YUNYONG KO

CONTACT INFORMATION

Siebel Center 4219, 201 N Goodwin Ave,
Urbana, IL 61801, USA

Email: yyko@illinois.edu
Homepage: https://yy-ko.github.io

RESEARCH INTERESTS

My research interests mainly lie in large-scale data mining and machine learning on a various types of data (e.g., graph, hypergraph, text, and image), with a special focus on discovering knowledge from real-world networks.

- **General Network Learning**: Data parallelism (IPDPS21, CIKM21, WWW22); Graph engine (CIKM22, CIKM23); Hypergraph learning (arXiv:2309.05798)
- **Application-specific Learning**: Recommender systems (ICDM21, arXiv:2310.09401); Influence maximization (WWW16, Info. Sci.18, SAC19); Echo chamber mitigation (WWW23, CSCW24); Fake new detection (SAC22)

EDUCATION

Hanyang University, Seoul, Korea — Sep. 2013 – Aug. 2021
- *Ph.D. in Computer Science*
  - Thesis: Effective Approaches to Distributed Deep Learning: Methods, Analyses, and Evaluation
  - Advisor: Prof. Sang-Wook Kim
  - *Received the **Outstanding Ph.D. Dissertation Award** from the Research Institute of Industrial Science, HYU*

Hanyang University, Seoul, Korea — Mar. 2009 – Aug. 2013
- *B.S. in Computer Science*

RESEARCH EXPERIENCES

University of Illionois at Urbana-Champaign, Urbana, IL, USA — May. 2022 – Present
- *Postdoctoral Researcher, Department of Computer Science*
  - Topic: Large-Scale Hypergraph Learning for Real-World Applications
  - Advisor: Prof. Hanghang Tong

Hanyang University, Seoul, Korea — Sep. 2021 – April. 2022
- *Postdoctoral Researcher, Department of Computer Science*
  - Topic: Optimization Technique for Large-Batch DNN Training
  - Advisor: Prof. Sang-Wook Kim

The Pennsylvania State University, University Park, PA, USA — Oct. 2019 – Feb. 2020
- *Visiting Scholar, College of Information Sciences and Technology*
  - Topic: Data Parallelism Approach for Distributed Deep Learning
  - Advisor: Prof. Dongwon Lee

AWARDS & HONORS

Received the **Scholarship and Teaching for Engineering Postdocs (STEP)** — 2023
- Grainger College of Engineering (GCOE), University of Illinois at Urbana-Champaign

Selected as One of the **Best-Ranked Papers** — 2021
- IEEE International Conference on Data Mining (IEEE ICDM)

Selected as One of the **Spotlight Presentations** — 2021
- ACM International Conference on Information and Knowledge Management (ACM CIKM)

Received the **Outstanding Ph.D. Dissertation Award** — 2021
- Research Institute of Industrial Science, Hanyang University

Received the **ACM SIGAPP Student Travel Award** — 2019
- ACM Symposium on Applied Computing (ACM SAC)

Awarded the **NAVER Ph.D. Fellowship** — 2017
- Naver Corporation

Domestic Conference/Journal Awards
- **Best Paper Awards**: KIPS Spring Confernece (2021, 2023), Journal of KIISE (2017)
- **Best Presentation Award**: KIISE KCC (2017)

PUBLICATIONS

Preprinted Papers

[2] CIDER: Category-Guided Intent Disentanglement for Accurate Personalized News Recommendation
Yunyong Ko, Seongeun Ryu, and Sang-Wook Kim
arXiv:2310.09401, 2023
Full Paper (*Under Review at One of the Top-Tier CS Conferences*)

[1] Enhancing Hyperedge Prediction with Context-Aware Self-Supervised Learning
Yunyong Ko, Hanghang Tong, and Sang-Wook Kim
arXiv:2309.05798, 2023
Full Paper (*Under Review at the IEEE Transactions on Knowledge and Data Engineering*)

