Jeongyeol Kwon

Contact Information

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Education

University of Wisconsin-Madison, WI, USA
Postdoctorate — 2022 - present
(Supervisor: Prof. Robert Nowak)

University of Texas at Austin, TX, USA
Ph.D. in Electrical and Computer Engineering — 2017 - 2022
(Supervisor: Prof. Constantine Caramanis)

Seoul National University, Seoul, Korea
B.S. in Electrical Engineering (*summa cum laude*) — 2016

Seoul Science High School, Seoul, Korea
High school diploma with distinction in 2 years — 2008

Research Interests

Statistical Learning Theory, Information Theory, Reinforcement Learning, Bilevel Optimization, Stochastic Approximation, Multitask/Meta-Learning, Large-Scale Optimization, Robust Statistics, High-Dimensional Statistics

Publications

J. Kwon, D. Kwon, S. Wright, R. Nowak, "A Fully First-Order Method for Stochastic Bilevel Optimization", *Proceedings of 40th International Conference on Machine Learning (ICML)*, 2023 (Oral Presentation).

J. Kwon, Y. Efroni, C. Caramanis and S. Mannor, "Reward-Mixing MDPs with Few Latent Contexts are Learnable", *Proceedings of 40th International Conference on Machine Learning (ICML)*, 2023.

H. Bai, G. Canal, X. Du, J. Kwon, R. Nowak and S. Li, "Feed Two Birds with One Scone: Exploiting Wild Data for Both Out-of-Distribution Generalization and Detection", *Proceedings of 40th International Conference on Machine Learning (ICML)*, 2023.

J. Kwon, Y. Efroni, C. Caramanis and S. Mannor, "Tractable Optimality in Episodic Latent MABs", *Proceedings of 36th Neural Information Processing Systems (NeurIPS)*, 2022.

J. Kwon, Y. Efroni, C. Caramanis and S. Mannor, "Coordinated Attacks against Contextual Bandits: Fundamental Limits and Defense Mechanisms," *Proceedings of 39th International Conference on Machine Learning (ICML)*, 2022.

J. Kwon, Y. Efroni, C. Caramanis and S. Mannor, "Reinforcement Learning in Reward-Mixing MDPs," *Proceedings of 35th Neural Information Processing Systems (NeurIPS)*, 2021.

J. Kwon, Y. Efroni, C. Caramanis and S. Mannor, "RL for Latent MDPs: Regret Guarantees and a Lower Bound," *Proceedings of 35th Neural Information Processing Systems (NeurIPS)*, 2021 (Spotlight).

J. Kwon, N. Ho and C. Caramanis, "On the Minimax Optimality of the EM Algorithm for Two-Component Mixed Linear Regression," *Proceedings of 24th Artificial Intelligence and Statistics (AISTATS)*, 2021.

J. Kwon and C. Caramanis, "The EM Algorithm gives Sample Optimality for Learning Mixtures of Well-Seperated Gaussians," *Proceedings of 33rd Annual Conference on Learning Theory (COLT)*,

2020.

J. Kwon and C. Caramanis, "EM Converges for a Mixture of Many Linear Regressions," *Proceedings of 23rd Artificial Intelligence and Statistics (AISTATS)*, 2020.

J. Kwon*, Q. Wei*, C. Caramanis, Y. Chen, and D. Davis, "Global Convergence of the EM Algorithm for Mixtures of Two Component Linear Regression," *Proceedings of 32nd Annual Conference on Learning Theory (COLT)*, 2019. (*: Equal Contribution)

Preprints and Ongoing Work

J. Zhuo, J. Kwon, N. Ho and C. Caramanis, "On the Computational and Statistical Complexity of Over-Parameterized Matrix Sensing," *arXiv preprint arXiv:2102.02756 (2021).*

J. Kwon and C. Caramanis, "MLE and EM for Well-Separated Mixtures: Minimax Rates," *Working Paper.*

J. Kwon, Q. Wei, C. Caramanis, Y. Chen, D. Davis and N.Ho "Global Optimality of the EM Algorithm for Mixtures of Two Linear Regression," *Submitted to IEEE Trans. on Information Theory.*

Talks

Invited Talk, "Reinforcement Learning in Latent Environments", at Korea Advanced Institute of Science and Technology (KAIST), Virtual, 03/2023.

Invited Talk, "What do we need to learn for RL with Latent Contexts?", at FAIR External RL Seminar, Virtual, 11/2022.

Invited Speaker, "Reinforcement Learning with Latent Contexts", at Workshop: *New Models in Online Decision Making for Real-World Applications,* Toyota Technology Institute at Chicago (TTIC), 07/2022.

