Junhyung Lyle Kim

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Education

Rice University   Houston, TX
Ph.D. in Computer Science   Aug 2019 - Present
- Advisors: Profs. Anastasios Kyrillidis (chair) [website]; César A. Uribe [website]; Nai-Hui Chia [website]
- Research interests: optimization; distributed optimization; quantum computing/algorithms; machine learning

University of Chicago   Chicago, IL
B.A. in Mathematics; B.A. in Statistics   Jun 2017
- Advisor: Prof. Panos Toulis [website]; General Honors; Dean's List 2013-2017

Professional Experience

Meta, Fundamental AI Research (FAIR)   New York, NY
Research Intern; Host: Dr. Aaron Defazio [website]   May 2022 - Aug 2022
- Theory and application of adaptive stochastic gradient methods for deep learning

Republic of Korea Special Warfare Training Group (SWTG)   Gyeonggi, South Korea
Sergeant / Aide-de-Camp to the commander of SWTG   Jan 2012 - Oct 2013
- Airborne training (certified paratrooper license #748-416); maritime infiltration training

Research Experience

Mila – Quebec Artificial Intelligence Institute   Montréal, QC
Visiting Student Researcher; Hosts: Profs. Ioannis Mitliagkas and Gauthier Gidel   May 2023 - Aug 2023
- Convergence analysis of structured performative prediction
- First-order methods for variational inequality problems with surrogate loss in function space
- Local curvature adaptive method for better out-of-distribution generalization

Rice University, Computer Science Department   Houston, TX
Ph.D. Candidate; Advisors: Profs. Anastasios Kyrillidis, César A. Uribe, and Nai-Hui Chia   Aug 2019 - Present
- Active collaborations with Google (F. Pedregosa) and IBM (G. Kollias) on optimization and quantum computing
- Adaptive optimization methods / accelerated proximal methods for robust and fast optimization
- Efficient quantum state tomography via non-convex and distributed optimization methods

University of Chicago, Booth School of Business   Chicago, IL
Research Assistant to Profs. Panos Toulis and Sanjog Misra   Jun 2017 - Jul 2019
- Stochastic approximation for large-scale inverse reinforcement learning

University of Chicago, Statistics Department   Chicago, IL
Research Assistant to Prof. Mikael Kuusela; Supervisor: Prof. Michael L. Stein   Oct 2016 - Jun 2017
- Uncertainty quantification for high-energy physics unfolding problem; [code]; [documentation]

Publications

Journal/Conference Papers

[1] When is Momentum Extragradient Optimal? A Polynomial-Based Analysis
J. L. Kim, G. Gidel, A. Kyrillidis, F. Pedregosa.
Transactions on Machine Learning Research (TMLR), 2024 (forthcoming)

[2] Fast Quantum State Reconstruction via Accelerated Non-Convex Programming
J. L. Kim, G. Kollias, A. Kalev, K.X. Wei, A. Kyrillidis.
Photonics 2023 / Quantum Information Processing (QIP) 2023 (poster)

[3] Local Stochastic Factored Gradient Descent for Distributed Quantum State Tomography
J. L. Kim, M. T. Toghani, C. A. Uribe, A. Kyrillidis.
Control Systems Letters (L-CSS), IEEE 2022 / Quantum Information Processing (QIP) 2023 (poster)

[4] Convergence and Stability of the Stochastic Proximal Point Algorithm with Momentum
J. L. Kim, P. Toulis, A. Kyrillidis.
Conference on Learning for Dynamics and Control (L4DC), PMLR 2022

Workshop Papers (peer-reviewed)

[1] Adaptive Federated Learning with Auto-Tuned Clients via Local Smoothness
J. L. Kim, M. T. Toghani, C. A. Uribe, A. Kyrillidis.
Federated Learning and Analytics in Practice: Algorithms, Systems, Applications, and Opportunities, ICML 2023

[2] Momentum Extragradient Is Optimal for Games with Cross-Shaped Jacobian Spectrum
J. L. Kim, G. Gidel, A. Kyrillidis, F. Pedregosa.
Workshop on Optimization for Machine Learning, NeurIPS 2022

[3] Acceleration and Stability of the Stochastic Proximal Point Algorithm
J. L. Kim, P. Toulis, A. Kyrillidis.
*Workshop on Optimization for Machine Learning, NeurIPS 2021 (**spotlight**)*

Papers Under Review

[1] Adaptive Federated Learning with Auto-Tuned Clients
J. L. Kim, M. T. Toghani, C. A. Uribe, A. Kyrillidis.

