Keuntaek Lee

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I am an applied researcher with 6+ years of research experience in the areas of machine learning and deep learning. My research interests include optimization, probabilistic deep learning, reinforcement learning, optimal control theory, and computer vision.

Experience

Amazon.com — New York City, NY, USA
Applied Scientist II — May 2022–Present
- Research and development on ML/DL for various Amazon products

Honda Research Institute, USA — San Jose, CA, USA
Research Intern at the ML planning and control team — May 2021–Dec 2021
- ML-based autonomous driving

Georgia Institute of Technology — Atlanta, GA, USA
Research Assistant at the Autonomous Control and Decision Systems Lab. — Aug. 2016–May 2022
- AutoRally: Offroad autonomous driving
- AlphaPilot: Lockheed Martin AI Drone Racing Innovation Challenge

Education

Georgia Institute of Technology — Atlanta, GA, USA
Ph.D. in Electrical and Computer Engineering, PI: Evangelos A. Theodorou — May 2022
- Thesis: "Robust Deep Vision-based Planning and Control Algorithms with Probabilistic Learning"

Georgia Institute of Technology — Atlanta, GA, USA
M.S. in Electrical and Computer Engineering, PI: Evangelos A. Theodorou — Aug. 2018

Hanyang University — Seoul, S. Korea
B.S. in Electrical Engineering (Summa Cum Laude) — Feb. 2016

Skills

- **Languages:** Python, C++, MATLAB, SQL, Shell scripting
- **Robotics:** ROS, CARLA, MuJoCo, OpenAI Gym
- **Version Control:** GitHub, GitLab, Bitbucket
- **ML/DL Tools:** PyTorch, TensorFlow, MXNet, SageMaker, EMR, Spark
- **Virtualization/Cloud:** Docker, AWS
- **Operating Systems:** Linux, Windows

Honors and Awards

- Lockheed Martin — AlphaPilot Qualifier — 2019
- Amazon.com — Amazon Web Services Machine Learning Research Awards & Scholarship (75,000 USD) — 2018–2019
- RSS 2018 — Finalist to Best Systems Paper Award — 2018
- South Korea — Government Scholarship to Study Abroad (80,000 USD) — 2016–2018
- Hanyang Univ. — 2nd Prize in Capstone Design Contest — 2015
- Hanyang Univ. — Dean's List & Scholarship — 2013–2015

Projects

ML-based autonomous driving Honda Research Institute, USA
May 2021–Dec. 2021

- Developed ML-based motion planning and behavior prediction algorithms for safe autonomous driving. 12% improvement in collision rate compared to SOTA RL methods.
- Keywords: Inverse RL, Planning under uncertainty, Risk-sensitive MPC, LSTM, CNN, VAE, GAN.
- Publications: 1 Journal, 2 Conferences, 2 Patent applications.

AutoRally: ML-based off-road high-speed autonomous driving Georgia Tech.
Aug. 2016–May 2022

- Developed ML-based motion planning, control, and failure detection algorithms for safe autonomous driving. 62% improvement in obstacle avoidance compared to SOTA imitation learning methods.
- Keywords: RL, MPC, CNN, LSTM, Imitation learning, Bayesian neural networks, System identification, Vision-based control, Explainable AI, Uncertainty quantification.
- Publications: 1 Journal, 5 Conferences, 3 Workshops.

AlphaPilot: Lockheed Martin AI Drone Racing Innovation Challenge Georgia Tech.
Feb. 2019–Dec. 2019

- AlphaPilot Qualifier; Top 9 out of 430 teams worldwide.
- Developed ML-based motion planning algorithms for drone racing. 8% improvement in collision rate compared to motion planning algorithms without ML.
- Keywords: Visual servoing, MPC, System identification, Object detection, Optical flow prediction.
- Publications: 1 Journal, 1 Conference.

Publications

[1] **K. Lee**, D. Isele, E. A. Theodorou, and S. Bae, "Risk-sensitive mpcs with deep distributional inverse rl for autonomous driving", in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2022.

[2] **K. Lee**, D. Isele, E. A. Theodorou, and S. Bae, "Spatiotemporal costmap inference for model predictive control via deep inverse reinforcement learning", in *IEEE Robotics and Automation Letters (RA-L)*, Jan. 2022.

