Jiin Woo

Ph.D. Student at Carnegie Mellon University

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Education

Carnegie Mellon University (CMU)   *Pittsburgh, PA, USA*
Ph.D. in Electrical & Computer Engineering   *Aug. 2021 - Present*
- Advisors: Yuejie Chi and Gauri Joshi

Korea Advanced Institute of Science and Technology (KAIST)   *Daejeon, South Korea*
M.S. in Electrical Engineering   *Sep. 2016 - Aug. 2018*
- Advisor: Yung Yi

Korea Advanced Institute of Science and Technology (KAIST)   *Daejeon, South Korea*
B.S. in Mathematical Sciences   *Feb. 2011 - Aug. 2016*

Linköping University   *Linköping, Sweden*
Exchange Student   *Feb. 2014 - Aug. 2014*

Work Experience

NAVER Search   *Seongnam, South Korea*
Machine Learning Engineer   *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

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, which guarantees convergence speedup when local models are trained from imbalanced datasets asynchronously collected with heterogeneous behavior policies.
- Analyzed sample complexity of the federated Q-learning algorithm and studied the effect of data heterogeneity 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

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

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 *Seoul, South Korea*
Korea IT Business Promotion Association (IPA) *Nov. 2015*

3rd place in "Show Me The Street" Innovation Challenge 2015   *Incheon, South Korea*
Cisco Global Center of Excellence (GCoE)   *Nov. 2015*

The National Scholarship for Science and Engineering   *South Korea*
Korea Student Aid Foundation (KOSAF)   *Spring 2011 - Spring 2015*

Teaching

Data Structures and Algorithms for Electrical Engineering (EE205)   *Fall 2017*
Teaching Assistant, Korea Advanced Institute of Science and Technology (KAIST)

Calculus 1, 2 (MAS101, MAS102)   *Fall 2016, Fall 2017*
Tutor, Korea Advanced Institute of Science and Technology (KAIST)

EE Co-op Program (Field Training and Education Program)   *Spring 2017*
Teaching Assistant, Korea Advanced Institute of Science and Technology (KAIST)

Relevant Coursework

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

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