[2] On the Error-Propagation of Inexact Deflation for Principal Component Analysis
F. Liao, **J. L. Kim**, C. Barnum, A. Kyrillidis.

[3] How Much Pre-training Is Enough to Discover a Good Subnetwork?
C. Wolfe, F. Liao, Q. Wang, **J. L. Kim**, A. Kyrillidis.

Working Papers

[1] Solving Quantum Linear System Problem via Proximal Point Method
J. L. Kim, N. H. Chia, A. Kyrillidis.

[2] First-Order Method for Variational Inequality Problems in Function Space
R. D'Orazio, **J. L. Kim**, I. Mitliagkas.

[3] Sharpness Aware Minimization with Local Curvature Adaptivity
J. L. Kim, H. Naganuma, I. Mitliagkas.

[4] Performative Prediction with Regularization
M. Mofakhami, **J. L. Kim**, I. Mitliagkas, G. Gidel

Honors & Awards

2023 Rice Engineering Alumni Graduate Student Fall Travel Grant ($480)
2023 AISTATS 2023 Top Reviewer (Top 10 %)
2022 Rice Engineering Alumni Graduate Student Fall Travel Grant ($1,200)
2022 Rice Engineering Alumni Graduate Student Spring Travel Grant ($960)
2021 Rice Engineering Alumni Graduate Student Fall Travel Grant ($1,900)

Service

Workshops	QuantIPS 2023: Co-organizer for "Quantum Information Processing Systems" [link]
	TL;DR 2023: Co-organizer for "Texas Colloquium on Distributed Learning" [link]
	ICML 2021: Co-organizer for "Beyond First Order Methods in Machine Learning Systems" [link]
Reviews	AISTATS (2022–2023), NeurIPS (2023), ICML (2023), CDC (2022), NECSYS (2022), TCNS (2022)

Mentorship

Undergraduate students

Co-advised with Prof. Anastasios Kyrillidis

- Rithik Jain (Rice University): sparse learning with hadamard product   Mar 2021 - May 2022
- Justin Lumpkin (U of Maryland): deep matrix factorization; Google/Rice REU 1st place   May 2021 - Aug 2021
- Cruz Barnum (Reed College): scalable streaming PCA; Google/Rice REU 2nd place   May 2021 - Aug 2021

Others

Software	MiFGD (Python) [link], sgd (R package) [link], UndersmoothedUnfolding (C++) [link]
Programming	Python, R, C++, Matlab, ROOT (CERN)
Language	Korean (native), English (bilingual proficiency)
Leadership	President, Rice University Computer Science Graduate Student Association (2022 - 2023)
	President, UChicago Korean Undergraduate Maroon Association (2016 - 2017)

Invited Talks

Adaptive Federated Learning with Auto-Tuned Clients   Phoenix, AZ
Annual Meeting, INFORMS   Oct 2023

Adaptive Federated Learning with Auto-Tuned Clients   Montréal, Canada
Montréal Machine Learning and Optimization (MTL MLOpt), MILA   Jun 2023

Local Stochastic Factored Gradient Descent for Distributed Quantum State Tomography   Cancún, Mexico
IEEE Conference on Decision and Control (CDC)   Dec 2022

Convergence and Stability of the Stochastic Proximal Point Algorithm with Momentum   Indianapolis, IN
Optimization for Machine Learning, INFORMS   Oct 2022

Convergence and Stability of the Stochastic Proximal Point Algorithm with Momentum   Bethlehem, PA
International Conference on Continuous Optimization (ICCOPT)   Jul 2022

Fast Quantum State Reconstruction via Accelerated Non-convex Programming   Houston, TX
Quantum Group Meeting Seminar, Rice University   Jan 2022

Acceleration and Stability of the Stochastic Proximal Point Algorithm   Virtual
Workshop on Optimization for Machine Learning, NeurIPS   Dec 2021

Fast Quantum State Reconstruction via Accelerated Non-convex Programming   Anaheim, CA
Optimization in Quantum Computing, INFORMS   Oct 2021