

# Heasung Kim

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## SUMMARY

- Expertise in **deep learning-based lossy compression, federated learning, reinforcement learning**, and **wireless communications/networks** (PHY layer & resource management).
- Ph.D. student at The University of Texas at Austin possessing a deep understanding of **optimization** and **probability** (4.0/4.0 GPA).
- Proven work experience with industry such as **InterDigital** and **Samsung**.
- Skilled in programming languages, including Python, C, and various machine learning libraries.
- The first author of the top-tier journals (e.g., **J-SAC**) and conferences in the fields of machine learning (e.g., **ICML**) and wireless communications (e.g., **ISIT, Globecom**).

## EDUCATION

Ph.D. Student, Electrical and Computer Engineering Fall 2021-Present  
Advisors: Prof. Hyeji Kim and Prof. Gustavo De Veciana  
The University of Texas at Austin, TX, USA

Master of Science in Electrical and Computer Engineering 2019  
Advisor: Prof. Jungwoo Lee  
Seoul National University, Seoul, Korea

Bachelor of Science in Computer and Communication Engineering 2017  
Korea University, Seoul, Korea

Exchange Student Spring 2016  
The University of Texas at Austin, TX, USA

## WORK EXPERIENCE

***Intern*** May 2024-Aug 2024 (Expected)  
InterDigital AI Wireless Lab, NewYork  
Research Topics:

- Building digital twin with ray-tracing channel model
- Diffusion model for compression

***Graduate Research Assistant*** Sep 2021-Present  
Research Topics:

- Channel compression, federated learning, rate-distortion analysis, wireless networks

***Researcher*** Jun 2021-Aug. 2021  
Research Advisor: Prof. Wonjae Shin  
Ajou University, Suwon, South Korea  
Research Topics:

- Reinforcement learning and evolution strategies
- Multiple access techniques for wireless communications

***Machine Learning Engineer*** Aug. 2019-Apr. 2021  
Network Analytics Lab, Samsung Networks Business, Samsung  
(Received an *Excellent (Highest) Grade* in 2020 Performance Appraisal)  
Responsibilities:

- Designing reinforcement learning algorithms for self-organizing networks (SON)
- Designing key point indicator prediction models for LTE base stations (data-driven models)
- Networks data analysis, data management, and database construction

## RESEARCH IN PROGRESS

J5. **Heasung Kim**, Hyeji Kim, and Gustavo De Veciana. “Fundamental Limits in Exploiting Side Information for CSI Feedback in Wireless Systems.” Presented at 6G@UT Research Showcase, Apr 2024. *Under Review*.

J4. **Heasung Kim**, Hyeji Kim, and Gustavo De Veciana. “Learning Context-Dependent CSI Feedback

Autoencoders.” Presented at 6G@UT Research Showcase, Nov 2023. Planned submission.

JOURNAL  
ARTICLES

J3. **Heasung Kim**, Jungwoo Lee, Wonjae Shin, and H. Vincent Poor. “Shallow Reinforcement Learning for Energy Harvesting Communications with Imperfect Channel Knowledge.” in *IEEE Journal of Selected Topics in Signal Processing*, Jun. 2021.

J2. **Heasung Kim**, Taehyun Cho, Jungwoo Lee, Wonjae Shin, and H. Vincent Poor. “Optimized Shallow Neural Networks for Sum-Rate Maximization in Energy Harvesting Downlink Multiuser NOMA Systems.” *IEEE Journal on Selected Areas in Communications*, vol. 39, no. 4, pp. 982-997, Apr 2021.

J1. **Heasung Kim**, Jungtae Kim, Wonjae Shin, Heecheol Yang, Nayoung Lee, Seong Jin Kim, and Jungwoo Lee. “On the Design of Tailored Neural Networks for Energy Harvesting Broadcast Channels: A Reinforcement Learning Approach.” *IEEE Access*, vol. 8, pp. 179678-179691, Aug. 2020.

CONFERENCE  
PROCEEDINGS

C8. **Heasung Kim**, Hyeji Kim, and Gustavo De Veciana. “Clustered Federated Learning via Gradient Partitioning.” *International Conference on Machine Learning (ICML)*, 2024.

