
Juno Kim ('16), Kyungwook Lee ('16), Yewon Kang ('16),
Geonwoo Kim ('16), Geon Yeong Park ('16), Ji Heon Lee ('16),
Geunchang Seong ('16), Wonyong Kim ('16), Jae Gwang Lee ('15)

Mentoring (Caltech)

Independent research

Vibhor Kumar (Caltech Computer Science, '15)
Paul Zhang (Caltech Computational and Applied Mathematics, '14)
Dae-Hyun Kim (Caltech Computational and Applied Mathematics, '14)
Brad Chattergoon (Caltech Computational and Applied Mathematics, '13 - '14)
Barclay Lee (Caltech Bioengineering, '13 - '15)
Abhineet Agarwal (Singapore Anglo-Chinese School, '13)
Janna Wennberg (Polytechnic School, '12)

Summer Undergraduate Research Fellowships (SURF)

Dae-Hyun Kim (Caltech Computational and Applied Mathematics, '14)
Barclay Lee (Caltech Bioengineering, '14)
Brad Chattergoon (Caltech Computational and Applied Mathematics, '14)

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Summary of publications

Total number of publications:

- **52 journal papers**
- **65 conference proceeding papers**
- **77 conference poster presentations**
- **22 granted patents**
- **39 filed patent applications**
  (incl. KR/US/JP/CN/WO)

Publications since joining KAIST (Dec. 2015):

- **29 journal papers**
- **28 conference proceeding papers**
- **63 conference poster presentations**
- **22 granted patents**
- **39 filed patent applications**
  (incl. KR/US/JP/CN/WO)

Selected publications (as a corresponding author):

- **Journal papers:**
  Cell Reports (2023), *Cell Reports* (2021), *Nature Communications* (2019), *Science Robotics* (2019), *Neural Networks* (2020), *PLOS Biology* (2015), *Neuron* (2014), *PLOS Computational Biology (2022), PLOS Computational Biology (2021)*

- **Proceeding papers (top AI conference):**
  NeurIPS (2023), *CVPR* (2023), *AAAI* (2021), *ICCV* oral (2021), *ICCV* (2021), *EMNLP* (2020), *ICASSP* oral (2019)

- **Workshops (top AI conference):**
  ICLR (2022), *NeurIPS* (2021), *ICLR* (2021), *NeurIPS* (2019)

- **Poster presentations (top computational neuroscience conference):**
  3 *COSYNE* (2024), 2 *COSYNE* (2023), 2 *COSYNE* (2022), 2 *COSYNE* (2021), 1 *COSYNE* (2020), 1 *COSYNE* (2019), 5 *COSYNE* (2018), 4 *COSYNE* (before 2015)

Journal Publications

(*corresponding author)

[1] J. H. Lee, S Y. Heo, **S. W. Lee***, "Controlling human causal inference through in-silico task design," *Cell Report* 2024.

[2] Y. H. Kang, A. Khorasani, R. Flint, B. Farrokhi, **S. W. Lee***, "Editorial: Neural Computations for Brain Machine Interface Applications," *Frontiers in Human Neuroscience*, 2023.

[3] A. Yaman, J. Z. Leibo, G. Iacca, **S. W. Lee**, "The emergence of division of labor through decentralized social sanctioning," *Proceedings of the Royal Society B: Biological Sciences*, 2023.

[4] S.-H. Hwang, D. Park, S. Paeng, **S. W. Lee**, S.-H. Lee, H. F. Kim, "Pneumatic tactile stimulus delivery system for studying brain responses evoked by active finger touch with fMRI," *Journal of Neuroscience Methods*, 2023.

[5] M. Baker, S. Kang, S. Hong, M. Song, M. Yang, L. Peyton, H. Essa, **S. W. Lee**, DS Choi, "External globus pallidus input to the dorsal striatum regulates habitual seeking behavior in male mice," *Nature Communications*, 2023.

[6] S. Kang, I. Hong, M. Song, M. A. Yang, H. Essa, M. Baker, J. Lee, R. A. Bruce, **S. W. Lee**, DS Choi, "Astrocyte activities in the external globus pallidus regulate action-selection strategies in reward-seeking behaviors," *Science Advances,* 2023.

[7] Z. Ruan, C. Seger, Q. Yang, D. Kim, **S. W. Lee**, Q. Chen, and Z. Peng, "Impairment of arbitration between model-based and model-free reinforcement learning in obsessive-compulsive disorder," *Frontiers in Psychiatry*, 2023.

