

# Jiin Woo

Ph.D. Candidate at Carnegie Mellon University

✉ [jiinw \[at\] andrew.cmu.edu](mailto:jiinw[at]andrew.cmu.edu) | 🏠 [jiinw.github.io](https://jiinw.github.io) | 🎓 Jiin Woo

## Education

### Carnegie Mellon University (CMU)

Ph.D. in Electrical & Computer Engineering

Pittsburgh, PA, USA

Aug. 2021 - Present

- Advisors: Yuejie Chi and Gauri Joshi

### Korea Advanced Institute of Science and Technology (KAIST)

M.S. in Electrical Engineering

Daejeon, South Korea

Sep. 2016 - Aug. 2018

- Advisor: Yung Yi

### Korea Advanced Institute of Science and Technology (KAIST)

B.S. in Mathematical Sciences

Daejeon, South Korea

Feb. 2011 - Aug. 2016

### Linköping University

Exchange Student

Linköping, Sweden

Feb. 2014 - Aug. 2014

## Work Experience

### NAVER Search

Machine Learning Engineer

Seongnam, South Korea

Sep. 2018 - Aug. 2021

- Developed a large-scale keyword representation model that identifies the intention of all queries using texts in search engine results pages (SERPs) and click logs, which covers long-tail keywords. Implemented a regularized BERT text classifier based on the co-click distance between keywords to extract fine-grained embeddings of SERPs. Reduced class spaces by clustering classes with non-negative matrix factorization.
- Developed a personalized keyword recommendation algorithm that considers real-time search trends and personal preferences depending on user features with contextual multi-armed bandit and Bradley-Terry model.
- Provided the embedding of user actions for various user analysis tasks, such as user satisfaction prediction and next action prediction. Contributed by developing an attention-based representation model, which encodes a sequence of search actions to a compact embedding.

## Publications

### Conference

#### [C3] Iterative Learning of Graph Connectivity from Partially-Observed Cascade Samples

Online

Jiin Woo, Jungseul Ok, Yung Yi

ACM MobiHoc, 2020

#### [C2] On the Asymptotic Content Routing Stretch in Network of Caches: Impact of Popularity Learning

New York, USA

Boram Jin, Jiin Woo, Yung Yi

NETGCOOP, 2019

#### [C1] Rumor Source Detection under Querying with Untruthful Answers

Atlanta, USA

Jaeyoung Choi, Sangwoo Moon, Jiin Woo, KyungHwan Son, Jinwoo Shin, Yung Yi

IEEE INFOCOM, 2017

### Journal

#### [J2] Information Source Finding in Networks: Querying With Budgets

Jaeyoung Choi, Sangwoo Moon, Jiin Woo, KyungHwan Son, Jinwoo Shin, Yung Yi

IEEE/ACM Transactions on Networking, 2020

#### [J1] Estimating the Information Source under Decaying Diffusion Rates

Jiin Woo, Jaeyoung Choi

Electronics, 2019

## Research Experience

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### Yuejie Chi Group and Optimization Probability and Learning (OPAL) Lab, CMU

Aug. 2021 - Present

Graduate Researcher (Advisors: Yuejie Chi and Gauri Joshi)

- Developed a federated Q-learning algorithm that balances heterogeneous training progress of local models via weighted averaging, which guarantees linear speedup with respect to the number of agents even in the presence of agents having insufficient coverage of the state-action space.
- Analyzed sample complexity of the federated Q-learning algorithm and studied the impact of heterogeneity in behavior policies and communication period on the sample efficiency.

### LeArning in Networking: Algorithm, Design, and Analysis (LANADA) Lab, KAIST

Sep. 2016 - Aug. 2018

Graduate Researcher (Advisor: Yung Yi)

- Developed a graph inference algorithm estimating the connectivity of a graph from a collection of partially observed epidemic cascades via approximate maximum likelihood estimation, which guarantees near-optimal sample complexity.
- Improved a rumor source localization algorithm via active querying with provable guarantees and analyzed the dependency between accuracy and querying cost.
- Designed a lightweight DQN structure via parameter sharing based on the symmetricity of MDP, which significantly reduces the computational complexity while guaranteeing local optimality.

### Algorithmic Intelligence Laboratory (ALIN-LAB), KAIST

Jun. 2015 - Dec. 2015

Undergraduate Intern (Advisor: Jinwoo Shin)

- Studied Minimum weight perfect matching (MWPM) and maximum weight matching (MWM) problems. Focused on parallelizable algorithms for MWPM and MWM with multiple intermediate max-product belief propagations (BPs).
- Studied the principles of graphical models. Focused on variational methods in parameter estimation.

