YUNYONG KO

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RESEARCH INTERESTS

My research interests lie in large-scale data mining and machine learning on various types of data (e.g., graph, hypergraph, text, and image), with a focus on developing AI/ML solutions for real-world problems.

- **Graph mining and learning**: Hypergraph learning, Graph engine, Influence maximization
- **Large-scale deep learning**: Large-batch optimization, Distributed data parallelism, Quantization
- **AI/ML solutions for real problems**: Recommender systems, Political polarization, Fake news detection

EDUCATION

Hanyang University, Seoul, South 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, South 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, South 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

PUBLICATIONS

Preprints

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

International Conference and Journal Papers (* indicates equal contributions)

[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
ACM 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
ACM CIKM 2022 (*The ACM International Conference on Information and Knowledge Management*)
Short Paper (Acceptance Rate ≈ 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 ≈ 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
ACM SAC 2022 (*The ACM Symposium on Applied Computing*)
Full Paper (Acceptance Rate ≈ 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
IEEE ICDM 2021 (*The IEEE International Conference on Data Mining*)
Full Paper (Acceptance Rate ≈ 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
ACM CIKM 2021 (*The ACM International Conference on Information and Knowledge Management*)
Full Paper (Acceptance Rate ≈ 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
IEEE IPDPS 2021 (*The IEEE International Parallel and Distributed Processing Symposium*)
Full Paper (Acceptance Rate ≈ 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
ACM SAC 2019 (*The ACM Symposium on Applied Computing*)
Full Paper (Acceptance Rate ≈ 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 ≈ 21%)

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 **ASK Best Paper Award** 2021, 2023
- Annual Spring Conference of KIPS (ASK)

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

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

Received the **KCC Best Presentation Award** 2017
- Korea Computer Congress of KIISE

INVITED TALKS

KHAN: Knowledge-Aware Hierarchical Attention Networks for Accurate Political Stance Prediction
- Invited Talk @ 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 (Online), Dec. 2022

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

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: 10-2555268 Jul. 2023
- Multi-State Diffusion Model Using Interest, Intimacy, and Share Tendency
  Registration Number: 10-2332348 Dec. 2020
- Accurate Ad-Effect Estimation Method based on Relevance between User and Item
  Registration Number: 10-2144122 Aug. 2020
- Influence Maximization in Social Networks: A Hybrid Approach Dec. 2017

Registration Number: 10-1810864

Filed Patents

- Knowledge-aware Hierarchical Attention Networks for Accurate Political Stance Prediction — May 2023
  Application Number: 10-2023-0059346
- A Layer-Wise Adaptive Approach toward Large-Scale DNN Training — June 2022
  Application Number: 10-2022-0075800

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