[8] M. Kwon, **S. W. Lee**, S.-H. Lee, "Hippocampal integration and separation processes with different temporal and spatial dynamics during learning for associative memory," *Human Brain Mapping*, 2023.

[9] J. Lee, J. Z. Leibo, S. J. An, **S. W. Lee***, "Importance of prefrontal meta control in human-like reinforcement learning," *Frontiers in Computational Neuroscience*, 2022.

[10] A. Yaman*, N. Bredeche, O. Caylak, Joel Z Leibo, **S. W. Lee***, "Meta-control of social learning strategies," *PLOS Computational Biology,* 2022.

[11] D. Kim, J. Jeong, **S. W. Lee***, "Prefrontal solution to the bias-variance tradeoff during reinforcement learning," *Cell Reports*, vol. 37, no. 13, 2021.

[12] J. Kim, **S. W. Lee**, S. Yoon, H. Park, B. Jeong, "Neurocomputational mechanism of controllability inference under a multi-agent setting," *PLOS Computational Biology*, 2021.

[13] S. Heo, Y. Sung, **S. W. Lee***, "Effects of subclinical depression on prefrontal–striatal model-based and model-free learning," *PLOS Computational Biology,* 2021.

[14] J. Seo and **S. W. Lee***, "Neural Network-Based Intuitive Physics for Non-Inertial Reference Frames," *IEEE Access*, vol. 9, 2021.

[15] J. P. O'Doherty*, **S. W. Lee**, R. Tadayon-Nejad, J. Cockburn, K. Iigaya, C. Charpentier, "Why and how the brain weights contributions from a mixture of experts," *Neuroscience and Biobehavioral Reviews,* 2020.

[16] F. Ke, S. J. Choi, Y. H. Kang, K-A Cheon* and **S. W. Lee***, "Exploring the structural and strategic bases of autism spectrum disorders with deep learning," *IEEE Access*, vol. 8, 2020.

[17] S. Zuo, L. Wang, J. H. Shin, Y. Cai, **S. W. Lee**, K. Appiah, Y. Zhou, S. C. Kwok, "Behavioral evidence for memory replay of video episodes in the macaque," *eLife*. 9, e54519, 2020.

[18] M. Song and **S. W. Lee***, "Dynamic resource allocation during reinforcement learning accounts for ramping and phasic dopamine activity, *Neural Networks,* 2020.

[19] D. Kim, G. Y. Park, J. P. O'Doherty*, and **S. W. Lee***, "Task complexity interacts with state-space uncertainty in the arbitration process between model-based and model-free reinforcement-learning at both behavioral and neural levels," *Nature Communications*, 10, 5738, 2019.

[20] S. Weissengruber[+], **S. W. Lee**[+], John P. O'Doherty, Christian C. Ruff, "Neurostimulation reveals context-dependent arbitration between model-based and model-free reinforcement learning," *Cerebral Cortex*, 2019 ([+]: co-first authors).

[21] J. H. Lee, B. Seymour, J. Z. Leibo, S. J. Ah, **S. W. Lee***, "Towards high performance, memory efficient, and fast reinforcement learning - lessons from decision neuroscience," *Science Robotics*, vol. 4, no. 26, 2019.

[22] **S. W. Lee***, B. Seymour*, "Decision-making in brains and robots - the case for an interdisciplinary approach," *Current Opinion in Behavioral Sciences*, no. 26, pp. 137-145, 2019.

[23] J. D. Kralik, J. H. Lee, P. S. Rosenbloom, P. C. Jackson, S. L. Epstein, O. J. Romero, R. Sanz, O. Larue, H. R. Schmidtke, **S. W. Lee**, and K. McGreggor, "Metacognition for a Common Model of Cognition," *Procedia Comput. Sci.*, vol. 145, pp. 730–739, 2018. (previously presented at AAAI 2018 Fall Symposium)

[24] O. Wang, **S. W. Lee**, J. O'Doherty, B. Seymour, and Y. Wako, "Model-based and model-free pain avoidance learning," *Brain Neurosci. Adv.*, vol. 2, 2018.

