Jiaru(Rubin) Zou

jiaruzouu.github.io | linkedin.com/in/jiaruzou | jiaruz2@illinois.edu

Education

University of Illinois at Urbana-Champaign (UIUC) Champaign, IL
Bachelor of Science in Computer Engineering, Minor in Mathematics & Statistics. **GPA**: 3.98/4.00 August 2020 - May 2024
ZJU-UIUC Study Abroad Program. 2020 - 2021

Research Interests

- **Machine Learning:** Decision-making algorithms; Personalized recommendation; Meta-learning; Graph mining/learning; Contextual bandit problems; Deep reinforcement learning algorithms.
- **Natural Language Processing (NLP):** LLMs' reasoning and generation enhancement; LLMs for zero-shot/few-shot learning; LLMs' application on multimodal machine learning; code generation; Distillation and transfer learning in LLMs fine-tuning.

Research Experience

Senior Project and Thesis *Hybrid*
Undergraduate Researcher, Advised by Prof. Jiawei Han *August 2023-present*

- Conducted an automatic supervision generation technique to facilitate zero-shot learning in text classification tasks.
- Currently working on formulating a novel framework and producing top-tier training data using LLM's label-descriptive prompt to enhance intricate NLP tasks' performance including reasoning tasks, text summarization, and question answering.

Contextual Multi-armed Bandit and Meta-Learning Algorithm Design - UIUC iSAIL Lab *Champaign, IL*
Research Group Member, Advised by Prof. Jingrui He *March 2022-November 2023*

- Paper 1 (published on NeurIPS 2023): Designed a novel framework BASS to enhance task scheduling strategies by leveraging meta-model status. Addressed data scarcity during the initial stages of meta-training and laid the groundwork for subsequent meta-training iterations. Conducted coding experiments and ablation studies on the proposed framework.
- Paper 2 (submitted to SIGKDD 2024): Drafted a publication on an innovative framework PPB that combines exploration-exploitation strategy in neural bandits with PageRank vector to provide personalized recommendations in graph datasets.

Mathematical Language Processing - UIUC MLP Group *Champaign, IL*
Research Group Member, Advised by Prof. Kani Nickvash *August 2022-May 2023*

- Addressed mathematical token extraction by developing a novel dataset called MTDE from the ArXiv corpus. Conducted evaluations of dataset effectiveness by introducing new NLP tasks, encompassing single and multi-word descriptor extraction. Experimented with leading models such as GPT3 to assess their performance on the new dataset.
- Enhanced the self-designed dataset by augmenting it with additional mathematical tokens accompanied by context descriptions. Implemented an automated parsing system to extract and correlate mathematical variable definitions with existing math descriptors from diverse data sources.
- Presented the enhanced MTDE dataset's value for advanced classification tasks. Emphasized mathematical token attributes and properties, with the overarching goal of augmenting NLP models' classification capabilities in STEM domains. Currently drafting findings and targeting on TMLR 2024.

Deep Learning Model quantization - NCSA, Center for Artificial Intelligence Innovation *Champaign, IL*
Research Assistant, Advised by Prof. Volodymyr Kindratenko *January 2022-May 2023*

- Project 1: Applied pruning and post-training quantization techniques to enhance efficiency and performance in a convolutional neural network VGG16. Conducted extensive experiments, showing a 20x reduction in memory consumption, a 2.5x boost in training speed, and an 89% accuracy for image classification tasks.
- Project 2: Deployed a quantized vision transformer model onto Field Programmable Gate Arrays (FPGAs) to achieve hardware-level compilation and performance acceleration. Further developed the framework through the high-speed processor expansion bus (OpenCAPI), achieving a threefold increase in FPGA-based acceleration, highlighting its substantial computational prowess.

Internship Experience

Microsoft Research - NLP and ML Research Intern *Beijing, China; August 2023-present*

- Research project: Pioneered the concept of a versatile pre-processor called Table-Provider for streamlined tabular reasoning tasks of LLMs. Innovated and optimized tabular input through packing, sampling, and augmentation techniques. Enhanced LLM performance in structured data comprehension and concluded the achievement in a research publication.
- Engineering project 1: Cooperated with Microsoft Office365 teams and transferred research output of the Table-Provider into engineering product features including Excel Copilot and Anna-Talk.
- Engineering project 2: Participated into the development of a data insights and analysis library for Excel, focusing on L2 analysis problem-solving and enabling LLM insights learning. Created a semantic API (copilot) integrated with GPT-4 to enhance semantic granularity in analysis while ensuring both human and LLM usability.

