Junhyung Lyle Kim

Legal name: Junhyung Kim

jlylekim.github.io | google scholar | jlylekim | jlylekim | jlylekim

Employment

JPMorganChase, Global Technology Applied Research — New York, NY
Quantum Computing Research Scientist — Sr. Associate — Oct 2024 - Present

- Research interests: optimization; quantum algorithms; randomized algorithms; machine learning

Education

Rice University — Houston, TX
Ph.D. in Computer Science — Aug 2019 - Aug 2024

- Advisors: Profs. Anastasios Kyrillidis (chair) `[website]`; César A. Uribe `[website]`; Nai-Hui Chia `[website]`
- Topics: algorithmic and structural acceleration techniques in machine learning and quantum computing `[thesis]`

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

JPMorganChase, Global Technology Applied Research — New York, NY
Research Intern in Quantum Computing; PI: Dr. Marco Pistoia `[website]` — Jun 2024 - Aug 2024

- Design, analysis, and application of quantum / quantum-inspired classical algorithms

Mila – Quebec Artificial Intelligence Institute — Montréal, QC
Visiting Student Researcher; Hosts: Profs. Ioannis Mitliagkas and Gauthier Gidel — May 2023 - Aug 2023

- First-order methods for variational inequality problems with surrogate loss in function space
- Curvature adaptive optimization algorithm for improved out-of-distribution generalization

Meta, Fundamental AI Research (FAIR) — New York, NY
AI 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

Academic Experience

Rice University, Computer Science Department — Houston, TX
Ph.D. Candidate; Advisors: Profs. Anastasios Kyrillidis, César A. Uribe, and Nai-Hui Chia — Aug 2019 - Aug 2024

- Active collaborations with Google (F. Pedregosa) and IBM (G. Kollias) on optimization and quantum computing
- Adaptive & robust optimization / efficient quantum state tomography via nonconvex & distributed optimization

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

(* denotes equal contributions)

Journal Papers

[J1] How Much Pre-training Is Enough to Discover a Good Subnetwork?
C. Wolfe*, F. Liao*, Q. Wang, **J. L. Kim**, A. Kyrillidis.
Transactions on Machine Learning Research, ***TMLR 2024***

[J2] 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***

[J3] 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)*

[J4] 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 2022*** */ Quantum Information Processing,* ***QIP 2023*** *(poster)*

Conference Papers (peer-reviewed)

[C1] Solving Hidden Monotone Variational Inequalities with Surrogate Losses
R. D'Orazio, D. Vucetic, Z. Liu, **J. L. Kim**, I. Mitliagkas, G. Gidel.
International Conference on Learning Representations, ***ICLR 2025***

[C2] On the Error-Propagation of Inexact Hotelling's Deflation for Principal Component Analysis
F. Liao, **J. L. Kim**, C. Barnum, A. Kyrillidis.
International Conference on Machine Learning, ***ICML 2024***

[C3] Adaptive Federated Learning with Auto-Tuned Clients
J. L. Kim, M. T. Toghani, C. A. Uribe, A. Kyrillidis.
International Conference on Learning Representations, ***ICLR 2024***

[C4] 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 2022***

Workshop Papers (peer-reviewed)

[W1] Solving Hidden Monotone Variational Inequalities with Surrogate Losses
R. D'Orazio, D. Vucetic, Z. Liu, **J. L. Kim**, I. Mitliagkas, G. Gidel.
Workshop on Optimization for Machine Learning, ***NeurIPS 2024***

[W2] Smoothness-Adaptive Sharpness-Aware Minimization for Finding Flatter Minima
H. Naganuma*, **J. L. Kim***, A. Kyrillidis, I. Mitliagkas.
Practical Machine Learning for Low Resource Settings Workshop (PML4LRS), ***ICLR 2024***

[W3] 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***

[W4] 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***

[W5] 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] A Catalyst Framework for the Quantum Linear System Problem via the Proximal Point Algorithm
J. L. Kim, N. H. Chia, A. Kyrillidis.

Honors & Awards

2024 Rice Engineering Alumni Graduate Student Spring Travel Grant ($540)
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 Quantum, TMLR, NeurIPS, ICML, ICLR, AISTATS, 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

Other Experience

Dimensional Fund Advisors — Austin, TX
Research Intern, Investment Analytics & Data Group — Jun 2016 - Sep 2016

- Automated checking system for security database; prototyping VBA tool for data comparison and visualization

Cook M&A Advisory Services — Chicago, IL
Investment Banking Summer Analyst — Jun 2015 - Aug 2015

- Data analysis for several buy-side projects; client document drafting

Freenters, Inc. — Chicago, IL
Operations Intern — Aug 2014 - Jan 2015

- VBA tool for automatically personalized email dispatching; logo/poster design (Adobe Illustrator)