[25] H. Joo, J. Kim, and **S. W. Lee***, "Model-based reinforcement learning using probabilistic simulation," *J. Korean Inst. Intell. Syst.*, vol. 27, no. 6, pp. 1–5, 2018. (written in Korean)

[26] **S. W. Lee***, "Reinforcement learning: from algorithms to neuroscience," *Commun. KIISE*, vol. 36, no. 1, pp. 8–16, 2018. (written in Korean)

[27] O. Choung, **S. W. Lee***, and Y. Jeong*, "Exploring feature dimensions to learn a new policy in an uninformed reinforcement learning task," *Sci. Rep.*, vol. 7, no. 1, p. 17676, 2017. (*co-corresponding authors)

[28] S. J. An and **S. W. Lee***, "A Study on the Exploration-Exploitation Dilemma using an uncertainty-driven state space learning algorithm," *J. Korean Inst. Intell. Syst.*, vol. 27, no. 4, 2017. (written in Korean)

[29] **S. W. Lee***, T. Yi, J.-W. Jung, and Z. Bien, "Design of a Gait Phase Recognition System That Can Cope With EMG Electrode Location Variation," *IEEE Trans. Autom. Sci. Eng.*, vol. 14, no. 3, pp. 1429–1439, 2017.

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[30] **S. W. Lee*** and Z. Bien, "Learning systems with fuzzy," in *Studies in Fuzziness and Soft Computing: Fifty Years of Fuzzy Logic and Its Applications*, E. T. et Al., Ed. Springer Berlin Heidelberg, 2015.

[31] **S. W. Lee***, J. P. O'Doherty, and S. Shimojo, "Neural Computations Mediating One-Shot Learning in the Human Brain," *PLoS Biol.*, vol. 13, no. 4, p. e1002137, Apr. 2015.

(Synopsis "How one-shot learning unfolds in the brain" by Weaver, J.)

[32] J. P. O'Doherty, **S. W. Lee**, and D. McNamee, "The structure of reinforcement-learning mechanisms in the human brain," *Curr. Opin. Behav. Sci.*, vol. 1, pp. 94–100, Oct. 2015.

[33] **S. W. Lee***, S. Shimojo, and J. P. O'Doherty, "Neural Computations Underlying Arbitration between Model-Based and Model-free Learning," *Neuron*, vol. 81, no. 3, pp. 687–699, Feb. 2014.

(Front cover; preview "Decisions about decisions" by Yoshida, W. and Seymour, B.)

[34] **S. W. Lee***, O. Prenzel, and Z. Bien, "Applying human learning principles to user-centered IoT systems," *IEEE Computer*, vol. 46, no. 2, pp. 46–52, Feb. 2013. **(cover feature)**

[35] J.-S. Han, **S. W. Lee***, and Z. Bien, "Feature subset selection using separability index matrix," *Inf. Sci.* (Ny)., vol. 223, pp. 102–118, Feb. 2013.

[36] J.-W. Jung, **S. W. Lee**, Z. Bien, and T. Sato, "Person Recognition Method using Sequential Walking Footprints via Overlapped Foot Shape and Center-Of-Pressure Trajectory," Journal on Systemics, Cybernetics and Informatics, vol. 11, no. 4, pp. 34–39, 2013.

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[39] Z. Bien and **S. W. Lee***, "Learning Structure of Human Behavior Patterns in a Smart Home System," *Adv. Intell. Soft Comput.*, vol. 81, pp. 1–15, 2010.

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[42] **S. W. Lee**, Y. S. Kim, K.-H. Park, and Z. Bien, "Iterative Bayesian fuzzy clustering toward flexible icon-based assistive software for the disabled," *Information Sciences* (Ny), vol. 180, no. 3, pp. 325–340, Feb. 2010.

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[46] Z. Bien, J.-S. Han, and **S. W. Lee**, "Feature Subset Selection of Biosignals for Rehabilitation System," *Proc. 28th Colloq. Autom.*, 2007.

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Peer-Reviewed Conference Proceedings / Posters

(*corresponding author)

[1] H. Kim and **S. W. Lee***, "Robust and efficient grid code transformation for rapid task transfer," *Computational and Systems Neuroscience (COSYNE)*, 2024.

[2] J. H. Shin and **S. W. Lee***, "Simulation-based behavioral profiling by model-guided task optimization and task-guided data generation," *Computational and Systems Neuroscience (COSYNE)*, 2024.

