Chenkai Sun

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EDUCATION

University of Illinois Urbana-Champaign **Champaign, IL**
Ph.D. in Computer Science *09/2020 - 12/2024*
Research Advisors: Heng Ji, ChengXiang Zhai *GPA: 3.93/4.00*

University of Michigan **Ann Arbor, MI**
B.S. in Computer Science and Honors Statistics *09/2016 - 05/2020*
Research Advisors: H. V. Jagadish, Ji Zhu, Quentin F. Stout *GPA: 3.92/4.00*

RESEARCH INTERESTS

Natural Language Processing, Information Extraction, Information Retrieval, Large Language Model, Conversational AI, Recommendation Systems, Personalization, Multimodal Learning, Deep Learning, Social Networks, Sentiment Analysis

PROFESSIONAL EXPERIENCE

Amazon **Seattle, WA**
Applied Scientist Intern; Mentor: Kevin Small *05/2023 – 08/2023*

- Designed and implemented an innovative framework that models user interactions on a network by utilizing a Large Language Model (LLM) to extract latent personas and construct implicit communities. The framework effectively addressed the cold start problem and achieved state-of-the-art performance in both zero-shot and supervised settings for response prediction, surpassing the baselines by over 11% in accuracy (F1 score).
- Developed a knowledge graph structure-aware large language model adapter for efficient fine-tuning. The model outperformed the baselines on QA datasets by over 3% in accuracy.
- Implemented distributed training for the LLaMA-based model using DeepSpeed to enhance efficiency and scalability.

Alibaba (Neuro-Symbolic Lab, Now Mindverse AI) **Hangzhou, China**
Research Intern; Mentor: Fangbo Tao *05/2021 – 08/2021*

- Designed a method for goal-oriented script generation using retrieval and prompt learning. Led a team of 3 in devising the experiments and developing the method. The results surpassed the baseline on the WikiHow dataset by 58% in automatic metrics and 46% in human metrics, reaching state-of-the-art performance.

Uber (Machine Learning Platform) **San Francisco, CA**
Software Engineer Intern; Mentor: Eric Chen *05/2019 – 08/2019*

- Implemented Spark transformers and their Python wrappers in Scala to compute feature distribution data such as histograms and numerical/categorical statistics, and attach them to input data frame columns.
- Migrated evaluation data from the old visualization-oriented Thrift structures to the new computation-oriented format.
- Designed visualization templates using Plotly for classification, regression, and feature distribution evaluation.
- Created Data Science Workbench notebook templates that guide users through the process of initializing, training, and evaluating models, as well as visualizing results using the newly developed customized evaluation pipeline. These templates were developed based on feedback and communication with internal users.

PUBLICATIONS

- Cascade Speculative Drafting for Even Faster LLM Inference
  Ziyi Chen, Xiaocong Yang, Jiacheng Lin, **Chenkai Sun**, Jie Huang, Kevin Chen-Chuan Chang
  Arxiv Preprint

- Decoding the Silent Majority: Inducing Belief-Augmented Social Graph with Large Language Model for Response Forecasting
  Chenkai Sun, Jinning Li, Yi R. Fung, Hou Pong Chan, Tarek Abdelzaher, ChengXiang Zhai, Heng Ji
  Empirical Methods in Natural Language Processing (**EMNLP**), 2023
- LM-Switch: Lightweight Language Model Conditioning in Word Embedding Space
  Chi Han, Jialiang Xu, Manling Li, Yi R. Fung, **Chenkai Sun**, Nan Jiang, Tarek Abdelzaher, Heng Ji
  Under Review, 2023. *Arxiv Preprint*
- Measuring the Effect of Influential Messages on Varying Personas
  Chenkai Sun, Jinning Li, Hou Pong Chan, ChengXiang Zhai, Heng Ji
  Annual Meeting of the Association for Computational Linguistics (**ACL**), 2023
- Incorporating Task-specific Concept Knowledge into Script Learning
  Chenkai Sun, Tie Xu, ChengXiang Zhai, Heng Ji
  European Chapter of the Association for Computational Linguistics (**EACL**), 2023
- Fine-Grained Chemical Entity Typing with Multimodal Knowledge Representation
  Chenkai Sun, Weijiang Li, Jinfeng Xiao, Nikolaus Nova Parulian, ChengXiang Zhai, Heng Ji
  IEEE International Conference on Bioinformatics and Biomedicine (**BIBM**), 2021
- HySPA: Hybrid Span Generation for Scalable Text-to-Graph Extraction
  Liliang Ren, **Chenkai Sun**, Heng Ji, Julia Hockenmaier
  Findings of the Association for Computational Linguistics (**ACL** Findings), 2021
- MithraCoverage: A System for Investigating Population Bias for Intersectional Fairness
  Zhongjun Jin, Mengjing Xu, **Chenkai Sun**, Abolfazl Asudeh, and H. V. Jagadish
  Association for Computing Machinery's Special Interest Group on Management of Data (**SIGMOD**), 2020
- MithraLabel: Flexible Dataset Nutritional Labels for Responsible Data Science
  Chenkai Sun, Abolfazl Asudeh, H. V. Jagadish, Bill Howe, and Julia Stoyanovich
  ACM International Conference on Information and Knowledge Management (**CIKM**), 2019