[3] R. Singh, **K. Lee**, and Y. Chen, "Sample-based distributional policy gradient", in *4th Annual Learning for Dynamics and Control Conference (L4DC)*, Jun. 2022.

[4] **K. Lee**, B. Vlahov, J. Gibson, J. M. Rehg, and E. A. Theodorou, "Approximate inverse reinforcement learning from vision-based imitation learning", in *2021 International Conference on Robotics and Automation (ICRA)*, Jun. 2021.

[5] Z. Wang, O. So, **K. Lee**, and E. A. Theodorou, "Adaptive risk sensitive model predictive control with stochastic search", in *3rd Annual Learning for Dynamics and Control Conference (L4DC)*, Jun. 2021.

[6] **K. Lee**, J. Gibson, and E. A. Theodorou, "Aggressive Perception-Aware Navigation using Deep Optical Flow Dynamics and PixelMPC", *IEEE Robotics and Automation Letters (RA-L)*, 2020.

[7] **K. Lee**, G. N. An, V. Zakharov, and E. A. Theodorou, "Perceptual attention-based predictive control", *3rd Conference on Robot Learning (CoRL)*, 2019.

[8] **K. Lee**, K. Saigol, and E. A. Theodorou, "Early failure detection of deep end-to-end control policy by reinforcement learning", in *2019 International Conference on Robotics and Automation (ICRA)*, May 2019, pp. 8543–8549.

[9] **K. Lee**, Z. Wang, B. I. Vlahov, H. K. Brar, and E. A. Theodorou, "Ensemble bayesian decision making with redundant deep perceptual control policies", *18th IEEE International Conference on Machine Learning and Applications (ICMLA)*, 2019.

[10] Y. Pan, C.-A. Cheng, K. Saigol, **K. Lee**, X. Yan, E. A. Theodorou, and B. Boots, "Imitation learning for agile autonomous driving", in *International Journal of Robotics Research (IJRR)*, 2019.

[11] Z. Wang, **K. Lee**, M. A. Pereira, I. Exarchos, and E. A. Theodorou, "Deep forward-backward sdes for min-max control", *The 58th IEEE Conference on Decision and Control (CDC)*, 2019.

[12] G. Williams, B. Goldfain, **K. Lee**, J. Gibson, J. M. Rehg, and E. A. Theodorou, "Locally weighted regression pseudo-rehearsal for adaptive model predictive control", *3rd Conference on Robot Learning (CoRL)*, 2019.

[13] **K. Lee**, K. Saigol, and E. A. Theodorou, "Safe imitation learning for end-to-end control", in *Robotics: Science and Systems (RSS) Workshop: Adversarial Robotics*, 2018.

[14] Y. Pan, C.-A. Cheng, K. Saigol, **K. Lee**, X. Yan, E. A. Theodorou, and B. Boots, "Agile autonomous driving using end-to-end deep imitation learning", in *Robotics: Science and Systems (RSS)*, 2018.

[15] Y. Pan, C.-A. Cheng, K. Saigol, **K. Lee**, X. Yan, E. A. Theodorou, and B. Boots, "Deep autorally: Agile autonomous driving via end-to-end imitation learning", in *Robotics: Science and Systems (RSS) Workshop on Learning from Demonstrations in High-Dimensional Feature Spaces*, 2017.

[16] Y. Pan, C.-A. Cheng, K. Saigol, **K. Lee**, X. Yan, E. A. Theodorou, and B. Boots, "Learning deep neural network control policies for agile off-road autonomous driving", in *2017 Conference on Neural Information Processing Systems (NeurIPS) Deep Reinforcement Learning Symposium*, 2017.

Teaching

Georgia Institute of Technology

- **Guest Lecturer** in Robotics and Autonomy (AE4803) — Spring 2020, Fall 2020
  Lectures on Differential Dynamic Programming and Model Predictive Control
- **Teaching Assistant** in Feedback Control Systems (ECE3550) — Spring 2019

Academic Services

Reviewer

- IEEE International Conference on Robotics and Automation (ICRA) — 2019, 2022
- IEEE Robotics and Automation Letters (RA-L) — 2020, 2021
- IEEE Conference on Decision and Control (CDC) — 2019, 2020
- Autonomous Robots (AURO) — 2022
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) — 2021
- Robotics: Science and Systems (RSS) — 2019