Rohit Kumar

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Education

MTech - IISc Bangalore — **Bangalore, India**
Artificial Intelligence: Aug 2022 - Jun 2024 — *CGPA-7.7*

BTech - BCE Bhagalpur — **Bhagalpur, India**
Electrical Engineering: Aug 2017 – Jun 2021 — *CGPA-8.75*

Research Project

Semi-supervised class incremental learning | *Prof. Soma Biswas*

- Engaged in the development of a pre-trained transformer-based model specifically designed for class incremental learning within a semi-supervised framework.
- Developed two strong baseline models for our research, which have been noted for their originality and significant improvements even with limited labeled data. Our findings have also been submitted for review at the **ECCV 2024** research conference.

Projects

Basic ML algorithm implementations | *Pattern Recog. & Neural Network*

- **Scratch Implementation**: K-Nearest Neighbors, Linear Regression, Logistic Regression, Convolutional Neural Network, Multi-layered Perceptron. Calculated evaluation metrics - Accuracy, Confusion Matrix, F1 score, Precision, Recall, and ROC curve for MNIST dataset

Image & Video Processing | *DIP, AIP, CV*

- **Scratch Implementation**: Otsu's binarization, foreground extraction, connected components, CLAHE, spatial and frequency domain filtering, downsampling & upsampling with interpolation, image denoising, edge detection, key point detection using SIFT, ViT, MNIST ViT achieved an accuracy of 77%.
- **Deep Learning :** Image classification using ResNet-18 achieved an accuracy of 97.66% on a subset of CIFAR100. Image segmentation using ResNet50 yielded a Pixel Acc of 90.62% and a mean IoU of 0.5476 on PASCAL VOC

Natural Language Processing | *NLP*

- **Scratch Implementation**: Tokenization, Skip-gram, Bag-of-Word, n-gram
- Conducted sentiment analysis on the SST2 dataset (67k sentences) and a movie reviews dataset, achieving accuracies of 93.23% and 86.60% respectively using BERT.
- Fine-tuned the Falcon 7B Instruct Model using QLoRA and LoRA techniques for question-answering.

Vehicle Number Plate Detection and Number Recognition

- Conducted license plate detection through contour detection and utilized YOLO v3 for enhanced accuracy.
- Implemented character segmentation and recognition using CNN, achieving an end-to-end accuracy rate of 72%.

Machine Translation for Low Resource Languages : English to Nepali | *IISc X Microsoft*

- Employed transfer learning with Google/mt5-small to achieve a BLEU score of 40 in translation, utilizing a custom dataset for fine-tuning. Created an interactive Nepali language learning chatbot.

Coursework & Skills

Courses: Linear Algebra, Stochastic Models and Application, Pattern Recognition and Neural Networks, Game Theory, Digital Image Processing, Advanced Image Processing, Computer Vision, LLMs for Practical NLP, Deep Learning for Natural Language Processing, Digital Video Perception and Algorithms, Intro to NLP, Computational methods of optimization

Skills: Python, PyTorch, OpenCV, Hugging Face, Google Cloud, SQL DataBase, Scipy, Scikit-Learn, Pandas

Achievements & Responsibilities

- Teaching Assistant for course **E9 241: Digital Image Processing**
- GATE **AIR-221 & AIR-227** in **EE & IN** respectively in 2022 and **1**st in the **BCECE[LE]** in 2018.
- Our **Atharva**(health assistant) ranked **7**th team in **GenAI Hackathon** among 65 teams.
- Volunteer for EE Summer School 2023, IISc and **Robotics Club** at BCE, Bhagalpur