Junheng Hao

CONTACT INFORMATION

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RESEARCH INTERESTS

Knowledge is power; knowledge graphs (KGs) are power to next-generation AI Analytics. My research interests lie at the intersection of graph learning, data mining, natural language processing and machine learning with a focus on knowledge bases and graphs, especially learning symbolic and semantic structures inside KGs and its empowered interdisciplinary applications. My research goal is to develop: TBA

EDUCATION

University of California Los Angeles (UCLA), CA, USA — June 2022 *(Expected)*
Ph.D. in Computer Science
Thesis: Incorporating ontological information in knowledge graph learning and applications
Advisors: Yizhou Sun, Wei Wang
Area of Study: Knowledge graph, graph mining, natural language processing, machine learning, bioinformatics, recommender systems.

Tsinghua University, Beijing, China — May 2017
B. Eng. in School of Information Science and Technology
B. Sc (Econ, Minor) in School of Economics and Management

PROFESSIONAL EXPERIENCE (INDUSTRY)

Research Intern at Microsoft Research (MSR), Redmond, WA — June 2021 - Sept 2021
- **Mentors:** Chieh-Han Wu, Zhihong (Iris) Shen, Ye-Yi Wang, Jennifer Neville
- **Project:** KG-enhanced document representation learning
  - **Overview:** Enhancing document pretrained representations with infused document knowledge graph (DocKG), including Microsoft Academic Graph (Content + Graph).
  - **Deliverables:** One research technical preprint [12] under review.

PhD Research Intern at IBM Research AI, San Jose, CA — June 2020 - Sept 2020
- **Mentor: Mentors:** Chuan Lei, Berthold Reinwald, Fatma Ozcan
- **Project:** Ontology Matching by Utilizing Graph Neural Networks
  - **Overview:** Empowering hybrid graph neural networks (GNNs) for ontology matching between relational databases and standard healthcare ontologies.
  - **Deliverables:** One paper [1] published at KDD 2021 with corresponding invention filed and partially shipped in *IBM Micromedex solutions (Watson Health)*.

Applied Scientist Intern/Student Researcher at Amazon, Seattle, WA — June 2019 - Dec 2019
- **Mentors:** Tong Zhao, Luna Xin Dong, Christos Faloutsos
- **Project:** Diversified Complementary Recommendation on Product Graph
  - **Overview:** Enabling diversified complementary recommendation from web-scale product graphs and hierarchical product ontology.
  - **Deliverables:** One paper [3] published at CIKM 2020 and deployed in *Amazon-wide product complementary recommendation engine*.

Research Intern at **NEC Lab America**, Princeton, NJ — June 2018 - Sept 2018
- **Mentors:** Lu-An Tang, Zhichun Li, Haifeng Chen
- **Project:** Diversified Complementary Recommendation on Product Graph
  - **Overview:** Graph-based Multi-source graph knowledge transfer and network fusion on enterprise engines for malicious process detection.
  - **Deliverables:** One research technical preprint [11] under review.

Professional Experience (Academia)

Graduate Student Researcher at University of California, Los Angeles Sept 2017 - Present

- **Project 1: MurderBook: Homicide Knowledge Graph**
  - **Collaborators:** P. Jeffrey Brantingham (UCLA Department of Anthropology), Wei Wang
  - **Overview:** Constructing case knowledge graphs for Los Angeles homicide investigation to improve search, analysis and solvability.
- **Project 2: Knowledge Graph Inference on Texera Platform**
  - **Collaborators:** Chen Li (UC Irvine), Wei Wang
  - **Overview:** Implemented knowledge graph completion module, such as COVID-19 drug repurposing pipeline, on Texera (one online platform for code-free collaborative modularized ML).
- **Comprehensive KG Representation Learning Framework**
  - **Advisors:** Wei Wang, Yizhou Sun (Scalable Analytics Institute)
  - **Overview:** Incorporating ontologies and semantics in encyclopedia knowledge graphs and wide-ranging biological knowledge bases (gene ontologies, proteins, pathways and reactions, etc).

Publication Summary

As of December 2021: I have accomplished 10+ Papers published papers and submissions, among which I first-authored papers published on top-tier venues (KDD, CIKM, BCB) from interdisciplinary domains across machine learning, data mining and bioinformatics. These papers have received 150+ Citations. More up-to-date publication record can be found in *Google Scholar* and/or *Semantic Scholar*. Several research works and internship projects (such as P-Companion[3]) have been successfully deployed in market-scale product.

