Minsung Kim

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RESEARCH INTERESTS

Wireless Systems and Networks
Quantum and Emerging Computing Systems
High-Performance and Parallel Computing Technologies

EDUCATION

Princeton University, NJ Sep. 2017 – Present
M.A. & Ph.D. in Computer Science
Advisor: Prof. Kyle Jamieson (kylej@cs.princeton.edu)

Dissertation: Quantum and Quantum-Inspired Computation for Wireless Networks (in progress)
FPO Committee: Prof. Kyle Jamieson, Prof. Jennifer Rexford, Prof. Yasaman Ghasempour
Prof. Ravi Netravali, Prof. Lin Zhong (Yale), Dr. Davide Venturelli (NASA/USRA RIACS)

Korea University, Seoul August. 2016
B.E. in Electrical Engineering *with Great Honor*
Advisor: Prof. Sangheon Pack (shpack@korea.ac.kr)

Stanford University, CA Summer. 2016
Visiting Student, Electrical Engineering

PROFESSIONAL EXPERIENCE (summer: approx. 3-4 months)

Princeton University, Ph.D. Student Researcher – PAWS Laboratory, Princeton, NJ Aug. 2017 - Present

Meta, Ph.D. Software Engineer Intern – Systems and Infrastructure, Menlo Park, CA Summer. 2022

InterDigital, Ph.D. Research Intern – R&I Department, Conshohocken, PA Summer. 2021

NASA – Ames Research Center, Moffett Field, CA
- Affiliated Researcher, *NASA Quantum Artificial Intelligence Laboratory (QuAIL)* Apr. 2018 – Feb. 2021
- Ph.D. Research Intern, *NASA Quantum Artificial Intelligence Laboratory (QuAIL)* Summer. 2020
- Ph.D. Research Intern, *NASA Quantum Artificial Intelligence Laboratory (QuAIL)* Summer. 2019
- Visiting Scholar, *Universities Space Research Association (USRA)* Summer. 2018

PUBLICATIONS (+: co-first author)

[6] **Minsung Kim**, and Kyle Jamieson, "Finer-Grained Decomposition for Parallel Quantum MIMO Processing," in **IEEE ICASSP 2023**, 5 pages, Special Session on Quantum Computing for Machine Learning and Signal Processing (**Invited Paper**), Oral.

[5] **Minsung Kim**, Davide Venturelli, John Kaewell, and Kyle Jamieson, "Warm-Started Quantum Sphere Decoding via Reverse Annealing for Massive IoT Connectivity," In **ACM MobiCom 2022**, 14 pages, acceptance rate: 17.8% (56/314).

[4] **Minsung Kim**$^{+}$, Srikar Kasi^{+}, Aron P Lott, Davide Venturelli, John Kaewell, and Kyle Jamieson, "Heuristic Quantum Optimization for 6G Wireless Communications," In **IEEE Network**, 35(4) July/August 2021, 8 pages, IF:10.693 (1 of 3 **Invited Papers** in 2021).

[3] **Minsung Kim**, Salvatore Mandrà, Davide Venturelli, and Kyle Jamieson, "Physics-Inspired Heuristics for Soft MIMO Detection in 5G New Radio and Beyond," In **ACM MobiCom 2021**, 14 pages, acceptance rate: 16.8% (19/113, summer round).

[2] **Minsung Kim**, Davide Venturelli, and Kyle Jamieson, “Towards Hybrid Classical-Quantum Computation Structures in Wirelessly-Networked Systems," In **ACM SIGCOMM HotNets 2020**, 7 pages, acceptance rate: 24.8% (30/121).

[1] **Minsung Kim**, Davide Venturelli, and Kyle Jamieson, “Leveraging Quantum Annealing for Large MIMO Processing in Centralized Radio Access Networks," In **ACM SIGCOMM 2019**, 15 pages, acceptance rate:14.5% (32/221).

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(under review & in preparation):

Minsung Kim, Abhishek Kumar Singh, Davide Venturelli, John Kaewell, and Kyle Jamieson., “X-ResQ: Multi-Seed Ensemble Reverse Annealing for Quantum MIMO Detection with Flexible and Scalable Parallelism" under review in **USENIX NSDI**.