SKILLS

- Programming languages: Python, C++, R, Scala, Java, JavaScript, PHP
- Technical: React, PyTorch, Flask, HTML & CSS, SQL, CUDA C++, Spark, Hadoop, MongoDB, JDBC, Regex, Bash, DeepSpeed, FSDP, HuggingFace, TensorFlow, PyG
- Others: Leadership, Product Design, Project Management, User Research, Communication

RESEARCH EXPERIENCE

Social Media Influence Campaigns Modeling
Advisors: Heng Ji, ChengXiang Zhai

- Collected Twitter data containing articles and responses from news accounts using Python and Twitter API. Annotated the dataset using the Amazon Mechanical Turk crowdsourcing platform.
- Analyzed the performances of trained language models in predicting user responses.

Missing Data Imputation with Variational Graph Neural Networks
Advisor: Ji Zhu

- Designed a variational autoencoder-based graph neural net framework for missing data imputation on network data. The method outperforms baselines on transductive and inductive imputation, and end-to-end label prediction.

Mithralabel: Flexible Dataset Nutritional Labels for Responsible Data Science

Advisor: H. V. Jagadish

- Designed and developed a web-based tool, MithraLabel, that generates task-specific information such as functional dependencies, association rules, and undersampling of attributes, to help the user decide the fitness of the dataset for this task, using Python, React, jQuery, and Flask.
- Led a team of 3 UI designers to devise and implement the user interface, resulting in publication at CIKM.
- Crawled the carspecs website (carspecs.us) using Python, cleaned the carspecs dataset by removing stop words, stemming the entries, and imputing the missing entries, and deduplicated the dataset.

UniIsoRegression: an R Package for Isotonic Regression Algorithms

Advisor: Quentin F. Stout

- Implemented and optimized Isotonic Regression algorithms, which generate isotonic models with minimized norm-based errors, in C++ and R, to demonstrate the algorithms and share them with the open-source community.
- Analyzed the time complexity of the algorithms and compared the running time of the program to that of existing packages on CRAN (The Comprehensive R Archive Network).
- Released the *UniIsoRegression* package in November 2017 (cran.r-project.org/web/packages/UniIsoRegression).

HONORS & AWARDS

- Saburo Muroga Endowed Fellowship *2020*
- Computer Science Excellence Fellowship *2020*
- Highest Honors in Statistics Major *2020*
- High Distinction on graduation *2020*
- James B. Angell Scholar *2020*
- EECS Scholar Award *2019, 2020*
- University Honors *Fall 2016, Fall 2017, Winter 2019, Fall 2019*

SERVICES

Program Committee Member

- ACL (2021-), EACL (2022-), EMNLP (2021-)

Teaching Assistant

- EECS 370 (Introduction to Computer Organization)

Mentored Students

- **Divyansh**, 2023-Now
  CS Undergraduate at Indian Institute of Technology, Kanpur
  Working on Video Propaganda Frames

PROJECT EXPERIENCE

Encyclopedia Search Engine (Python, Flask, Hadoop, SQL, SQLite3, HTML & CSS) *11/2017 - 12/2017*

- Implemented a search engine with MapReduce for scalability. The search results were ranked based on tf-idf and PageRank scores and each page contains a title, a summary, and several recommended pages.

Insta485 (website) (JavaScript, React, Python, Flask, HTML & CSS) *09/2017 - 10/2017*

- Designed and implemented an Instagram-like website, which included infinite-scroll newsfeed, friend recommendations, user profile, account management, etc.

News Article Summarization (Python) *03/2019 - 04/2019*

- Compared Textrank, Lexrank, and Divrank on summarizing the articles crawled from BBC News, based on ROGUE.