# Seungwon Lee

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Researcher with 10 years of machine learning experience and 8 years of deep learning experience to model human conversations and a dynamic system of a mobile robot and improve deep multi-task/lifelong learning, mainly in image recognition.

## Programming Skills

C++, Python, TensorFlow, PyTorch, MATLAB, ROS (Moderate), Java (Beginner)

## Education

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| Sep 2017 - May 2024 | **Ph.D. Computer & Information Science** - University of Pennsylvania, Philadelphia, PA<br>Deep Multi-task/Lifelong Learning — Advisor: Dr. Eric Eaton |
| Sep 2015 - Apr 2017 | **M.Sc. Electrical & Computer Engineering** - University of Michigan, Ann Arbor, MI<br>Control System and Machine Learning — Advisor: Dr. Benjamin Kuipers |
| Mar 2009 -Feb 2015 | **B.S. Electrical & Computer Engineering** - Seoul National University, Seoul, Korea<br>Control System and Machine Learning |

## Research Experience

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| Jul 2017 - May 2024 | **Lifelong Machine Learning Group**, University of Pennsylvania |

- Designed a deep neural network architecture to extract and share knowledge between different tasks' CNNs. By factorizing CNN filters, I discovered the abstract form of transferable knowledge, improving learning efficiency.
- Developed a neural architecture search algorithm to discover related tasks and transferable layers based on the data stream.
- Developed an unsupervised lifelong learning framework using data programming methods to support existing supervised lifelong learning algorithms.
- Studied the relationship between tasks' similarities and the performance of lifelong learning algorithms. I found that the proper form of factorized knowledge transfer is less sensitive to the tasks' relationships.
- Projects: (a) DARPA Lifelong Learning Machines (b) Air Force RL-based Control (c) DARPA Triage Challenge

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| Aug 2015 - Apr 2017 | **Machine Learning-based System Identification**, University of Michigan |

Modeling the dynamic system of a differential-drive mobile robot for model predictive control

- Developed a Gaussian Process, a CNN-based, and an LSTM-based model to model the mobile robot's dynamic system.
- Optimized parameters when applying friction models of a wheel for system identification.

## Selected Publications

Lu, Pengyuan, **Seungwon Lee**, et al. Bridging the Gap between Semi-supervised and Supervised Continual Learning via Data Programming, `https://openreview.net/pdf?id=_o4JUv2lmD`

Baker, Megan, et al. A Domain-agnostic Approach for Characterization of Lifelong Learning Systems, In Proceedings of *Neural Networks*, pp. 274-296. 2023.

**Lee, Seungwon**, Sima Behpour, Eric Eaton. Sharing Less is More: Lifelong Learning in Deep Networks with Selective Layer Transfer, In Proceedings of $38^{th}$ *International Conference on Machine Learning*, pp. 6065-6075. 2021.

**Lee, Seungwon**, James Stokes, Eric Eaton. Learning Shared Knowledge for Deep Lifelong Learning Using Deconvolutional Networks, In Proceedings of $28^{th}$ *International Joint Conference on Artificial Intelligence*, pp. 2837-2844. 2019.

**Lee, Seungwon**, James Stokes, Eric Eaton (2019) Deep Lifelong Reinforcement Learning for Resilient Control and Coordination, Report no. AD1074259, University of Pennsylvania, Philadelphia. Available at https://apps.dtic.mil/docs/citations/AD1074259 [Verified 15 December 2019].

Park, Jongjin, **Seungwon Lee**, Benjamin Kuipers. Discrete-time Dynamic Modeling and Calibration of Differential-Drive Mobile Robots with Friction, In Proceedings of *International Conference on Robotics and Automation*, pp. 6510-6517. 2017.

**Lee, Seungwon**, Jaedong Hwang, Eunsol Kim, Byoungtak Zhang. An Adaptive Computational Discourse System based on Data-driven Learning Algorithm, In Proceedings of $16^{th}$ *International Symposium on Advanced Intelligent System*, 2015.

**Lee, Seungwon**, Sungjun Choi, Songhwai Oh. Learning of the Service Robot about People's Avoidance Behavior, Undergraduate Thesis of the Department of Electrical and Computer Engineering of SNU. 2014.