[3] S. Tong, T. Denison, **S. W. Lee**, and B. Seymour*, "A novel pain measurement tool by modelling free-operant foraging behaviour in immersive virtual reality," *Computational and Systems Neuroscience (COSYNE)*, 2024.

[4] S. Joo and **S. W. Lee***, "Learning Robust Goal Space with Hypothetical Analogy-Making," *arXiv* (preprint), 2024.

[5] G. Y. Park, J. Kim, B. Kim, **S. W. Lee*** and J. C. Ye*, "Energy-Based Cross Attention for Bayesian Context Update in Text-to-Image Diffusion Models," *Neural Information Processing Systems (NeurIPS)*, 2023. (acceptance rate = 26%)

[6] M. Song, S. Kang, M. Yang, R. Bruce, D.-S. Choi*, and **S. W. Lee***, "Parvalbumin-Positive Neurons in the Globus Pallidus Externus Modulate Task-Irrelevant Behaviors to Balance Exploration and Exploitation," *Cognitive Computational Neuroscience (CCN)*, 2023.

[7] M. A. Yang, K. J. Miller, M. W. Jung, and **S. W. Lee***, "Neural substrates of the flexibly stable learning," *The 32st Annual Computational Neuroscience Meeting (CNS)*, 2023.

[8] M. A. Yang, S.-I. Hong, S. Kang, J. Lee, M. Song, D.-S. Choi*, and **S. W. Lee***, "GPe astrocytes selectively represent routine formation," *The 32st Annual Computational Neuroscience Meeting (CNS)*, 2023.

[9] G. Y. Park, S. Lee, **S. W. Lee***, J. C. Ye*, "Training debiased subnetworks with contrastive weight pruning," in *Proceedings of IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023. **(acceptance rate = 25%)**

[10] J. Shin, J. H. Lee, and **S. W. Lee***, "Controlling human cortical and striatal reinforcement learning with meta prediction error," in *Computational and Systems Neuroscience (COSYNE)*, 2023.

[11] Y. Sung and **S. W. Lee***, "Uncertainty-robust goal embedding in the prefrontal cortex for flexibly stable learning," in *Computational and Systems Neuroscience (COSYNE)*, 2023.

[12] J. Ryu and **S. W. Lee***, "Generalizable Perceptual Embedding with Noise-Tuning Alignment," *The 31st Annual Computational Neuroscience Meeting (CNS)*, 2022.

[13] H. Kim and **S. W. Lee***, "Hippocampal Successor Representation Learning for Zero-shot Navigation," *Korean Artificial Intelligence Association Summer Conference*, 2022.

[14] Y. Sung and **S. W. Lee***, "Uncertainty and goal embeddings in the lateral prefrontal cortex guide flexible and stable reinforcement learning," in *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.

[15] S. J. An, B. D. Martino, and **S. W. Lee***, "How human metacognitive exploration improves reinforcement learning in a sparse reward environment," in *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.

[16] Y. Cha and **S. W. Lee***, "Information Amplification in Human-AI Interactions via Reinforcement Learning," in *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.

[17] D. Kim, J. H. Lee, and **S. W. Lee***, "Exploring essential computations underlying generalizable human reinforcement learning," in *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.

[18] G. Lee, M. A. Yang, and **S. W. Lee***, "Memory-guided goal-driven reinforcement learning explains subclinical depression," in *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.

[19] S. Joo and **S. W. Lee***, "Learning Robust Task Context with Hypothetical Analogy-Making," in *International Conference on Learning Representations (ICLR) Workshop on Generalizable Policy Learning in the Physical World*, 2022.

[20] S. J. An and **S. W. Lee***, "Learning state-space uncertainty, but not value uncertainty, is sufficient for metacognitive exploration," *Cold Spring Harbor Laboratory meeting: From Neuroscience to Artificially Intelligent Systems (NAISys)*, 2022.

[21] H. Chi, M. Ha, S. Chi, **S. W. Lee**, Q. Huang, and K. Ramani, "InfoGCN: Representation Learning for Human Skeleton-based Action Recognition," in *Proceedings of IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. **(acceptance rate = 25%)**

[22] S. J. An, B. D. Martino, and **S. W. Lee***, "Rethinking Tolman's latent learning with metacognitive exploration," in *Computational and Systems Neuroscience (COSYNE)*, 2022.

[23] J. Shin, J. H. Lee, **S. W. Lee***, "In silico manipulation of human cortical computation underlying goal-directed learning," in *Computational and Systems Neuroscience (COSYNE)*, 2022.