International Conference and Journal Papers (* indicates equal contributions)

[14] HearHere: Mitigating Echo Chambers in News Consumption through an AI-based Web System
Youngseung Jeon, Jaehoon Kim, Sohyun Park, Yunyong Ko, Seongeun Ryu, Sang-Wook Kim, and Kyungsik Han
CSCW 2024 (*The ACM Conference on Computer-Supported Cooperative Work and Social Computing*)
Full Paper (Accepted to appear)

[13] SAGE: A Storage-Based Approach for Scalable and Efficient Sparse Generalized Matrix-Matrix Multiplication
{Myung-Hwan Jang*, Yunyong Ko*}, Hyuck-Moo Gwon, Ik-Hyeon Jo, Yongjun Park, and Sang-Wook Kim
CIKM 2023 (*The ACM International Conference on Information and Knowledge Management*)
Full Paper (Acceptance Rate $\approx$ 24%)

[12] KHAN: Knowledge-Aware Hierarchical Attention Networks for Accurate Political Stance Prediction
Yunyong Ko, Seongeun Ryu, Soeun Han, Youngseung Jeon, Jaehoon Kim, Sohyun Park, Kyungsik Han, Hanghang Tong and Sang-Wook Kim
WWW 2023 (*The ACM Web Conference*)
Full Paper (Acceptance Rate $\approx$ 19.2%)

[11] RealGraph^{GPU}: A High-Performance GPU-Based Graph Engine Toward Large-Scale Real-World Network Analysis
Myung-Hwan Jang, Yunyong Ko, Dongkyu Jeong, Jeong-Min Park, and Sang-Wook Kim
CIKM 2022 (*The ACM International Conference on Information and Knowledge Management*)
Short Paper (Acceptance Rate $\approx$ 28.3%)

[10] Not All Layers Are Equal: A Layer-Wise Adaptive Approach Toward Large-Scale DNN Training
Yunyong Ko, Dongwon Lee, and Sang-Wook Kim
WWW 2022 (*The ACM Web Conference*)
Full Paper (Acceptance Rate $\approx$ 17.7%)

[9] D-FEND: A Diffusion-Based Fake News Detection Framework for News Articles Related to COVID-19
Soeun Han, Yunyong Ko, Yusim Kim, Heejin Park, Seongsu Oh, and Sang-Wook Kim
SAC 2022 (*The ACM Symposium on Applied Computing*)
Full Paper (Acceptance Rate $\approx$ 24%)

[8] SHAT: A Novel Asynchronous Training Algorithm That Provides Fast Model Convergence in Distributed Deep Learning
Yunyong Ko, and Sang-Wook Kim
Applied Sciences (SCIE Journal, 2022)

[7] MASCOT: A Quantization Framework for Efficient Matrix Factorization in Recommender Systems
{Yunyong Ko*, Jae-Seo Yu*}, Hong-Kyun Bae, Yongjun Park, Dongwon Lee, and Sang-Wook Kim
ICDM 2021 (*The IEEE International Conference on Data Mining*)
Full Paper (Acceptance Rate $\approx$ 9.9%)
Selected as One of the Best-ranked Papers of ICDM 2021 for Fast-track Journal Invitation

[6] ALADDIN: Asymmetric Centralized Training for Distributed Deep Learning
Yunyong Ko, Kibong Choi, Hyunseung Jei, Dongwon Lee, and Sang-Wook Kim
CIKM 2021 (*The ACM International Conference on Information and Knowledge Management*)
Full Paper (Acceptance Rate $\approx$ 21.7%)
Selected as One of the Spotlight Presentations of CIKM 2021

[5] An In-Depth Analysis of Distributed Training of Deep Neural Networks
Yunyong Ko, Kibong Choi, Jiwon Seo, and Sang-Wook Kim
IPDPS 2021 (*The IEEE International Parallel and Distributed Processing Symposium*)
Full Paper (Acceptance Rate $\approx$ 24.5%)