Yummy Future & YC - Software and Robotics Engineering Intern *Champaign, IL; May 2023-August 2023*

- Built a robotics system for automated coffee service, utilizing a combination of Arduino, Raspberry Pi, and the MG400 robot.
- Devised TCP, Serial Service, and MQTT communication protocols to facilitate seamless interaction among system components. Orchestrated the deployment of a Firestore cloud command center for comprehensive and automated system control.
- Established and maintained the sustainability of the robotics system by implementing Pytest on the Raspberry Pi and integrating it with the cloud command center, guaranteeing reliable and consistent operation performance.
- Led the development of an Arduino2560 automated test system, focusing on the intersection of software and hardware elements, including the Cup/ICE dispenser and rail modules.

IntelliPro Group Inc. - Software Development Engineering Intern *Santa Clara, CA; June 2022-August 2022*

- Constructed the backend of a B2B sales intelligence and email campaign platform.
- Developed essential endpoint features, including A/B testing and conditional filters. Enhanced user experiences through product lifecycle design. Implemented a recommendation system based on the KNN-algorithm for relevant product recommendations.
- Implemented a comprehensive dataset containing customer information. Leveraged Scrapy and SQL to optimize data collection and management, resulting in improved sustainability and performance on the company's software APP.

UIUC Disruption Lab - Software Engineer *Champaign, IL; August 2022-May 2023*

Project1: OSF Health Care

- Collaborated with OSF HealthCare to enhance patient data privacy and control using Solidity-based blockchain systems.
- Deployed the Oasis Sapphire smart contract backend to safeguard patient data and ensure privacy.
- Developed a user-friendly React-based website, enabling users and administrators to manage their data securely via MetaMask registration. Expanded website functionality by implementing notifications and researcher portals, enhancing the governance system to improve user experience and data management.

*Porject2: Greenwashing with A*STAR Singapore*

- Collaborated with a Singapore research team to implement NLP and data mining tools for the systematic collection, interpretation, and analysis of sustainability data. Presented real-time global sustainability insights for informative visualization.
- Leveraged transfer learning models to enable highly accurate contextual searches within worldwide companies' ESG reports. Engineered prompts to extract structured data from reports and integrated it with OpenAI to generate a MongoDB Database.

Tencent - Product Management Intern *Beijing, China; May 2021-August 2021*

- Facilitated a cloud engineering team collaboration with BOE (Beijing Over East), driving forward an authentication and manufacturing initiative within the co-working project valued at over two million dollars.
- Conducted comprehensive research and analysis of the digital product sector, including assessments of several ongoing software products such as Tencent Cloud, showcasing expertise in user-experience evaluation and technical strategic planning.

Skills

- Programming Languages: C/C++, Python, C#, TypeScript, Java/JavaScript, x86, Solidity, Go, System Verilog, R, SQL.
- Techniques: PyTorch, TensorFlow, OpenAI, OpenCV, OpenCAPI, AWS, LaTeX, Git.

Publications

Manuscripts and Pre-prints *"*" denotes equal contribution.*

- TAP4LLM: Table Provider on Sampling, Augmenting, and Packing Semi-structured Data for Large Language Model Reasoning
  Yuan Sui, Jiaru Zou, Mengyu Zhou, Xinyi He, Lun Du, Shi Han, Dongmei Zhang *ArXiv, Submitted to VLDB*
- Personalized PageRank Bandits and Applications *ArXiv, Submitted to SIGKDD*
  Yikun Ban, Jiaru Zou*, Zihao Li, Dongqi Fu, Jian Kang, Jingrui He*

Peer-reviewed Conference

- Meta-Learning with Neural Bandit Scheduler *Published on NeurIPS 2023*
  Yunzhe Qi, Yikun Ban*, Tianxin Wei, Jiaru Zou, Huaxiu Yao, Jingrui He.*

Community Services

Academic:

- ICML: program committee paper reviewer 2023
- NeurIPS: program committee paper reviewer 2023
- VLDB: program committee paper reviewer 2022

School & RSO:

- UIUC Disruption Lab: Software Engineer 2022 - 2023
- Chinese Engineering Student Association: Technology Department member 2022
- Illinois Solar Car: electronic and data analysis team member 2021
- Campus Ambassador of Tencent 2021
- Course Assistant and grader of ECE210, ECE310, ECE313, CS374 2021 - 2023
- Chinese Student & Scholar Esports Association: Vice President 2021 - 2022
- Overseas China Education Foundation (OCEF): Student Tutor, team member 2020 - 2022
- Chinese Union - Illinois Chinese Student Organization: minister of public relation 2020 - 2022

Honors And Awards

- Microsoft Stars of Tomorrow Award 2023
- O. Thomas and Martha S. Purl Scholarship 2023
- Daniel W. and Carol A. Dobberpuhl Student Award 2023
- Innovation Program Certificate 2023
- Illinois Engineering Outstanding Scholarship 2023
- Professor N. Narayana Rao Scholarship 2022
- Illinois Engineering Achievement Scholarship 2022
- UIUC Edmund J. James Scholarship 2021 - 2023
- UIUC Dean's List 2020 - 2023
- International Concrete Dragon Boat Competition (ICDBC), Second Prize and Best Design Prize. 2020