Y S SAI NITISH

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Education

Indian Institute of Science, Bengaluru **Aug'22 − Present**
M.Tech Artificial Intelligence *CGPA : 7.1/10*

JNTUH College of Engineering Hyderabad **Jul'17 − Jul'21**
B.Tech Electrical & Electronics Engineering *CGPA : 8.62/10*

Relevant Coursework

- Mathematics: Stochastic Models & Applications, Linear Algebra & Applications, Computational Methods of Optimization, Information Theory
- Machine Learning & Deep Learning: Pattern recognition, Advanced Deep Representation Learning
- Image & Vision: Digital Image Processing, Advanced Image Processing, Computer Vision, Digital Video: Perception & Algorithms
- Data Structures & Algorithms, Data Analytics

Projects

Variational Auto Encoder for Image Generation | *Generative Modelling, PyTorch* **Aug'23-Sep'23**

- Implemented a Variational Autoencoder (VAE) for image generation using a deep learning framework with different sampling strategies during training.
- Built a CNN based classifier on the classes and also constructed an MLP-based working on the latent vectors obtained from the trained VAE.
- Implemented a beta-VAE model with varying beta values to explore the trade-off between image reconstruction quality and the disentanglement of latent representations.

Deep Learning for Computer Vision | *CNN, YOLO, Segmentation, PyTorch* **Feb'23**

- Transformed a pretrained MobileNetv2 backbone, initially designed for ImageNet classification, into an FCN by replacing the final fully connected (FC) layers with convolutional layers, enabling it to handle variable-sized inputs and perform dense pixel-wise predictions.
- Quantified the model's effectiveness by calculating the overall pixel accuracy and **mean Intersection over Union (meanIOU)**, resulting in 92.10% for the ResNet-based FCN and 81.14% for the MobileNetv2-based FCN.
- Finetuned a pre-trained **YOLO** model with a dataset containing various door types and computed the mean average precision(mAP)

Video Interpolation using Optical Flow | *Multi & Singel Scale Optical Flows* **Aug'23 - Sep'23**

- Implemented a Multi-scale Discrete Horn-Schunck optical flow algorithm for dense flow estimation.
- Applied optical flow to interpolate video frames between consecutive frames in a video sequence. Evaluated the quality of the interpolated videos using both subjective and objective metrics, including PSNR and frame-wise average LPIPS

Community Detection & Analysis in Graph Data | *Spectral Clustering, Modularity Score* **Aug'23**

- Implemented a spectral decomposition algorithm for community detection on graphs. Implemented a stopping criterion to ensure good partition of communities.
- Implemented the Louvain Algorithm for graph partitioning. Explored criteria for picking the best decomposition of nodes into communities, considering factors like modularity.

SEIR-V Modelling for COVID-19 **Oct'23**

- Constructed a SEIRV model incorporating immunity waning to simulate COVID-19 transmission dynamics in a population of N individuals.
- Calibrated the model parameters using real-world data from Karnataka, India, during 16 March 2021 - 26 April 2021, with constraints on initial conditions and a specified model for immunity waning
- Evaluated the model's performance by updating the cases-to-infections ratio based on the average number of tests and implementing a loss function to assess the accuracy of the model's predictions against actual COVID-19 cases.

Transformer Neural Network Applications for Extended Reality - Research Thesis **Oct'23 - Present**

- A colloborative project between IISc & Shell guided by Prof. Pradipta Biswas, RBCCPS and co-advised by Dr. Saumil Merchant, Shell Technology Centre Bengaluru
- Actively involved in researching and applying Transformer neural networks across diverse domains within Extended Reality (XR).
- Currently engaged in active survey of research to tackle the problem of Object tracking using optical flow based approaches & depth estimation using Vision Transformers.

Technical Skills

Languages: Python, MATLAB, Simulink, SQL, C++
Libraries: NumPy, Matplotlib, Pandas, PyTorch, PIL, Scikit-Learn, Scipy
Domains: Data Science, Statistical Analysis, Machine Learning, Deep Learning, Computer Vision, Natural Language Processing
Software/ Frameworks: Google Colab, Jupyter Notebooks, VS Code, Anaconda, GitHub
Other Tools: LaTeX, MS Word, PowerPoint, Canva.

Achievements & Leadership

- Distinguished as a **Shell Research Fellow**, participating in a unique research collaboration program between the Indian Institute of Science (IISc) and Shell.
- Recognized as a **Reliance Foundation Scholar**, an accolade granted to the top 100 postgraduate students nationwide in India.
- Achieved an All India Rank of **21** in the GATE'22 Electrical Engineering examination and an All India Rank of **35** in Instrumentation Engineering.
- Honored with the **Award of High Distinction** by the Royal Australian Chemical Institute.
- Spearheaded a diverse, 11-member cross-functional team, spanning various academic backgrounds, in the successful development of an e-bike designed for daily commuting.