Krishna Sri Ipsit Mantri

https://ipsitmantri.github.io Google Scholar mantrik@purdue.edu

Education

Purdue University, West Lafayette, IN, United States — August 2023 - Present
Master of Science in Computer Science — Graduation: May 2025
Specialization: Machine Learning
GPA: 3.74/4.0;

Indian Institute of Technology Bombay, Mumbai, India — Jul 2018 - May 2022
Bachelor of Technology in Electrical Engineering
GPA: 9.36/10.0
Minor Degrees: (1) Computer Science and Engineering (2) Artificial Intelligence and Data Science

Publications

Krishna Sri Ipsit Mantri, Xinzhi Wang, Carola-Bibiane Schönlieb, Bruno Ribeiro, Beatrice Bevilacqua, Moshe Eliasof. DiGRAF*: Diffeomorphic Graph-Adaptive Activation Function.* under review at NeurIPS 2024. [arXiv]

Nevasini Sasikumar, **Krishna Sri Ipsit Mantri**, *STAGCN: Spatial-Temporal Attention Based Graph Convolutional Networks for COVID-19 Forecasting*, accepted for oral presentation at the 2023 ICLR First Workshop on Machine Learning & Global Health. [OpenReview]

Pritish Chakraborty, Sayan Ranu, **Krishna Sri Ipsit Mantri**, Abir De, *Learning and Maximizing Influence in Social Networks Under Capacity Constraints*, accepted for publication at the 16th ACM International Web Search and Data Mining Conference (WSDM), 2023. [ACM]

Research Experience

DiGRAF: **Diffeomorphic Graph Activation Function** — December 2023 - May 2024

- Developed DiGRAF, a flexible graph-adaptive activation function using diffeomorphisms and CPAB transformations.
- Created an end-to-end framework that adapts activation based on graph structure and task needs.
- Integrated an additional GNN to learn diffeomorphism parameters for enhanced graph adaptivity.
- Achieved 18% improvement in MAE on **ZINC** and 4.7% in ROC-AUC on **molhiv** over leading baselines.
- Proved key properties of DiGRAF, including differentiability, boundedness, and permutation equivariance.
- Performed theoretical analysis proving key properties of DIGRAF: differentiability, boundedness, and permutation equivariance.
- Consistently outperformed 12 baseline activation functions in extensive experiments across 15 datasets.

Sony AI Research — May 2024 - August 2024
Research Scientist Intern — Tokyo, Japan

- Proposed and developed **Sparse View Augmentation for Zero-Shot 3D Scene Reconstruction via Diffeomorphic Enhancements**, a novel framework enabling 3D scene reconstruction from a single input view.
- Introduced a deterministic zoom-enhance framework to generate a secondary sparse view, avoiding common pitfalls like hallucination and loss of detail, without relying on diffusion models.
- Utilized small-magnitude diffeomorphic transformations to simulate realistic camera pose changes, effectively generating viewpoint diversity from a single image.
- Integrated this approach with MVSplat, a state-of-the-art feed-forward Gaussian prediction model, to render high-quality 3D scenes in under 15 seconds, significantly improving speed and visual quality over existing methods.
- Addressed the challenges of single-image 3D reconstruction in complex scenes, providing a scalable and efficient solution for real-time applications where multi-view data acquisition is constrained.

Grad Course Projects

Diagnosing Supply Chain Optimization Problems using LLMs August 2023 - May 2024
with Prof. Can Li

- Developed a GPT-4 based chatbot to solve industry-scale optimization problems using Mixed Integer Programming
- Incorporated advanced capabilities like infeasibility troubleshooting, sensitivity analysis, and counterfactual reasoning
- Proposed and developed a Proof-of-Concept using Code Gen + RAG for enhanced chatbot capabilities
- Tech Stack: OpenAI API, LlamaIndex, ChromaDB, Streamlit, PySide6

Code Review Automation using LLMs + RAG January 2024 - May 2024
CS 592 - AI Assisted Software Eng. Seminar with Prof. Tianyi Zhang

- Developed a novel multi-stage code review generation framework using RAG-empowered off-the-shelf LLMs
- Verified the efficacy of the proposed approach using LLMs of different capacities (GPT-3.5, Mistral 7B, Llama 3 70B)
- Implemented the framework as a Github App for automated code review of pull requests
- Tech Stack: OpenAI API, LlamaIndex, Weviate

xkcd-style Comic Generation using DPO January 2024 - May 2024
CS 587 - Foundations of Deep Learning with Prof. Raymond Yeh

- Fine-tuned StableDiffusion model using LoRA for 50k steps using 2240 comics
- Trained a ResNet-18 reward model to capture coherent text within generated comics
- Performed second-stage fine-tuning using Direct Preference Optimization for 20k steps
- Achieved improved CLIP and FID scores in comic generation

Industry Experience

Texas Instruments July 2022 - July 2023
Software Enginner, Power Interfaces Firmware Team Bangalore, India

- Worked on FW validation of Power over Ethernet Power Sourcing Equipment controller chip TPS23881
- Used Pytest and Jenkins automation framework to detect and validate correct state machine execution
- Gained deep understanding of PoE PSE specs, TPS EVM datasheets, FW debugging, and new product development

Microsoft May 2021 - July 2021
Software Engineer Intern, Defensive Search @ Bing Hyderabad, India

- Automated the query expansion pipeline for enabling safe search in the Bing search engine using C#
- Reduced query treatment time by 62% using sampling techniques to minimize crowdsourcing budget
- Built a job manager for submitting and tracking multiple workflows to improve agility and quality

Other Experience

Computer Systems Bootcamp, *Teaching Assistant for OS* Summer 2022
IITB CS 419M Introduction to Machine Learning, *Head Teaching Assistant* Spring 2022
IITB MA 108 Ordinary Differential Equations, *Teaching Assistant* Fall 2021

Skills

Programming Languages: Python, C++, MATLAB, C#
Machine Learning Frameworks: PyTorch, PyTorch Geometric, Huggingface, Detectron2

Scholastic Achievements

2023 Accepted to The Cornell, Maryland, Max Planck Pre-doctoral Research School
2022 Achieved perfect GPA of 10.0/10.0 in the 8th semester at IIT Bombay
2018 Secured All India Rank of 242 in JEE Advanced among 0.2 million candidates
2016 KVPY Fellowship (Declined) by Department of Science and Technology, Government of India

References

Dr. Moshe Eliasof
Department of Applied Mathematics at University of Cambridge, **Email:** me532@cam.ac.uk.