Ved Umrajkar

UG (V Year I Semester)
BS-MS (Mathematics and Computing)
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Indian Institute of Technology Roorkee

Area of Interest

Machine Learning, Computer Vision, Multimodal Learning

Education

Year	Degree/Examination	Institution/Board	CGPA/ Percentage
2024	BS 4th Year	Indian Institute of Technology, Roorkee	8.605
2021	Intermediate (Class XII)	Late PB Jog Junior College, Pune	94.33 %
2019	Matriculate (Class X)	DAV Public School, Pune	96.20 %

Internships

Intern | JPMorganChase May 2025 - July 2025

- Successfully implemented and deployed the investment management fees macroeconomic model into production as a part of the Bengaluru Data Science CoE.
- Developed a highly granular prototype for an existing headcount forecasting tool to account for COVID disparities in macroeconomic modelling.

Intern | Hashstack Finance August 2023 - February 2024

- Developed a Real-Time Risk Management Framework leveraging Starknet, PostgreSQL Database and Streamlit Frontend to model debt health, assess solvency metrics, and dynamically update user token portfolios
- Integrated the Mean-Variance Portfolio Optimization model into the existing backend to identify users at risk of impermanent loss, resulting in a 15% improvement in Outlier Detection accuracy
- Designed and implemented a comprehensive alert system and growth dashboard using Streamlit and a Python backend, effectively integrating data from Mixpanel, Google Analytics, Starknet and Blockchain

Data Science Intern | Hloov January 2023 - March 2023

- Developed a Transfer Learning VGG-19 model in PyTorch to detect cracks in buildings with 99.43% accuracy
- Integrated the seasonal and trend metrics of SARIMAX to detect sensor anomalies with 96.7% accuracy
- Designed and implemented a dynamically trained weekly forecasting model using Long Short-Term Memory (LSTM) networks for electromagnetic sensor data, achieving robust predictive accuracy

Projects

Tree Ring Watermark Detection in Rectified Flow Models | ICLR, Singapore January 2025 - April 2025

- Conducted comprehensive analysis of Tree Ring Watermarking performance across DDIM (SD 2.1) and rectified flow architectures (FLUX.1-dev), revealing critical dependencies on prompt guidance for watermark recovery in transformer-based diffusion models
- Identified fundamental limitations in current inversion techniques for rectified flow models, establishing the need for specialized robust watermarking approaches in state-of-the-art text-to-image generation systems.
- Presented the findings at ICLR- International Conference on Learning Representations, 2025 held at Singapore Expo

Multi-Modal Person Re-Identification with Video-Text Retrieval | IIT Roorkee December 2024 - Present

- Developing a novel video-text person re-identification system combining tracklet-based visual embeddings with natural language queries for enhanced retrieval performance
- Conducting comprehensive ablation studies across multiple Video-ReID datasets (MEVID, LSVID, ILIDS, Duke, G2A) to evaluate performance against existing Multimodal Learning Methods (currently ongoing)

Voice Cloning with AutoRegressive Acoustic Models | IIT Roorkee March 2024 - April 2024

- Developed automated voice clones that convert text into discretized acoustic tokens, utilizing Tortoise-TTS for high-fidelity voice cloning using mel spectrogram synthesis and tuning softmax temperature of the model.
- Designed and implemented a Streamlit application facilitating real-time voice clone generation from textual inputs with an option for users to upload .wav files to personalize and create custom voice clones

Performance Analysis of VGG19 and ResNet50 Architectures | IIT Roorkee February 2024 - March 2024

- Employed Transfer Learning by adding a fully connected layer on top of both VGG19 and ResNet50 architectures, which were pretrained on the ImageNet dataset, to classify a diverse set of celebrity faces
- Calculated precision, recall, F1-score, and confusion matrix to comprehensively evaluate model performance
- Concluded that the VGG19 model significantly outperformed the ResNet50 model, achieving an overall accuracy improvement of 11% and displaying a higher average F1-score

ForecastPro | IIT Roorkee March 2023 - April 2023

- Implemented a SOTA Tensorflow-based approach to handling single-step iterated forecasting based on the LSTNet(Modelling Long Short-Term Time Series with Deep Neural Networks) paper
- Compiled implementations from multiple research papers with statistical AutoRegressive Models - ARIMA and SARIMAX along with Deep Learning models- RNNs, ConvLSTMs and Stacked LSTMs to create a robust forecasting package
- Evaluated the models on the AirQuality UCI and Yahoo Finance datasets using MAPE(Mean Absolute Percentage Error).

GANs vs Mixture Models for Image Generation | IIT Roorkee March 2023 - April 2023

- Developed modular implementations of DCGAN and WGAN models for training on image data.
- Applied the Expectation Maximization Algorithm on the log likelihood of Gaussian Mixture Models (GMM) to determine underlying distributions, and compared the results with those from GANs.
- Deduced that GMM-generated images were more diverse but they lacked the sharpness of GAN outputs.

Awards / Scholarships / Academic Achievements

- Silver Medal at the Inter-IIT Tech Meet 13.0 at IIT Bombay- Building AI powered Product for Dream11
- Secured 16th Rank in Amazon ML Challenge 2024 with 10000+ candidates
- Qualified for the India Terminal Coding competition hosted by Correlation One in partnership with Citadel Securities after clearing a rigorous test
- All India Rank 342 in KVPY Fellowship Examination.
- State Topper from Maharashtra in Astronomy Olympiad(IOQA-2020)
- Rated Expert on Kaggle(amongst top 1%, handle: vedumrajkar) with Global Rank 1890
- Awarded the INSPIRE Scholarship by the Government of India for undergraduates in research.
- All India Rank 1336 in JEE Advanced (Top 0.2% of all candidates)

Skills

Computer languages	C++, Python, SQL
Software Packages	PyTorch, TensorFlow, Numpy, Pandas, Sklearn, NLTK, Streamlit, Starknet-py
Additional Courses	Statistical Machine Learning, Natural Language Processing, Design and Analysis of Algorithms, Mathematical Cryptography, Stochastic Calculus

Positions of Responsibility & Extra Curriculars

Joint Secretary | Data Science Group, SDS, IIT Roorkee May 2024 - Present

- Mentored upcoming students in pursuing careers in Data Science, fostering a thriving campus community.
- Actively coordinated various campus projects and events taken up by members and hosted multiple campus-wide data science workshops and managed the recruitments of club members.
- Hosted a two week long Supervised Learning hackathon on UCI Gesture Phase Segmentation Dataset.

Research Publications

- Ved Umrajkar , Aakash Kumar Singh, "Detection Limits and Statistical Separability of Tree Ring Watermarks in Rectified Flow-based Text-to-Image Generation Models", in ICLR, International Conference on Learning Representations, 2025
- Ved Umrajkar, "DAC-LoRA: Dynamic Adversarial Curriculum for Efficient and Robust Few-Shot Adaptatio", in Under Review, ICCV, 2025