Suraj Prasad

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Education

IIT Bombay Aug 2022 - Present
B.Tech in Mechanical Engineering ***CGPA: 8.58/10***
Minor in Computer Science and Engineering ***CGPA: 10/10***
Relevant Coursework: Object Oriented Programming, Databases, Linear Algebra, Probability, Data Structures and Algorithms,Computer Networks, Machine Learning, Data Mining, Image Processing, RAG

Skills

Languages: C/C++, Python, MATLAB, JavaScript, HTML, CSS,React, SQL, Latex

Technologies & Tools: PyTorch, TensorFlow, Langchain, Chainlit, OpenCV, Pandas, bash scripting, Linux, Docker, Git, DSA, LangGraph

Publication

Federated Cross-Modal Style-Aware Prompt Generation | CVPR 2025 (under review) September 2024 - February 2025

Researcher

- Developed FedCSAP, a federated prompt learning model that fuses multi-scale visual features with local style cues using cross-attention and injection blocks—pushing boundaries in model adaptation, enhancing versatility remarkably.
- Achieved superior performance on non-IID data, enhancing generalization to unseen classes and domains compared to existing methods boosting accuracy, ensuring consistent performance, and delivering unmatched reliability.
- Designed a privacy-preserving federated learning pipeline that minimizes communication overhead through effective parameter sharing—ensuring scalable deployment, maximizing operational efficiency, and securing data integrity

MedPromptExtract | The Journal of Applied Laboratory Medicine August 2023 - February 2024

Researcher

- Implemented EIGEN and LayoutLM for semi-supervised record anonymization, using labeling functions with positional heuristics with minimal annotation (714 labeled , 20 unlabeled) reducing annotation time by over 90%
- Developed Streamlit-based interface for automated anonymization of confidential information ensuring data privacy and Dockerized the GUI code for deployment and scalability across different environments ensuring accessibility

Smart India Hackathon

Ministry Of Social Justice and Empowerment September 2024 - December 2025

AI Engineer

- Secured 1st rank nationwide for developing a bidirectional real-time speech-to-sign and sign-to-speech system
- Designed and implemented PoseNet and LSTM-based architectures, achieving accurate ISL gesture recognition
- Integrated Speech-to-Text,NMT and MediaPipe for rendering ISL gestures with 3D avatars for forward pipeline
- Developed a Sign-to-Text system integrating MediaPipe's Hand Tracking API, Pose Estimation, and ad- vanced NLP models to convert ISL gestures into written text, enhancing accessibility for non-signing users.
- Developed a system to detect sign language users in Google Meet through ultrasonic signals, ensuring their active speaker visibility and accessibility while enabling seamless communication between multiple deaf individuals

Internships and Technical Projects

BharatGen September 2024 - January 2025

LLM Engineer

- Implemented Graph-Based Retrieval with LightRAG combining entity and relationship indexing for accurate retrieval
- Built multimodal RAG pipeline integrating text and image retrieval with a combined vector store for efficient retrieval
- Used multi-vector retrievers and vector databases to optimize search and retrieval across both image and text data
- Deployed low-level and high-level keys for optimized retrieval, supporting both specific and generalized query handling
- Added self-reflection process to grade document retrieval accuracy, and mitigate hallucinations in response generation

Markdrop August 2024 - January 2025

LLM Engineer

- Built Markdrop Python Package which quickly gains traction, hitting 7,000+ installs in a month
- Developed robust support of 6 LLM clients to generate descriptions for both visual content (plots/images) and tables.

3D Object Detection Under Sensor Failure | ICRA 2024: RoboDrive Challenge January 2024 - February 2024

LLM Engineer

- Challenge involved predicting 3D bounding boxes where autonomous cars suffer temporary sensor failure
- Secured **4th rank worldwide** achieving Mean Average Precision **0.30** beating the previous benchmark **mAP 0.25**
- Benchmarked on **nuScenes dataset** with **1.4M images six**, per frame and **390k LIDAR** sweeps (one per frame) l
- Integrated multi-modal sensor data **(camera, LiDAR)** in a shared **bird's-eye view** (BEV) space to leverage the complementary strengths of both visual and distance measurements, for robustness of 3D object detection tasks

KCDH, IITB Sep 2023 - Feb 2024

Machine Learning Researcher

- Built MedPromptExtract, an automated tool for extracting data from DS while ensuring confidentiality.
- Implemented EIGEN and LayoutLM for semi-supervised record anonymization, using labeling functions with positional heuristics with minimal annotation (714 unlabeled , 20 labeled) reducing annotation time by over 90
- Implemented an NLP model for text pattern matching to organize data into DataFrame, supplemented by prompt engineering via the Gemini API (temperature 0) for response agreement analysis using the Kappa coefficient.
- Developed Streamlit-based interface for automated anonymization of confidential information ensuring data privacy and Dockerized the GUI code for deployment and scalability across different environments ensuring accessibility