Minsung Kim, Keith Briggs, and Kyle Jamison, “Toward Physics-Inspired 3D Beamforming with Inexpensive PIN-Diode Extra-Large Antenna Arrays" to be submitted to **IEEE Transactions on Antennas and Propagation** in June/July 2023.

HONORS AND AWARDS

Adiabatic Quantum Computing (AQC) Junior Scientist Award (2023), CquIC & LANL

Andrew Kim Memorial Foundation Engineering Award (2023), Andrew Kim Foundation

School of Engineering and Applied Science Award for Excellence (2022), Princeton University [link]

Qualcomm Innovation Fellowship (2021) $100,000 Award (North America), Qualcomm [link]

Graduate Prize Scholarship (2021 & 2023) $4,500, Korea University Alumni Association of New York

Princeton Honorific Fellow Nominee (2021 & 2022), Princeton University

NASA NAMS Student Spotlight (2020), NASA Ames Research Center

Princeton Ph.D. Fellowship (2017), Princeton University

Presidential Best Research Award (2016), Korea University

Best Project & Outstanding Intern Award (2016), Korea Telecom (KT)

Qualcomm IT Tour (Class of 2015) Invited Small Conference with Executive Chairman, Qualcomm [link]

Creative Challenger $2K Research Funding Scholarships (2015) Team TAS Leader, Korea University

Merit-Based Undergraduate Scholarships & High Honor Awards (all semesters)

PATENTS

Provisional US Patent Application 62/845,642 filed May 9, 2019. PCT application PCT/US2020/032398. Leveraging Quantum Annealing for Large MIMO Processing in Cloud-Based Radio Access Networks. **Minsung Kim**, Davide Venturelli, Kyle Jamieson. Assignee: Princeton University.

OTHER RESEARCH OUTPUTS

Minsung Kim, and Kyle Jamieson, “Transforming MIMO BPSK Maximum Likelihood Detection into QUBO Form," Department of Computer Science Technical Report TR-010-17, Princeton University 2017.

Minsung Kim, Joon Yeop Lee, and Hwangnam Kim, “Warning and Detection System for Epidemic Disease," In International Conference on ICT Convergence, ICTC 2016, (undergraduate publication and talk).

GRANTS AND FUNDING

Student Travel Grants: ACM SIGMOBILE Award (MobiCom’21), Princeton Dean’s Funding Award (MobiCom’21), Princeton SEAS Award (MobiCom’22)

InterDigital Corporation Gift 2019-2021 ($330,000)
Gift for research in Quantum Enabled Wireless Networks to PAWS Research Group, (PI) Prof. Kyle Jamieson
InterDigital mentor: John Kaewell, Senior Principal - Advisor to CTO

Qualcomm Innovation Fellowship 2021 Award ($100,000)
Award for innovative research "Quantum Computation for Wireless Networks" w/ Srikar Kasi, 2021−2022.
Fellowship mentor: Dr. Naga Bhushan, Vice President of Technology, Qualcomm

National Science Foundation (NSF) Award #1824357 ($372,667) and Award #1824470 ($277,206)
"SpecEES: Collaborative Research: Advancing the Wireless Spectral Frontier with Quantum-Enabled Computational Techniques (QENeTs)", Oct. 2018−Jul. 2022. (PIs) Prof. Kyle Jamieson and Dr. Davide Ventruelli.

Princeton University SEAS Project X Innovation Fund ($150,000), Feb. 2018−Jan. 2020. (PI) Prof. Kyle Jamieson.

USRA Cycle 3 and Cycle 4 Awards
Research time on a D-Wave Quantum Computer in the USRA-NASA-Google Quantum Artificial Intelligence Laboratory at NASA Ames Research Center, Feb. 2018 (Cycle 3) & Nov. 2020 (Cycle 4). (PI) Prof. Kyle Jamieson.