(This is an extended version of our poster presentation at the *2021 NeurIPS HMD workshop*.)

[24] P. Mahajan, **S. W. Lee**, B. Seymour, "Balancing safety and efficiency in human decision-making," in *Computational and Systems Neuroscience (COSYNE)*, 2022.

[25] M. H. Kim. E. Jo, and **S. W. Lee***, "Goal-Driven Atari Environment," in *Proceedings of the 10th International Winter Conference on Brain-Computer Interface (IEEE BCI Winter)*, 2022.

[26] Y. H. Kang and **S. W. Lee***, "Meta-BCI: Perspectives on a role of self-supervised learning in meta brain computer interface," in *Proceedings of the 10th International Winter Conference on Brain-Computer Interface (IEEE BCI Winter)*, 2022. **(Oral presentation)**

[27] H. Joo, I. Jeong, **S. W. Lee***, "Estimating the level of inference using an order-mimic agent," in *Proceedings of the Asian Conference on Pattern Recognition (ACPR)*, 2021.

[28] J. Shin, J. H. Lee, **S. W. Lee***, "In silico manipulation of human cortical computation underlying goal-directed learning," *Neural Information Processing Systems (NeurIPS) Workshop on Human and Machine Decisions*, 2021.

[29] G. Y. Park and **S. W. Lee***, "Reliably fast adversarial training via latent adversarial perturbation," in *Proceedings of the International Conference on Computer Vision (ICCV)*, 2021. **(Oral presentation; acceptance rate = 3%)**

(The preliminary version of this work has been presented at *International Conference on Learning Representations (ICLR) Workshop on Security and Safety in Machine Learning Systems*, 2021.)

[30] G. Y. Park and **S. W. Lee*,** "Information-theoretic regularization for multi-source domain adaptation," in *Proceedings of the International Conference on Computer Vision (ICCV)*, 2021. **(acceptance rate = 25.9%)**

[31] G. Y. Park and **S. W. Lee*,** "Information-theoretic regularization for multi-source domain adaptation," in *Proceedings of International Conference on Learning Representations (ICLR) Workshop on Security and Safety in Machine Learning Systems*, 2021.

[32] S. J. An, B. D. Martino, and **S. W. Lee***, "Metacognition guides near-optimal exploration of a large state space with sparse rewards," in *Computational and Systems Neuroscience (COSYNE)*, 2021.

[33] M. Song, S. H. Huh, J. W. Shin, M. W. Jung, and **S. W. Lee***, "Midbrain dopamine activity during reinforcement learning reflects bias-variance tradeoff," in *Computational and Systems Neuroscience (COSYNE)*, 2021.

[34] Y-J. Cha and **S. W. Lee***, "Human Uncertainty Inference via Deterministic Ensemble Neural Networks," in *Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI)*, 2021. (**acceptance rate = 21%**)

[35] D. Kim, M. H. Kim, **S. W. Lee***, "Decoding learning strategies from EEG signals provides generalizable features for decoding decision," in *Proceedings of the 9th International Winter Conference on Brain-Computer Interface (IEEE BCI Winter)*, 2021.

[36] B.-J. Choi, J. Hong, D. Park and **S. W. Lee***, "F^2-Softmax: Diversifying Neural Text Generation via Frequency Factorized Softmax," in *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2020. (**acceptance rate = 22.4%**)

[37] J. Ryu and **S. W. Lee***, "Brain-like autoencoder that learns latent covariance structure," *Cold Spring Harbor Laboratory meeting: From Neuroscience to Artificially Intelligent Systems*, 2020.

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[39] M. Elgaar, J. Park, and **S. W. Lee***, "Multi-speaker and multi-domain emotional voice conversion using factorized hierarchical variational autoencoder," in *Proceedings of IEEE International Conference on Acoustics,* Speech, and Signal Processing (ICASSP), 2020.

