# 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 – Nov. 2023
M.A. & Ph.D. in Computer Science
*Advisor:* Prof. Kyle Jamieson (kylej@cs.princeton.edu)

Dissertation: Quantum and Quantum-Inspired Computation for MIMO Communications in Wireless Networks
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)

**Yale University**, Postdoctoral Associate – Efficient Computing Lab, New Haven, CT Nov. 2023 - Present

**Princeton University**, Ph.D. Student Researcher – PAWS Laboratory, Princeton, NJ Aug. 2017 – Oct. 2023

**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 (ARC), 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)

[7] **Minsung Kim**, "Quantum and Quantum-Inspired Computation for MIMO Communications in Wireless Networks," **Ph.D. Dissertation**, Department of Computer Science, Princeton University, NJ, USA, Nov 2023.

[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 or 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," 14 pages.

**Minsung Kim**, Annalise Stockley, Keith Briggs, and Kyle Jamieson, “Toward Physics-Inspired Discrete-Phase Optimization for 3D Beamforming with PIN-Diode Extra-Large Antenna Arrays," 10 pages.

Abhishek Kumar Singh, Ari Kapelyan, **Minsung Kim**, Davide Venturelli, Peter L. McMahon, and Kyle Jamieson, “Uplink MIMO Detection using Ising Machines: A Multi-Stage Ising Approach,” 13 pages.

## HONORS AND AWARDS

**Moon-Jung Chung Scholarship (2023)** 1st Place, KOCSEA

**Nomination for ACM Doctoral Dissertation Award (2023)**, Princeton University

**Siebel Scholar (Class of 2024)** $35,000 Award, Thomas and Stacey Siebel Foundation [link]

**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 Award, 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

**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 & Academic High Honor Awards (all semesters)**

## PATENTS AND OTHER RESEARCH OUTPUTS

**Minsung Kim**, Davide Venturelli, Kyle Jamieson. Assignee: Princeton University. **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**, 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

**Travel Grants:** ACM SIGMOBILE Award (MobiCom'21), ACM SIGCOMM Award (SIGCOMM'23), 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**

- KOCSEA Technical Symposium 23, Dearborn, MI — Nov. 2023
"Quantum and Quantum-Inspired Computation for MIMO Communications in Wireless Networks"

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

- North Regional Conference 23, Montclair, NJ — Apr. 2023
"Quantum and Quantum-Inspired Computation for Wireless Networks"

- 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**

- Yonsei University, Seoul, Korea (virtual) — Aug. 2023
"Quantum and Quantum-Inspired Computation for Wireless Networks", host: Prof. Chan-Byoung Chae

- KAIST, Daejeon, Korea — May. 2023
"Quantum and Quantum-Inspired Computation for Wireless Networks", host: Prof. Jeongseok Ha

- 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
- ACM MobiCom 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
- IEEE Transactions on Wireless Communications
- IEEE Wireless Communications Magazine
- 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)
- Member, Korean-American Innovative Technology Engineers and Entrepreneurs (KITEE)
- Member, Korean Computer Scientists and Engineers Association in America (KOCSEA)
- 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
- Best Project & Outstanding Intern Award

**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: 11/2023)***