

# Suraj Prasad

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## Education

<b>IIT Bombay</b>	Aug 2022 - Present
<b>B.Tech in Mechanical Engineering</b>	<b>CGPA: 9.42/10</b>
<b>Minor in Computer Science and Engineering</b>	<b>CGPA: 10/10</b>
<b>Higher Secondary Education, NPRS , Siliguri</b>	<b>98.6%</b>
<b>Senior Secondary Education, HB Vidyapith , Siliguri</b>	<b>97%</b>
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, SQL, Latex

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

## Publication

<b>MedPromptExtract   The Journal of Applied Laboratory Medicine (under the review)</b>	September 2024 - Present
<b>Researcher</b>	
<ul style="list-style-type: none"><li>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%</li><li>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</li></ul>	

## Indian Government Hackathon

<b>Ministry Of Social Justice and Empowerment</b>	September 2024 - Present
<b>AI Engineer</b>	
<ul style="list-style-type: none"><li>Secured 1st rank nationwide for developing a bidirectional real-time speech-to-sign and sign-to-speech system</li><li>Designed and implemented PoseNet and LSTM-based architectures, achieving accurate ISL gesture recognition</li><li>Integrated Speech-to-Text, NMT and MediaPipe for rendering ISL gestures with 3D avatars for forward pipeline</li><li>Developed a Sign-to-Text system integrating MediaPipe's Hand Tracking API, Pose Estimation, and advanced NLP models to convert ISL gestures into written text, enhancing accessibility for non-signing users.</li><li>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</li></ul>	

## Internships and Technical Projects

<b>Technology Innovation Hub, IITB</b>	September 2024 - Present
<b>LLM Engineer</b>	
<ul style="list-style-type: none"><li>Implemented Graph-Based Retrieval with LightRAG combining entity and relationship indexing for accurate retrieval</li><li>Built multimodal RAG pipeline integrating text and image retrieval with a combined vector store for efficient retrieval</li><li>Used multi-vector retrievers and vector databases to optimize search and retrieval across both image and text data</li><li>Deployed low-level and high-level keys for optimized retrieval, supporting both specific and generalized query handling</li><li>Added self-reflection process to grade document retrieval accuracy, and mitigate hallucinations in response generation</li></ul>	

**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 Vision 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, Chainlit, scikit-learn, CI/CD

**ISB, Bangalore**

Feb 2024 - March 2024

**Data Analyst Intern**

- Automated web scraping using Selenium and BeautifulSoup 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 Competition**

- 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 Bombay 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