[40] M. A. Yang, J. H. Lee, and **S. W. Lee***, "Biological Reinforcement Learning via Predictive Spacetime Encoding," *Korean Artificial Intelligent Association Summer Conference*, 2020. (in Korean) (**Outstanding paper award**)

[41] J. H. Shin, J. H. Lee, and **S. W. Lee***, "Deep Interaction between Reinforcement Learning Algorithms and Human Reinforcement Learning," *Korean Artificial Intelligent Association Summer Conference*, 2020. (in Korean) (**Best paper award**)

[42] M. Song, S. H. Huh, J. W. Shin, M. W. Jung, and **S. W. Lee***, "Midbrain dopamine activity during reinforcement learning reflects bias-variance tradeoff," *Korean Artificial Intelligent Association Summer Conference*, 2020. (in Korean)

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[45] J. H. Shin, J. H. Lee, S. Tong, S. H. Kim, and **S. W. Lee***, "Designing model-based and model-free reinforcement learning tasks without human guidance", in *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2019.

[46] D. Kim and **S. W. Lee***, "Behavioral and neural evidence for intrinsic motivation effect on reinforcement learning", in *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2019.

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Patent Lists (US/CN/EP/JP/WO)

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[1]	APPARATUS AND METHOD FOR NON-INVASIVE CONTROL OF HUMAN LEARNING AND INFERENCE PROCESS AT BEHAVIOR AND NEURAL LEVELS BASED UPON BRAIN-INSPIRED ARTIFICIAL INTELLIGENCE TECHNIQUE	US
[2]	APPARATUS AND METHOD FOR ELICITING OPTIMAL STRATEGY OF THE HUMANS IN THE INTERACTIVE GAMES USING ARTIFICIAL INTELLIGENCE	US
[3]	METHOD AND APPARATUS FOR METACOGNITION DRIVEN STATE SPACE EXPLORATION	US
[4]	METHOD AND APPARATUS FOR PREDICTING ULTRA-HIGH PERFORMANCE COMPLEX BEHAVIOR BASED ON BRAIN SIGNAL BASED UNIVERSAL COGNITIVE STATE DECODER	US
[5]	ELECTRONIC DEVICE FOR HIGH-PRECISION PROFILING TO DEVELOP ARTIFICIAL INNTELLIGENCE WITH HUMAN-LIKE INTELLIGENCE, AND OPERATING METHOD THEREOF	US

[6] COMPTER SYSTEM FOR AUTOMATIC EXPLORATION OF MENTAL ILLNESS DIAGNOSIS PROTOCOL AND METHOD THEREOF — US

[7] COMPUTER SYSTEM FOR INFERRING UNCERTAINTY OF HUMAN AND METHOD THEREOF — US

[8] COMPUTER SYSTEM FOR PROFILING NEURAL FIRING DATA AND EXTRACTING CONTENT, AND METHOD THEREOF — US

[9] ELECTRONIC DEVICE FOR FEW-SHOT GENERATIVE MODELLING WITHOUT ASSOCIATIVE DOMAIN KNOWLEDGE, AND OPERATING METHOD THEREOF — US

[10] ELECTRONIC DEVICE FOR BRAIN-INSPIRED ADAPTIVE CONTROL OF RESOLVING BIAS-VARIANCE TRADEOFF, AND METHOD THEREOF — US

[11] COMPUTER SYSTEM FOR MULTI-SOURCE DOMAIN ADAPTATIVE TRAINING BASED O N SINGLE NEURAL NETWORK WOTHOUT OVERFITTING, AND METHOD THEREOF — US

[12] METHOD FOR SELF-SUPERVISED REINFORCEMENT LEARNING BY ANALOGY — US

[13] METHOD AND APPARATUS FOR METACOGNITION DRIVEN STATE SPACE EXPLORATION — WO

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[17] COMPUTER SYSTEM FOR MULTI-SOURCE DOMAIN ADAPTATIVE TRAINING BASED O N SINGLE NEURAL NETWORK WOTHOUT OVERFITTING, AND METHOD THEREOF — WO

[18] ELECTRONIC DEVICE FOR BRAIN-INSPIRED ADAPTIVE CONTROL OF RESOLVING BIAS-VARIANCE TRADEOFF, AND METHOD THEREOF — CN

[19] COMPUTER SYSTEM FOR MULTI-SOURCE DOMAIN ADAPTATIVE TRAINING BASED O N SINGLE NEURAL NETWORK WOTHOUT OVERFITTING, AND METHOD THEREOF — CN

[20] METHOD AND APPARATUS FOR METACOGNITION DRIVEN STATE SPACE EXPLORATION — EP

[21] ELECTRONIC DEVICE FOR HIGH-PRECISION PROFILING TO DEVELOP ARTIFICIAL INNTELLIGENCE WITH HUMAN-LIKE INTELLIGENCE, AND OPERATING METHOD THEREOF — JP

