Krishna Sri Ipsit Mantri

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Education

Purdue University, West Lafayette — IN, USA
Master of Science in Computer Science — *Aug'23 – Present*

- Cumulative GPA: 3.74/4.0
- Courses: Databases, Machine Learning Theory, Algorithms & Complexity, Foundations of Deep Learning

Cornell-Maryland-Max Planck Pre-doctoral Research School — Saarbrücken, Germany
Summer School in Computer Science — *Aug'23*

Indian Institute of Technology Bombay — Mumbai, India
Bachelor of Technology in Electrical Engineering — *July'18 – May'22*

- Cumulative GPA: **9.36/10.0**
- Minor Degrees: (1) Computer Science and Engineering (2) Artificial Intelligence and Data Science

Publications

1. **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
2. 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.
3. 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.

Key Projects

Diagnosing Supply Chain Optimization Problems using LLMs — Aug'23 – May'24
Graduate Research Assistant, PI: Prof. Can Li, Davison School of Chemical Engineering — *Purdue University*

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

Code Review Automation using LLMs + RAG — Jan'24 – May'24
CS 592 - AI Assisted Software Eng. Seminar, Advisor: Prof. Tianyi Zhang — *Purdue University*

- 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)
- Shipped the framework as a *Github App* that automatically reviews each code diff patch of a pull request
- Tech Stack: OpenAI Api, LlamaIndex, Weviate

xkcd-style Comic Generation using DPO — Jan'24 – May'24
CS 587 - Foundations of Deep Learning, Advisor: Prof. Raymond Yeh — *Purdue University*

- Performed web-crawling to curate a dataset of image and text pairs for each xkcd comic
- Fine-tuned StableDiffusion model using LoRA for 50k steps using 2240 comics
- Manually labelled a held-out set of 580 comics as good vs bad and trained a ResNet-18 reward model to capture coherent text within the generated comic
- Performed a second stage of fine-tuned using *Direct Preference Optimization* for 20k steps and observed improved clip and fid scores

Professional Experience

Software Engineer | **Texas Instruments** | **Power Interfaces Firmware Team** *July'22 – July'23*

TI designs and manufactures semiconductor chips, focusing on analog chips and embedded processors

- Worked on **FW validation** of **Power over Ethernet** Power Sourcing Equipment controller chip TPS23881
- Used **Pytest** and **Jenkins** automation framework to detect and validate the correct state machine execution
- Gained a deep understanding of PoE PSE specs, TPS EVM datasheets, **FW debugging**, among others
- Gained knowledge of **new product development**, **interaction with customers** and FW release process

Software Engineer | **Microsoft** | **Defensive Search @ Bing** *May'21 – Jul'21*

Microsoft is a multinational technology company producing computer software, consumer electronics, personal computers

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

Engage Mentorship Program | **Microsoft** *Jun'20 – Jul'20*

This is for sophomore college students who are guided by Microsoft employees on a web dev project along with various webinars

- Developed a web app in Angular to simulate the movement of a mars rover by ideating on different scenarios
- Implemented various shortest-path and maze-generator algorithms like Dijkstra, Floyd-Warshall & Prim
- Modelled the terrain of Mars on a 2D grid using different types of obstacles and tackled traveling salesman problem

Teaching Assistantships | IIT Bombay

Facilitating smooth course organization, grading papers, mentoring students, conducting tutorials and help sessions

- **Computer Systems Bootcamp**: OS Track, Prof. Mythili Vutukuru, CSE Department — Summer'22
- **CS 419M: Introduction to Machine Learning**, Prof. Abir De, CSE Department — Spring'22
- **MA 108: Ordinary Differential Equations**, Prof. Prachi Mahajan, Department of Mathematics — Fall'21

Scholastic Achievements

- Accepted to **The Cornell, Maryland, Max Planck Pre-doctoral Research School** 2023 (*2023*)
- Achieved **perfect GPA of 10.0/10.0** in the 8th semester (*2022*)
- Received a **certificate of merit** for extraordinary performance in the Digital Signal Processing course (*2020*)
- Secured an **All India Rank of 242** in JEE Advanced among 0.2 million candidates (*2018*)
- Secured an **All India Rank of 123** in JEE Mains (Engineering) among 1.3 million candidates (*2018*)
- Ranked in the **national top 1%** in NSEC and NSEA and selected to appear for INChO and INAO (*2018*)
- Recipient of the **KVPY Fellowship** by Department of Science and Technology, Government of India (*2016*)

Other Projects

Efficient Matroid-Constraint-Based Submodular Maximization | *CS769: Optimization in ML* *Spring 2022*

- Implemented the computationally efficient continuous greedy and **accelerated continuous greedy** algorithms
- Modified the **Pipage-Rounding** subroutine for efficient translation of fractional solutions to discrete subsets
- Implemented the **Submodular Welfare Problem**, **Separable** and **Generalized Assignment Problem** in submodlib

Post-Hoc Out-of-Distribution Detection | *CS726: Advanced Machine Learning* *Spring 2022*

- Proposed a **scoring function** based on the **Dirichlet** distribution on the DNN's softmax-ed logits for OOD detection
- Verified and validated that the score **outperformed** other OOD metrics on multiple datasets and tasks
- **Reduced** the number of hyperparameters to by demonstrating the efficacy of **marginless loss** functions for the task

Statistical Compressed Sensing of Gaussian Mixture Models | *CS754: Adv. Image Processing* *Spring 2021*

- Exploited **statistical properties** of natural images to reconstruct them using a linear decoder in MATLAB
- Compared SCS and conventional CS using a **dictionary learned** via K-SVD on Berkeley Segmentation dataset
- Performed **blind CS** on standard images like **Lena** and **Peppers** and contrasted the results with SCS and CCS

Fast Texture Transfer using Wavelets | *CS663: Digital Image Processing* *Fall 2020*

- Used wavelet-based **image fusion** to transfer texture from texture image to source image in linear time w.r.t size
- Employed **CDF 9/7** wavelet decomposition on Y channel and used histogram matching for better visual appeal

Wavelet Based ECG Delineator and ECG Data Compression | *EE338: Digital Signal Processing* *Fall 2020*

- Used **Singular Value Decomposition** to compress the ECG signals by exploiting their **periodicity in time**
- Employed quadratic spline wavelet filter banks and ***Algorithme à trous*** to **robustly** delineate a noisy signal
- Tested our procedure on **physionet** databases and achieved accuracies greater than **95%** on signals with artifacts