Krishna Sri Ipsit Mantri

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Education	**Purdue University**, West Lafayette, IN, United States Master of Science in Computer Science Specialization: Machine Learning GPA: 3.74/4.0;	August 2023 - Present Graduation: May 2025
	Indian Institute of Technology Bombay, Mumbai, India Bachelor of Technology in Electrical Engineering GPA: 9.36/10.0 Minor Degrees: (1) Computer Science and Engineering (2) Artificial Intelligence and Data Science	Jul 2018 - May 2022

Publications

Krishna Sri Ipsit Mantri, Xinzhi Wang, Carola-Bibiane Schönlieb, Bruno Ribeiro, Beatrice Bevilacqua, Moshe Eliasof. DɪGRAF: *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

DɪGRAF: **Diffeomorphic Graph Activation Function**   December 2023 - May 2024

Worked on developing a novel graph-adaptive activation function for Graph Neural Networks (GNNs)

- Developed DɪGRAF, leveraging diffeomorphisms and Continuous Piecewise-Affine Based (CPAB) transformations to create a flexible, graph-adaptive activation function.
- Designed and implemented an end-to-end learning framework that adapts the activation function to both input graph structure and task requirements.
- Incorporated graph-adaptivity by implementing an additional GNN to learn diffeomorphism parameters based on input graphs.
- Conducted extensive experiments across 15 datasets, including node classification, graph classification, and regression tasks.
- Achieved significant performance improvements – 18% relative improvement in MAE on ZINC and 4.7% absolute improvement in ROC-AUC on MOLHIV dataset over the best performing baseline
- Performed theoretical analysis proving key properties of DIGRAF: differentiability, boundedness, and permutation equivariance.
- Compared DIGRAF against 12 baseline activation functions, including traditional, learnable, and graph-specific functions, consistently demonstrating superior performance.
- Demonstrated DIGRAF's ability to learn complex non-linearities due to its diffeomorphism-based blueprint.

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		

Sony AI Research   May 2024 - August 2024
Research Intern   Tokyo, Japan
- Designed and developd a web application that generates a 3D model of the scene using a text prompt
- Performed a benchmarking study on various Text-to-3D models, including NeRFs and 3D Gaussian Splatting.
- Demostrated the pitfalls of using 3D object generating models for scenes by ideating and conducting experiments

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
Misc: OpenAI API, LlamaIndex, ChromaDB, Streamlit, Git, LaTeX

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, **Tel:** .