[22] COMPTER SYSTEM FOR AUTOMATIC EXPLORATION OF MENTAL ILLNESS DIAGNOSIS PROTOCOL AND METHOD THEREOF* (7209383) — JP

Patent Lists (KR)

(*Granted patents)

[23] **뇌기능 지식 베이스 자가 성장 시스템 및 방법*** (10-2221263-0000)

[24] **게임환경에서 상대방 전략 학습을 위한 적응형 강화학습 시스템**

[25] **강화학습을 이용한 적응형 뇌파 분석 방법 및 장치**

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[30] **생성모델을 이용한 실험 최적화 및 실험 가설 생성 시스템 및 방법*** (10-2203336-0000)

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[33] **전략 유도방식의 행동 실험 기반의 비침습적, 비전기/비자기자극형 신경 활성화 제어 방법**

[34] **인공지능 기반 게임 전략 유도 시스템 및 방법*** (10-2111857-0000)

[35] **뇌 기반 인공지능 기술을 이용한 행동 및 신경 수준에서의 인간의 학습/추론 과정 비침습적 제어 방법 및 시스템*** (10-2132529-0000)

[36] **게임환경에서 상대방 전략 학습을 위한 적응형 강화학습 시스템**

[37] **뇌 기반 인공지능 기술을 이용한 행동 및 신경 수준에서의 인간의 학습/추론 과정 비침습적 제어 방법 및 시스템**

[38] **인공지능 기반 게임 전략 유도 시스템 및 방법**

[39] **뇌 신호 기반 범용 인지 상태 디코더 및 그에 기반한 초고성능 복잡 행동 예측 방법 및 장치*** (10-2305124-0000)

[40] **인간의 지능을 인공 지능으로 이식하기 위한 정밀 행동 프로파일링을 위한 전자 장치 및 그의 동작 방법**

[41] **메타 인지 기반 고속 환경 탐색 방법 및 장치**

[42] **정신 질환 진단 프로토콜 자동 탐색을 위한 컴퓨터 시스템 및 그의 방법*** (10-2496834)

[43] **연관 도메인에 대한 사전 정보 없이 극소량의 데이터 만을 이용한 데이터 생성 및 작업 성능 향상을 위한 전자 장치 및 그의 동작 방법**

[44] **일반화 가능한 인간 모사형 강화학습 알고리즘 설계를 위한 정책 신뢰도, 정보처리 효율 및 일반화 능력의 정량화 방법 및 장치**

[45] **인간의 불확실성 추론을 위한 컴퓨터 시스템 및 그의 방법**

[46] **뇌 신호 기반 범용 인지 상태 디코더 및 그에 기반한 초고성능 복잡 행동 예측 방법 및 장치**

[47] **신경 발화 데이터 프로파일링 및 컨텐츠 추출을 위한 컴퓨터 시스템, 및 그의 방법**

[48] **과적합 없는 단일 신경망 기반 다중 도메인 적응 학습을 위한 컴퓨터 시스템, 및 그의 방법**

[49] **인간의 지능을 인공 지능으로 이식하기 위한 정밀 행동 프로파일링을 위한 전자 장치 및 그의 동작 방법**

[50] **편향-분산 딜레마를 해결하는 뇌모사형 적응 제어를 위한 전자 장치 및 그의 방법**

[51] **강화학습을 이용한 적응형 뇌파 분석 방법 및 장치*** (10-2318775-0000)

[52] **정신 질환 진단 프로토콜 자동 탐색을 위한 컴퓨터 시스템 및 그의 방법**

[53] **적대적 공격에 강건한 신경망 학습을 위한 은닉 섭동 기반 가속화 방법 및 장치**

[54] **경쟁 환경에서 모델 기반 강화 학습을 이용한 대중 인식 예측을 위한 컴퓨터 장치 및 그의 방법**

[55] **인간 사용자 또는 인공지능 모델의 추론 깊이 추정 기술**

[56] **유추에 의한 자기 지도 강화학습 방법**

[57] **인간 고속 학습 제어를 통한 인간 고속 학습 유도 방법, 컴퓨터 장치, 및 컴퓨터 프로그램**

[58] **인간 또는 AI 의 전략적, 목표지향적 능력 프로파일링을 위한 AR/VR/게임 환경 리퍼포징 방법 및 시스템**