C7. **Heasung Kim**, Hyeji Kim, and Gustavo De Veciana. “Estimation of Rate-Distortion Function for Computing with Decoder Side Information.” In *Proc. IEEE International Symposium on Information Theory (ISIT)*, pp. 1-6. IEEE, 2024. (**Spotlight Paper** for ISIT ‘Learn to Compress’ workshop presentation)

C6. **Heasung Kim**, Hyeji Kim, and Gustavo De Veciana. “Learning Variable-Rate Code for CSI Feedback.” In *Proc. IEEE Global Communications Conference (GLOBECOM)*, pp. 1-6. IEEE, 2022.

C5. **Heasung Kim**, Taehyun Cho, Jungwoo Lee, Wonjae Shin, and H. Vincent Poor. “An Efficient Neural Network Architecture for Rate Maximization in Energy Harvesting Downlink Channels.” In *Proc. IEEE International Symposium on Information Theory (ISIT)*, pp. 2498-2503. IEEE, 2020.

C4. **Heasung Kim**, Wonjae Shin, Heecheol Yang, and Jungwoo Lee. “RL-Based Transmission Completion Time Minimization with Energy Harvesting for Time-Varying Channels.” In *Proc. IEEE International Conference on Communications Workshops (ICC Workshops)*, pp. 1-7. IEEE, 2020.

C3. **Heasung Kim**, Wonjae Shin, Heecheol Yang, Nayoung Lee, and Jungwoo Lee. “Rate Maximization with Reinforcement Learning for Time-Varying Energy Harvesting Broadcast Channels.” In *Proc. IEEE Global Communications Conference (GLOBECOM)*, pp. 1-6. IEEE, 2019.

C2. **Heasung Kim**, Heecheol Yang, Yeongmo Kim, and Jungwoo Lee. “Action-Bounding for Reinforcement Learning in Energy Harvesting Communication Systems.” In *Proc. IEEE Global Communications Conference (GLOBECOM)*, pp. 1-7. IEEE, 2018.

C1. Jiwoo Mun, **Heasung Kim**, and Jungwoo Lee. “A Deep Learning Approach for Automotive Radar Interference Mitigation.” In *Proc. IEEE Vehicular Technology Conference (VTC)*, pp. 1-5. IEEE, 2018.

DOMESTIC  
PAPERS

D3. **Heasung Kim**, Wongeun Song, Kyeongjun Ko, Jungtai Kim, and Jungwoo Lee. “Speed Scheduling of Autonomous Train through Reinforcement Learning.” In *Proc. The 29th Joint Conference on Communications and Information*, May. 2019.

D2. Jiwoo Mun, **Heasung Kim**, and Jungwoo Lee. “A Real-time Food Detection on Mobile Phones for Diet Management Service.” In *Proc. The 29th Joint Conference on Communications and Information*, May. 2019.

D1. **Heasung Kim**, Yeongmo Kim, and Jungwoo Lee. “Actor-Critic Method for Power Allocation Optimization in Energy Harvesting Systems.” In *Proc. the Korean Institute of Communication Sciences Conference*, Jun. 2018.

AWARDS AND  
HONORS

**Professional Development Award**  
The University of Texas at Austin

Jul. 2024

<b>Friends of Alec Graduate Student Fellowship</b> The Cockrell School of Engineering, The University of Texas at Austin	Jun. 2024
<b>Student Travel Grant Award for ISIT 2024</b>	Jun. 2024
<b>Grad Site Travel Award for Fall 2021</b> The Cockrell School of Engineering, The University of Texas at Austin	Aug. 2021
<b><i>The University of Texas at Austin Engineering Fellowship</i></b> The Cockrell School of Engineering, The University of Texas at Austin	Apr. 2021
<b>Second Place Award, Super Rookie Project</b> Samsung Network Business — Designed mobile user movement prediction systems to prevent car accidents	May 2020
<b><i>Distinguished M.S. Dissertation Award</i></b> (The Best M.S. Dissertation Award) Seoul National University	Aug. 2019
<b>Grand Prize (First Place), Smart Museum Implementation</b> National Research Foundation of Korea and The Independence Hall of Korea — Designed AI-based image colorization systems for restoring old portraits	Aug. 2019
<b>Brain Korea 21 Plus Research Scholarship</b> Brain Korea 21 Plus	Fall 2017, Spring 2018, Fall 2018
<b>Excellence Award (First Place), Artificial Intelligence Capstone Project</b> SK Telecom Co. Ltd. and Seoul National University (Graduate Course, Topics in Computer and VLSI) — Developed hardware-efficient neural networks for object detection systems in smartphones — Designed interactive user interface using Android Studio and developed prototypes, including implementation of voice recognition, for a smart speaker-based diet service	Dec. 2018
<b>Tuition Fee Scholarship</b> (100% tuition) Jin-Air Co. Ltd.	Fall 2011—Fall 2013, Spring 2016—Spring 2017
<b>Semester High Honors</b> , Fall 2016, Spring 2017 and <b>Semester Honors</b> , Fall 2012, Fall 2013 Korea University	