### Artificial Intelligence & Probabilistic Reasoning Laboratory (AIPR-LAB), KAIST

Jan. 2015 - May. 2015

Undergraduate Intern (Advisor: Kee-Eung Kim)

- Studied and implemented reinforcement learning (RL) methods for competition examples. Focused on kernel-based RL.

## Projects

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### Learning-Based Framework for Improving Large-scale Search

Jul. 2017 - Jun. 2018

NAVER Corporation

- Developed a recommendation algorithm that daily selects a small set of keywords among a massive size of candidates to maximize user satisfaction on the search engine result pages.
- Significantly reduced the computational complexity of deep reinforcement learning by designing parameter shared Deep Q-Networks (DQN) based on the permutation equivariant and invariant properties of the problem's Markov Decision Process (MDP).
- Contributed to the MDP formulation and mathematical proofs for the local optimality of the weight shared DQN structure.

### Versatile Network System Architecture for Multi-dimensional Diversity

Sep. 2016 - Dec. 2017

Institute for Information & communications Technology Promotion (IITP) funded by the Korea government (MSIP)

- Developed FogOS, a distributed operating system for IoT services, which manages the cloud and the resources at the edge and connects individually owned edge devices with incentives in a distributed manner.
- Participated in the implementation of a matching module in FogOS, which optimizes the resource allocation between service requests and available edge devices.

### Real-Time Analysis and Interactive Visualization Platform for Large-Scale IoT Data

Jun. 2015 - Nov. 2015

Korea IT Business Promotion Association (IPA)

- Developed a web-based data visualization platform, which provides real-time information about large-scale streaming data. Applied the platform to smart city data collected from sensors, such as air pollution and energy consumption, and provided real-time urban information to citizens.
- Implemented interactive data visualization web pages with MEAN stack (MongoDB, Express.js, AngularJS, and Node.js).

## Honors & Awards

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### Hsu Chang Memorial Fellowship

United States

Electrical and Computer Engineering Department at Carnegie Mellon University (CMU)

2023

### KAIST Support Scholarship

South Korea

Korea Advanced Institute of Science and Technology (KAIST)

Fall 2016 - Spring 2018

**Excellence Award in Creative Challenge Type SW R&D Program**  
Korea IT Business Promotion Association (IPA)

Seoul, South Korea  
Nov. 2015

**3rd place in “Show Me The Street” Innovation Challenge 2015**  
Cisco Global Center of Excellence (GCoE)

Incheon, South Korea  
Nov. 2015

**The National Scholarship for Science and Engineering**  
Korea Student Aid Foundation (KOSAF)

South Korea  
Spring 2011 - Spring 2015

## Teaching

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**Special Topics in Artificial Intelligence: Foundations of Reinforcement Learning (18-813B)**  
Teaching Assistant, Carnegie Mellon University (CMU)

Spring 2023

**Data Structures and Algorithms for Electrical Engineering (EE205)**  
Teaching Assistant, Korea Advanced Institute of Science and Technology (KAIST)

Fall 2017

**Calculus 1, 2 (MAS101, MAS102)**  
Tutor, Korea Advanced Institute of Science and Technology (KAIST)

Fall 2016, Fall 2017

**EE Co-op Program (Field Training and Education Program)**  
Teaching Assistant, Korea Advanced Institute of Science and Technology (KAIST)

Spring 2017

## Relevant Coursework

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### Machine Learning

- Distributed and Federated Learning Algorithms
- Advanced Introduction to Machine Learning
- Artificial Intelligence and Machine Learning
- Fundamentals of Machine Learning
- Convex Optimization
- Information Theory

### Statistics/Math

- Engineering Statistics
- Introduction to Graph Theory
- Mathematical Statistics
- Lebesgue Integral Theory
- Introduction to Differential Geometry
- Logic and Set Theory
- Analysis
- Discrete Mathematics
- Probability and Statistics
- Differential Equations and Applications
- Linear Algebra
- Calculus

### Programming/Systems

- Operating Systems and System Programming for Electrical Engineering
- System Programming
- Data structure
- Computer Network
- Introduction to Programming

## Technical Skills

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<b>Programming</b>	Python, MATLAB, C, Java, LaTeX
<b>ML, Data Science</b>	Pytorch, Tensorflow, Spark, Hive, Hadoop
<b>Others</b>	HTML, CSS, Javascript, MongoDB, Express, AngularJS, NodeJS