Invited Talk, "Reinforcement Learning with Latent Contexts", at MLOPT Idea-Seminar, University of Wisconsin-Madison, 04/2022.

Invited Talk, "RL for Latent MDPs: Regret Guarantees and a Lower Bound," at Virtual RL Theory Seminar, 05/2021.

Research Experience

Wisconsin Institute for Discovery, University of Wisconsin-Madison, WI

Postdoctorate 2022.9 - present

- Efficient optimization algorithms for bilevel-programming
- Out-of-Distribution (OOD) detection
- Efficient reinforcement learning with side-observations in latent environments
- Foundation of reinforcement learning in latent environments

DICE (Decision, Information, and Communications Engineering), The University of Texas at Austin, TX

Graduate Research Assistant 2018.1 - 2022.8

- Robustness and clustering in multitask reinforcement learning
- Develop of method-of-moments for sequential decision making in partially observable domains
- Reinforcement learning in Markov decision processes with latent contexts
- Local analysis of the likelihood landscape and Expectation-Maximization
- Convergence study on the low-rank matrix factorization in a rank over-specified case
- Application of sum-of-squares (SoS) proofs to meta-learning of mixed linear regressions
- Lead a reading group on the theory of Reinforcement Learning: algorithms and analysis for efficient exploration, stochastic approximation and practical approaches

- Tight analysis on the EM algorithm for a mixture of multiple Gaussians and linear regressions
- Global and tight statistical analysis on the EM algorithm for a mixture of two linear regressions
- Adversarial Examples: Empirical study on robustifying DNN classifier to malicious perturbation on test image with GANs

PIL (Perceptron and Intelligence Laboratory, Seoul National University
Research Internship (Prof. Jin Young Choi) 2016.7 - 2017.4

- Multi-camera multi-object tracking in computer vision with network-flow formulation
- Group study on first-order optimization methods

Design Project for Electrical Engineering, Seoul National University
Course Project: Computer Vision (Prof. Nam Ik Cho) 2014.8 - 2014.12

- Image-dehazing with prior knowledge on the natural scene

Teaching Experience

The University of Texas at Austin, Austin, TX
Instructor, Student Workshop: Sum-of-Squares and Learning Mixture Models Spring 2021
Organizer, Student Seminar: Theory of Reinforcement Learning Spring 2020

The University of Texas at Austin, Austin, TX
Teaching Assistant, EE 381V, Large Scale Optimization Fall 2018
Teaching Assistant, EE 381V-SE, Introduction to Convex Optimization Spring 2018

Seoul National University, Seoul, Korea
Teaching Assistant, Convex Optimization Fall 2016

Work Experience

Alegion, Inc., Austin, Texas
Research Intern, Research Internship in Human-Interactive Annotation 2019.6 - 2019. 8

- Explore automated annotation algorithms/applications
- Study on image segmentation with classical computer vision algorithms
- Apply a deep-learning based human-interactive annotation tool on a real annotation task
- Development language: Python

Scientific Analog Inc., Seoul, Korea
R&D Engineer, Software Engineer for Mixed Circuit Simulator 2015.5 - 2016. 6

- Develop core module: first-order difference equation (ODE) solver for analog circuit
- Applied model-order reduction technique for faster simulation speed
- Develop scheduler and processor for events in the circuit system in a time order
- Development language: C/C++, Python, Verilog

Redduck Inc., Seoul, Korea
Programmer, Software Engineer for a PC Game Client 2011.2 - 2013.12

- Develop a First Person Shooting (FPS) PC game client with Unreal Engine 3
- Game performance profiling, Game-log data analysis, Manage game AI logic
- Development language: C/C++, Unreal Engine Script

Technical Skills

- Specialty: Statistical Learning Theory, Optimization, Reinforcement Learning Theory
- Computer Language: C/C++, Python, MATLAB, LaTeX

Honors and Awards

Graduate Continuing Fellowship, University of Texas at Austin, 2021 - 2022
- One-year scholarship for academic achievement

Fellowship, The Kwanjeong Educational Foundation, 2017 - 2021
- Four-year scholarship for doctorate program

President Scholarship for Undergraduate, Korea Student Aid Foundation 2008 - 2014
- Four-year scholarship for undergradute program

International Collegiate Programming Contest, Association for Computing Machinery 2010
- 6th Place in Daejeon Region
- 2nd Place in Hanoi Region

Korea Olympiad in Informatics, Ministry of Science, ICT and Future Planning 2007
- Gold in Area of High School

Korea Physics Olympiad, The Korean Physical Society 2007
- Silver in Area of High School