## KEY PROJECTS

<b>Beyond-5G Extreme Mobility : Issues and Solutions</b> Sponsored research project by Interdigital and 6G@UT	Sep. 2023—Present
<b>Distributed Coordinated Multipoints</b> Sponsored research project by Interdigital and 6G@UT — Designed explicit CSI feedback algorithms for distributed CoMP. — Designed Clustered federated learning algorithms for context-dependent CSI feedback modules.	Sep. 2021—Aug. 2023
<b>Cell Load Balancing</b> Network Analytics Lab in Samsung Electronics — Designed and implemented model-based reinforcement learning algorithms for LTE cell load balancing — Developed state-transition models and traffic prediction models for networks	Oct. 2019—Apr. 2021
<b>Deep and Reinforcement Learning Techniques for Smart IoT Networks</b> Funded by the Korean Ministry of Science — Researched and developed lightweight and shallow artificial neural networks for energy-efficient communications — Researched power allocation policies based on deep learning for advanced IoT Networks	Mar. 2018—Jul. 2019
<b>Development of Artificial Intelligence for Automatic Train Operation</b> Funded by the Korea Railroad Research Institute — Developed reinforcement learning algorithms for speed scheduling of railway vehicles	Apr. 2018—Dec. 2018

- Implemented real-time packet communications between reinforcement learning agents and a virtual railway simulator that reflects the Korean railway systems

### **Low-Powered Jamming in Cyber and Electronic Warfare**

Funded by the Korean Agency for Defense Development

Jan. 2018—Dec. 2018

- Designed algorithms for low-powered jamming using generative adversarial neural networks, which generate fake signals that mimic enemy signals
- Implemented jamming scenarios on GNU Radio simulator with C/C++

## TEACHING EXPERIENCE

*Teaching Assistant, Introduction to Reinforcement Learning* (430.758)

Spring 2019

Graduate Course, Seoul National University

- Ran Teaching Assistant session for over 70 students, answered questions in person and online, graded assignments and projects, and proctored exams

*Teaching Assistant, Introduction to Communications* (420.317.002)

Fall 2017

Undergraduate Course, Seoul National University

- Answered questions in person and online, graded assignments, and proctored exams

## MILITARY SERVICE

*Sergeant, Korean Army and Korean National Police Agency*

Feb. 2014—Nov. 2015

- Served in Korean Army and Korean Police Agency (mandatory military service)
- Received *Seoul Gangbuk Police Chief's Commendation Award*

## TALKS

**Reinforcement Learning Approaches for Sum-Rate Maximization in Energy Constrained Systems** Aug. 2021

Hanyang University, Seoul, South Korea (invited by Prof. Songnam Hong)

- Covered the basic theories of dynamic programming with applications to sum-rate maximization problems on NOMA scheme

**Reinforcement Learning with Applications to Communications**

May 2020

Pusan National University, Busan, South Korea (invited by Prof. Wonjae Shin)

- Covered the basic theories and implementation methods of tabular-based reinforcement learning and deep reinforcement learning, both with applications to sum-rate maximization problems

**Reinforcement Learning Implementation with TensorFlow**

Jan. 2018

Soongsil University, Korea Information and Communications Society, Seoul, South Korea

- Provided tutorials on implementation of deep reinforcement learning algorithms through TensorFlow for OpenAI game simulators and wireless communication simulators