Publications, Submissions & Preprints

[1] *MEDTO: Medical Data to Ontology Matching using Hybrid Graph Neural Networks*
Junheng Hao, Chuan Lei, Abdul Quamar, Vasilis Efthymiou, Fatma Ozcan, Yizhou Sun, Wei Wang.
Proceedings of 27th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD, Applied Data Science Track). Auguest 2021.

[2] *JEDI: Circular RNA Prediction based on Junction Encoders and Deep Interaction among Splice Sites*
Jyun-Yu Jiang, Chelsea J.-T. Ju, **Junheng Hao**, Muhao Chen, Wei Wang.
Proceedings of the 29th annual international conference on Intelligent Systems for Molecular Biology and the 20th annual European Conference on Computational Biology (ISMB-ECCB). September 2021.

[3] *P-Companion: Framework for Diversified Complementary Product Recommendation*
Junheng Hao, Tong Zhao, Jin Li, Luna Xin Dong, Christos Faloutsos, Yizhou Sun, Wei Wang.
Proceedings of the 29th ACM International Conference on Information and Knowledge Management (CIKM), Applied Research Track. October 2020.

[4] *Bio-JOIE: Joint Representation Learning of Biological Knowledge Bases*
Junheng Hao, Chelsea J.-T. Ju, Muhao Chen, Yizhou Sun, Carlo Zaniolo, Wei Wang.
Proceedings of The 11th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM BCB 2020), September 2020. **Best Student Paper Award**.

[5] *Universal Representation Learning of Knowledge Bases by Jointly Embedding Instances and Ontological Concepts*
Junheng Hao, Muhao Chen, Wenchao Yu, Yizhou Sun, Wei Wang.
Proceedings of 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD, Research Track). August 2019.

[6] *Accident Impact Analysis in Traffic Safety and Mobility Using Group Network Features*
Chen-Shuo Sun, Xin Pei, **Junheng Hao**, Zuo Zhang.

Transportation Research Part B: Methodological (TRB), 2018.

[7] *Normal/Abnormal Heart Sound Recordings Classification Using Convolutional Neural Network*
Tanachat Nilanon, Jiayu Yao, **Junheng Hao**, Yan Liu.
Proceedings of the 43rd Computing in Cardiology Conference (CinC). December 2016.

[8] *A Data Driven Approach for Evaluation of Urban Accident Impacts*
Chen-Shuo Sun, **Junheng Hao**, Xin Pei, Zuo Zhang.
Proceedings of IEEE Conference on Intelligent Transportation Systems (ITSC), December 2016.

[9] *Metadata-Induced Contrastive Learning for Zero-Shot Extreme Multi-Label Text Classification*
Yu Zhang, Zhihong Shen, Chieh-Han Wu, Boya Xie, **Junheng Hao**, Ye-Yi Wang, Kuansan Wang and Jiawei Han.
Prerpint, under review.

[10] *A Mobility-Aware Longer-Term Deep Learning Model for COVID-19 PandemicPrediction with Policy Impact Analysis*
Danfeng Guo, Zijie Huang, **Junheng Hao**, Yizhou Sun, Wei Wang, Demetri Terzopoulos.
Prerpint, under review.

[11] *MSGT-GNN: Multi-source Graph Knowledge Transfer*
Junheng Hao, Lu-An Tang, Yizhou Sun, Zhengzhang Chen, Haifeng Chen, Junghwan Rhee, Zhichun Li and Wei Wang.
Prerpint, under review.

[12] *KG-Doc: Hybrid Knowledge Graph Infused Document Representation Learning*
Junheng Hao, Chieh-Han Wu, Iris Zhihong Shen, Boya Xie, Jennifer Neville, Ye-Yi Wang, Yizhou Sun, Wei Wang. Preprint, under review.

[13] *MurderBookKG: Homicide Analysis from Automatic Case Knowledge Graph Construction*
Junheng Hao, Jingyue Shen, P. Jeffrey Brantingham, Wei Wang. Preprint, under review.

