Mingjia Huo

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Education

University of California, San Diego (UCSD) *California, US*

PhD in Electrical and Computer Engineering (GPA: 4.0) *Sep 2023 - now*

- Advisor: Pengtao Xie

University of Illinois, Urbana-Champaign (UIUC) *Illinois, US*

MS in Electrical and Computer Engineering (GPA: 3.95) *Aug 2020 - Dec 2022*

- Advisor: Kirill Levchenko

Peking University *Beijing, China*

BS in Computer Science (Turing Class, GPA: 3.76, rank top 10%) *Sep 2016 - Jun 2020*

- Advisor: Qun Huang

Research Projects

Multi-Modal Reasoning with Process Reward Model *Oct 2024 - now*

- Leveraged the Phi-3.5B vision model to generate chain-of-thought reasoning steps on the ScienceQA and MathVista datasets.
- Applied Monte Carlo Tree Search (MCTS) to assign rewards to individual reasoning steps and utilized the results to train a process reward model (PRM).
- Fine-tuned the Phi-3.5B vision model with PRM on ScienceQA and MathVista datasets to enhance reasoning capabilities.

LLM Watermarking *Sep 2023 - Feb 2024*

- Applied watermarking by adjusting LLM logits during LLM inference time to add watermark.
- Designed a multi-objective optimization framework to balance detectability and semantic coherence.
- Applied Gumbel-Softmax and a straight-through estimator to preserve gradients.
- Evaluated on C4 realnewslike dataset and showed our method significantly improved the Pareto frontier of detection-semantics trade-off curves.
- Analyzed the learned parameters with respect to part-of-speech (POS) tags.

Multi-Modal Large Language Model for Protein Function Prediction *Jul 2023 - Aug 2024*

- Applied multimodal learning (LLAVA) to perform instruction tuning based on Llama2-13B on one million QA data points.
- Utilized Pytorch Distributed Data Parallel (DDP) for multi-GPU training.
- Evaluated the performance on open-text generations and classification tasks using F1-score, perplexity, BLEU, and SimCSE.
- Visualized the learned embeddings using t-SNE.

Publication

[1] Mingjia Huo, Sai Ashish Somayajula, Youwei Liang, et al. Token-Specific Watermarking with Enhanced Detectability and Semantic Coherence for Large Language Models. International Conference on Machine Learning (ICML), 2024.

[2] Mingjia Huo, Han Guo, Xingyi Cheng, et al. Multi-Modal Large Language Model Enables Protein Function Prediction. (Under review for Nature Methods)

[3] Mingjia Huo, Maxwell Bland, Kirill Levchenko. All Eyes On Me: Inside Trackers' Exfiltration of PHI from Healthcare Providers' Online Systems. Proceedings of the 21th ACM Workshop on Privacy in the Electronic Society (WPES), 2022.

Working Experience

Trova AI, Inc. *Illinois, US*

AI Software Development Intern *May 2022 - Aug 2022*

- Conducted customer segmentation using clustering methods for Snap-on, a US manufacturing company.
- Performed feature engineering on the purchase history of 6 million customers spanning from 2010 to 2022.
- Trained XGBoost model to predict individual purchase intention, and improved F1-score by 14%.
- Presented findings to the company's leadership and the franchisee training sessions for deployment.

Biomap *Beijing, China*

Machine Learning Engineer Intern *Jul 2023 - Sep 2023*

- Leveraged xTrimoPGLM-1B as the encoder to extract protein embeddings from amino-acid sequences.
- Trained a lightweight adapter to map protein embedding to the embedding space of Llama2.

Skills

Tool PyTorch, Matlab, Kubeflow, Snowflake, Adobe Illustrator
Programming Python(Fluent), SQL(Fluent), C, C++

University Working Experience

2022 Teaching Assistant, CS 461: Computer Security I *UIUC*
2022 Teaching Assistant, ECE 445: Senior Design Laboratory *UIUC*
2019 Teaching Assistant, Theoretical Computer Science *PKU*

Selected Awards

2019 **Fellowship**, Hui-Chun Chin and Tsung-Dao Lee Chinese Undergrad Research Endowment
2015 **Silver Medal**, Chinese Mathematical Olympiad
2015 **Gold Medal**, Chinese Girls' Mathematical Olympiad