[4] Influence Maximization for Effective Advertisement in Social Networks: Problem, Solution, and Evaluation
Suk-Jin Hong, Yunyong Ko, Moon-Jeung Joe, and Sang-Wook Kim
SAC 2019 (*The ACM Symposium on Applied Computing*)
Full Paper (Acceptance Rate $\approx$ 24.2%)

[3] Efficient and Effective Influence Maximization in Social Networks: A Hybrid-Approach
Yunyong Ko, Kyung-Jae Cho, and Sang-Wook Kim
Information Sciences (SCIE Journal, 2018)

[2] Influence Maximization in Social Networks: A Target-Oriented Estimation
Yunyong Ko, Dong-Kyu Chae, and Sang-Wook Kim
Journal of Information Science (SCIE Journal, 2018)

[1] Accurate Path-Based Influence Maximization in Social Networks
Yunyong Ko, Dong-Kyu Chae, and Sang-Wook Kim
WWW 2016 (*The ACM Web Conference*)
Short Paper (Acceptance Rate $\approx$ 21%)

Domestic Conference and Journal Papers

[14] Performance Evaluation: Knowledge Embedding Methods for Political Stance Prediction
Seongeun Ryu, Yunyong Ko, and Sang-Wook Kim
KIPS Spring Conference 2023 (*Received the Best Paper Award*)

[13] CoAID+: COVID-19 News Cascade Dataset for Social Context Based Fake News Detection
Soeun Han, Yoonsuk Kang, Yunyong Ko, Jiwon Ahn, Yusim Kim, Seongsu Oh, Heejin Park, and Sang-Wook Kim
KIPS Transactions on Software and Data Engineering (KCI Journal, 2022)

[12] Precision Switching for Efficient Matrix Factorization in Recommender Systems
Jae-Seo Yu, Yunyong Ko, Hong-Kyun Bae, Seokwon Kang, Yongseung Yu, Yongjun Park, and Sang-Wook Kim
KIPS Spring Conference 2021

[11] COVID-19 Cascade Dataset for Fake News Detection
Soeun Han, Yoonsuk Kang, Yunyong Ko, Jiwon Ahn, Yusim Kim, Seongsu Oh, Heejin Park, and Sang-Wook Kim
KIPS Spring Conference 2021 (*Received the Best Paper Award*)

[10] Parameter Sharding for Synchronous and Asynchronous Distributed Training
Johyung Jung, Utae Lim, Junhwan Park, Kibong Choi, Yunyong Ko, and Sang-Wook Kim
KSC 2020 (*Korea Software Congress*)

[9] Parameter Sharding approaches for DNN Models with a Very Large Layer
Kibong Choi, Yunyong Ko, and Sang-Wook Kim
KIPS Fall Conference 2020

[8] Performance Evaluation: Parameter sharding for Distributed Deep Learning
Kibong Choi, Yunyong Ko, Hyungseung Jei, Hongchan Noh, and Sang-Wook Kim
KCC 2019 (*Korea Computer Congress*)

[7] Inter-Node Communications Methods for Distributed Deep Learning
Kibong Choi, Yunyong Ko, and Sang-Wook Kim
KSC 2018 (*Korea Software Congress*)

[6] A Diffusion Model for Influence Maximization in Selecting Advertisement Agent
Suk-Jin Hong, Yunyong Ko, Sang-Wook Kim, and Gyehwan Park
CSMS 2018 (*KISM Workshop on Convergent & Smart Media Systems*)

[5] Accurate Ad-Effect Estimation Method based on Relevance between User and Item
Suk-Jin Hong, Yunyong Ko, Sang-Wook Kim, and Gyehwan Park
KOCON 2018 (*Korea Contents Association*)

[4] Effective Ad-Effect Maximization Exploiting User's Support and Share
Suk-Jin Hong, Yunyong Ko, Sang-Wook Kim, and Gyehwan Park
KIPS Spring Conference 2018