TALKS

Conference Talks

- IEEE ICASSP 23, Rhodes Island, Greece (scheduled) Jun. 2023
"Finer-Grained Decomposition for Parallel Quantum MIMO Processing"

- ACM MobiCom 22, Sydney, Australia Oct. 2022
"Warm-Started Quantum Sphere Decoding via Reverse Annealing for Massive IoT Connectivity"

- ACM MobiCom 21, New Orleans, LA Mar. 2022
"Physics-Inspired Heuristics for Soft MIMO Detection in 5G New Radio and Beyond"

- ACM SIGCOMM HotNets 20, Chicago, IL (virtual) Nov. 2020
"Towards Hybrid Classical-Quantum Computation Structures in Wirelessly-Networked Systems"

- NASA Symposium 20, NASA Ames Research Center, CA (virtual) Aug. 2020
"Quantum-Inspired Heuristics for Wireless Networks"

- ACM SIGCOMM 19, Beijing, China Aug. 2019
"Leveraging Quantum Annealing for Large MIMO Processing in Centralized Radio Access Networks"

- ICTC 16, Jeju, Korea Oct. 2016
"Warning and Detection System for Epidemic Disease"

Invited Talks

- International Network on Quantum Annealing (INQA) at UCL, UK (virtual) Jan. 2023
"Warm-Started Quantum Sphere Decoding via Reverse Annealing for Massive IoT Connectivity", host: Prof. Daniel Lidar

- Ajou University, Suwon, Korea Nov. 2022
"Quantum and Quantum-Inspired Computation for Wireless Networks", host: Prof. Wonjae Shin

- KAIST, Daejeon, Korea Oct. 2022
"Quantum and Quantum-Inspired Computation for Wireless Networks", host: Prof. Sung-Ju Lee

- Qualcomm, CA (virtual) May. 2021
"QIF Summit: Quantum Computation for Wireless Networks", host: Qualcomm

- Princeton University, NJ (virtual) Nov. 2020
"Quantum Annealing for MIMO Processing", host: Princeton Quantum Science and Engineering Group

- Pusan National University, Pusan, Korea May. 2019
"Wireless Systems and Quantum Computing", host: Prof. Wonjae Shin

- Korea University, Seoul, Korea Feb. 2016
"CCP Winner: Smart Public Transportation", host: Korea University Center for Teaching and Learning

TEACHING EXPERIENCE

Teaching Assistant, Department of Computer Science, Princeton University
- Wireless Networks (COS 463) – Precept/Lab Instructor Spring. 2019
- Mobile Computing Design for Assistive Technology (COS IW 07) Fall. 2018
- Network Measurement, Sensing, and Visualization Across the Princeton Campus (COS IW 08) Fall. 2018

KUCTL Voluntary Peer Tutor - Linear Algebra (IMEN15102)**,** Korea University Spring. 2016

Guest Lecturer, Ajou University, Suwon, Korea
"Wireless Communications and MIMO Techniques", Mobile Communications (ECE 432) May. 2021

SERVICE & MEMBERSHIP

Technical Program Committee
- ACM SenSys 2022 (Shadow)
- ACM S^3 Workshop at ACM MobiCom 2022

Artifact Evaluation Committee
- ACM CoNEXT 2023

Reviewer
- IEEE/ACM Transactions on Networking
- IEEE ICASSP
- Springer Quantum Machine Intelligence
- IEEE Internet of Things Magazine
- IEEE Network Magazine
- IEEE Transactions on Communications
- Elsevier ICT Express

Society Membership & Activities
- Student Member, IEEE, ACM, ACM SIGMOBILE, IEEE SPS, and IEEE ComSoc
- Student Member, Korean-American Scientists and Engineer Association (KSEA)
- Representative of Korea University at the K2 Global Leadership Conference, Keio University, Japan

OTHER EXPERIENCE

Undergraduate Internship, Wireless Engineering Dept., Korea Telecom (KT) Dec. 2015 - Feb. 2016

Intelligence Agent & Translator (Eng), Foreign Affairs Division, National Police Jun. 2012 - Mar. 2014
- Military service in South Korea (Sergeant at R.O.K Army)

End of CV ***(latest update: 05/2023)***