[14] *Neighbor Aggregative Network Embedding*
Yunsheng Bai, Ruchi Jain, **Junheng Hao**, Yang Qiao, Zixia Weng, Yizhou Sun, Wei Wang. Preprint.

[15] *Latent Translational Dialogue State Tracking*
Muhao Chen*, **Junheng Hao***, Jyun-Yu Jiang, Zijun Xue, Yizhou Sun, Carlo Zaniolo, Wei Wang. Preprint.

PATENT APPLICATIONS

[16] *OntoGNN: Hybrid Graph Neural Networks for Ontology Matching.*
Chuan Lei, **Junheng Hao**, Vasilis Efthymiou, Fatma Ozcan, Abdul Quamar. U.S. Patent Application. (Sept. 2021)

ACADEMIC SERVICES

Conference Program Committee / Reviewer

- Conference on Neural Information Processing Systems (NeurIPS) 2021
- SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2019-2021
- International Conference on Machine Learning (ICML) 2020-2022
- AAAI Conference on Artificial Intelligence (AAAI) 2021,2022
- TheWebConf / International World Wide Web Conference (WWW) 2022
- International Conference on Learning Representations (ICLR) 2020-2022
- International Joint Conferences on Artificial Intelligence (IJCAI) 2020-2022
- IEEE International Conference on Data Engineering (ICDE) 2020
- Conference on Empirical Methods in Natural Language Processing (EMNLP) 2019

- SIAM International Conference on Data Mining (SDM) 2019-2022

Program Committee Board

- International Joint Conferences on Artificial Intelligence (IJCAI) 2022-2024

Journal Reviewer

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Big Data (TBD)
- ACM Transactions on Intelligent Systems and Technology (TIST)
- ACM Transactions on Knowledge Discovery from Data (TKDD)

Conference Volunteer

- International Conference on Learning Representations (ICLR) 2021
- SIKKDD Conference on Knowledge Discovery and Data Mining (KDD), 2019, 2020
- Conference on Empirical Methods in Natural Language Processing (EMNLP) 2020, 2021
- Conference on Neural Information Processing Systems (NeurIPS) 2018, 2020

Invited Talks

- Dec 2021: Coupang, Ranking, Discovery and Personalization.
  Invited tech talk: *Knowledge Graphs Meets Product Recommendation: One Deep Learning Solution*.
- Oct 2021: UCLA CS Data Science Seminar
  Graphs, Transformers, and When They Meet Biology (AlphaFold2). [Video]
- Aug 2021: Microsoft Search, Assistant and Intelligence (MSAI).
  Graph learning session: *Knowledge Graph with Ontology Learning and Applications*.
- July 2019: Amazon, Product Graph.
  Invited talk: *Representation Learning on Knowledge Graphs: Embedding, Logic Rules and Graph Neural Networks* (with Yizhou Sun).

Honors and Awards

- Best Student Paper Award (ACM BCB) 2020
- SIGIR Student Travel Grant (CIKM) 2020
- Student Travel Award (KDD) 2019, 2020
- UCLA Graduate Division Fellowship 2018-2019

Teaching

- CS M146: Introduction to Machine Learning (Instructor: Sriram Sankararaman).
  Teaching Associate / Head TA, Winter 2021 Evaluation Score: **8.2**/9.0
- CS145: Introduction to Data Mining (Instructor: Yizhou Sun)
  Teaching Associate / Head TA, Fall 2020 Evaluation Score: **8.0**/9.0
- CS32: Introduction to Computer Science II, Data Structures (Instructor: David Smallberg & Carey Nachenberg)
  Teaching Assistant, Spring 2019 & Winter 2019
- CS145:Introduction to Data Mining (Instructor: Yizhou Sun)
  Teaching Assistant, Fall 2018

Extracurricular Activities

- UCLA Volunteer Income Tax Assistance (VITA) Organization: *IRS-certified volunteer*
- UCLA Bruin Mental Health Advisory Committee: *Representative and advocate volunteer*
- UCLA GUM: Graduate-Undergraduate Mentorship Program: *STEM Graduate Mentor*
- UCLA CS PhD Mentorship Program: *Seinor PhD Mentor*

Skills

- **Programming:** Python (PyTorch, TensorFlow), C/C++, LaTeX, MATLAB, SQL
- **Language:** Mandarin (Native), English (Proficient), Spanish (Basic)