[3] Accurate Trust Prediction Based on the Uninteresting User Concept
Jonghyun Kim, Seungwon Yun, Yunyong Ko, Jangwan Koo, and Sang-Wook Kim
KSC 2017 (*Korea Software Congress*)

[2] Fast Influence Maximization in Social Networks
Yunyong Ko, Kyung-Jae Cho, and Sang-Wook Kim
Journal of KIISE (KCI Journal, 2017) (*Received the Best Paper Award*)

[1] Efficient CELF Algorithm for Community-based Influence Maximization in Social Networks
Yunyong Ko, Kyung-Jae Cho, and Sang-Wook Kim
KCC 2017 (*Korea Computer Congress*) (*Received the Best Presentation Award*)

INVITED TALKS

KHAN: Knowledge-Aware Hierarchical Attention Networks for Accurate Political Stance Prediction
- Invited Talk @ Electronic & Information Research Information Center (EIRIC), Sep. 2023

Not All Layers Are Equal: A Layer-Wise Approach Towards Large-Scale DNN Training
- Poster Session @ Hyundai Vision Conference (HVC), Aug. 2023
- Invited Talk @ METU-HYU Joint Workshop, Dec. 2022

Basic Concept of Distributed Deep Learning with PyTorch Tutorials
- Invited Talk @ Medical AI Korea, Oct. 2021

Efficient and Effective Influence Maximization in Social Networks: A Hybrid-Approach
- Invited Talk @ Waseda-UMS-Hanyang-UKM (WUHU) Joint Workshop, Dec. 2018
- Invited Talk @ NAVER Corp., Feb. 2018

PROFESSIONAL SERVICES

Track Co-Chair
- The ACM Symposium on Applied Computing (**ACM SAC**) 2023

Conference Reviewer
- The ACM Web Conference (**WWW**) 2023
- The ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**ACM KDD**) 2021, 2022
- The IEEE International Conference on Data Mining (**IEEE ICDM**) 2022, 2023
- The IEEE International Conference on Big Data (**IEEE BigData**), GTA3 Workshop 2023
- The AAAI International Conference on Artificial Intelligence (**AAAI**) 2021
- The ACM Symposium on Applied Computing (**ACM SAC**) 2022, 2023

Journal Reviewer

- The IEEE Transactions on Neural Networks and Learning Systems (**IEEE TNNLS**) 2023
- The Journal of Supercomputing 2023

PATENTS

Granted Patents

- Asymmetric Centralized Training for Distributed Deep Learning
  Registration Number: **KR10-2555268** Jul. 2023
- Multi-State Diffusion Model Using Interest, Intimacy, and Share Tendency
  Registration Number: **KR10-2332348** Nov. 2021
- Accurate Ad-Effect Estimation Method based on Relevance between User and Item
  Registration Number: **KR10-2144122** Aug. 2020
- Hybrid Approach for Influence Maximization in Social Networks
  Registration Number: **KR10-1810864** Dec. 2017

Filed Patents

- Political Stance Prediction Method and System using Political Knowledge Graphs and Hierarchical Attention Networks
  Application Number: **KR10-2023-0059346** May 2023
- Method and System for Adjusting the Learning Rate Differentiated by Layer for Large Scale Data Parallel Based Deep Learning
  Application Number: **KR10-2022-0075800** June 2022

REFERENCES

Hanghang Tong, *Associate Professor* (Postdoc. Advisor) htong@illinois.edu
Department of Computer Science, University of Illinois at Urbana-Champaign (UIUC)

Sang-Wook Kim, *Professor* (Ph.D. Advisor) wook@hanyang.ac.kr
Department of Computer Science, Hanyang University

Dongwon Lee, *Professor* (Collaborator) dongwon@psu.edu
College of Information Sciences and Technology, The Pennsylvania State University (PSU)

Kyungsik Han, *Associate Professor* (Collaborator) kyungsikhan@hanyang.ac.kr
Department of Data Science, Hanyang University