CSRE, IITB June 2024 - Present

Computer Vision Researcher

- Conducted meticulous experimentation and evaluation on the CLIP model, optimizing image-text context alignment
- Enhanced prompt learning by combining features from multiple encoder layers for better remote sensing classification
- Leveraged CLIP's capabilities to refine scene classification models, resulting in better contextual understanding

Think Onwards Stranger Section-2 May 2024 - June 2024

Computer Visinon Engineer

- Ranked 49/299 teams globally focused on segmenting minerals from micro rock samples with limited labeled data (87)
- Achieved a remarkable mIoU score of 0.4934 in semantic segmentation, surpassing the previous result by 115.2%units
- Systematically experimented with R2AU-Net, ViT, DeepLabV3, Auto Encoder resulting in 50% improvement
- Utilized unlabeled dataset for semi-supervised task, leveraging Unimatch to achieve additional 30% boost in result
- Conducted meticulous experimentation and detailed analysis using W&B track tool led improvement of over 4-5%

Koita Centre For Digital Health Dec 2023 - Jan 2024

Machine Learning Engineer

- Implemented LangChain pipeline to extract information from 30,000+ mammography reports using text splitting,HuggingFace embeddings , and custom prompt with Llama2 7B model, achieving accurate data extraction
- Developed a chatbot using LLaMA2 7B model and Chainlit, integrating 20+ prompts for information extraction
- Python, Langchain, Chanilit, scikit-learn, CI/CD

ISB, Banglore Feb 2024 - March 2024

Data Analyst Intern

- Automated web scraping using Selenium and Beautiful Soup to efficiently gather and process large datasets
- Developed data extraction tool with OpenAI's GPT-3.5-turbo to swiftly identify and retrieve financial information
- Reduced manual data collection time by more than 90% by implementing NLP methods and prompt engineering.

Azeotropy Predictioneer, IITB Jan 2024 - Feb 2024

Data Science Competetion

- Secured 1st rank across 80+ competing teams achieving 90% accuracy in timeseries prediction of groundwater
- Cleaned and prepared the dataset, conducted extensive EDA with heat maps and covariance matrices identifying key features, separated features for predicting 3 groundwater depths, and removed outliers using the Z-score method
- Calculated correlation coefficients to identify 9 key features, applied PCA to select the top 3 components, and implemented LSTM network for forecasting timeseries groundwater depth 15 days ahead using 180 days of data

Crop Disease Detection Oct 2023 - Dec 2023

Data Science Project

- Implemented robust image preprocessing techniques with OpenCV, effectively standardizing and resizing more than 1000+ crop disease images sourced from the PlantVillage dataset, crucial for facilitating multiple feature extraction
- Leveraged ImageDataGenerator to apply diverse data augmentation techniques, effectively augmenting the dataset and enabling model convergence over 47 epochs, thereby enhancing robustness and performance significantly
- Attained a 71.57% test accuracy, indicating the model's efficiency and reliability in the crop disease identification

Course Projects

Predictability of Stock Market Data April 2024 - May 2024

Data Analysis

- Utilized Shannon's Entropy and Approximate Entropy to analyze NASDAQ and DJIA, for pattern consistency
- Achieved forecasting accuracy with XGBoost R^2 values up to 0.995, analyzed stock movements using Hurst exponent and entropy measures, indicating persistent correlations with Hurst values of 0.769 for NASDAQ and 0.706 for DJIA

Web Development Jul 2023 - Dec 2023

Fronted developer

- Spearheaded the end-to-end development of a dynamic website from scratch for the IITB Rocket Team, employing HTML, CSS, and Javascript to create an interactive online platform showcasing the team's projects
- Designed seven landing pages with interactive animations, intuitive user interfaces, and a visually appealing layout
- Developed a contact page featuring a dynamic map and enhanced with animations like falling stars during page load

Leadership and Mentorship roles

Team Manager | Unmesh Mashruwala Innovation Cell, IIT Bombay Aug 2023 - Present

- Managing a diverse team of 32, responsible for gaining sponsorships and establishing a strong social media presence
- Organised the recruitment drive and interviews to select 20 freshmen from the pool of 100+ applicants for UMIC
- Coordinated budget proposal of 1.5M INR, optimised the uses of allocated budget and ensured project timeline

Summer of Science Mentor May 2024 - Jul 2024

- Trained 5 students from IIT Bomaby in implementing Image Classification, Object detection and Semantic Segmentation
- Taught CNN, VGG16, RCNN, Faster RCNN, Mask RCNN, UNet, R2Attention UNet with real Dataset
- Enhanced practical skills in implementing and troubleshooting deep learning models through weekly live sessions