SOMYAA RASTOGI

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EDUCATION

Virginia Polytechnic Institute and State University **Aug 2021 - Present**

Pursuing M.Eng. in Computer Science and Applications **(GPA 4.0/4.0)**

- Working under Dr. Matthew Hicks as Graduate Research Assistant
- Natural Language Processing (Sentiment Analysis, Joint Entity and Relation Extraction, Abstractive Summarization, Question-Answering, Coreference Resolution, Bias Detection), Machine Learning with Big Data, Data Analytics, Introduction to Deep Learning, Advanced Machine Learning

Sardar Patel Institute of Technology, Mumbai University, India **Aug 2014 - May 2018**

Secured a Bachelor of Engineering in Electronics **(GPA 9.03/10)**

- Applied Mathematics (Calculus), Java and Object-Oriented Programming Concepts, C++, Design and Analysis of Data structures and Algorithms, Database Management Systems, Introduction to Computer Architecture, Digital and Analog Signal Processing, Computer communication and networks

ACADEMIC PROJECTS

Music Information Retrieval (Class project - Machine Learning with Big Data)

- Used "FMA: A Dataset For Music Analysis" dataset from UCI Machine Learning Repository.
- Extracted content based features - Chroma, Tonnetz, MFCC, Spectral Centroid, Spectral Bandwidth, Spectral Contrast, Spectral Rolloff, RMSE, Zero-crossing rate from 106,574 tracks from 16,341 artists and 14,854 albums, arranged in a hierarchical taxonomy of 161 genres.
- Compared the performance of various algorithms with cross validation using various features for music genre classification - Logistic Regression, KNN, Gaussian Naive Bayes, Decision Tree, SVM, Random Forest, DNN and CNN.
- Evaluated the performance of CRNN model using RMSE score for Music Emotion Detection and Classification.
- Compared the performance of Content-based approach, Access-pattern-based approach and Hybrid approach using K-means algorithm for Music Recommendation.
- Evaluated the performance of Convolution Neural Network in identifying predominant instrument in real-world music by using different activation functions, identification thresholds, window size etc. and F1 measure as the evaluation metric.
- Evaluated the performance of Hierarchical Attention Network (GRUs with attention mechanism) in Music Genre Classification using song lyrics.
- Used "MoodyLyrics" dataset comprising of 2595 songs uniformly distributed across the 4 quadrants of the Russell's Valence-Arousal (V-A) circumplex model for identifying the music emotion from lyrics using BERT transformer.

Multi-lingual Neural Machine Translation for Videos (Class project - Natural Language Processing)

- Project is related to generating a lip-synchronised video of the speaker speaking in Target Language (e.g., French/German), given a video of a speaker in Source Language (e.g., English).
- Used DeepSpeech 2 model with 11 layers of bidirectional recurrent layers and convolution layers on LibriSpeech dataset for Automatic Speech Recognition, i.e., converting the speech of Source Language (English) to text.
- Explored Fairseq S2S model, RNN-Based models like B-Base and B-Big and Transformer based models like T-Sm, T-Md and T-Lg for end-to-end speech recognition and speech-to-text translation on LibriSpeech dataset and used Word Error Rate and BLEU score as the evaluation metrics.
- Used 'Big' Transformer Encoder-Decoder model with attention mechanism for Multi-lingual Neural Machine Translation with Zero-shot translation for 4 language pairs with source language English and used BLEU score as evaluation metric.
- Used DeepVoice 3 model with convolution layers for encoder, attention-based decoder and converter trained on 10000 audio-text pairs and evaluated on 200 unseen test sentences for Text to Speech synthesis in the target language and used Mean Opinion Score as the evaluation metric.
- Trained CycleGAN model on audio clips obtained from users to generate speech in the voice of the speaker it was trained on.
- Implementing a GAN with a Generator (Face Encoder, Audio Encoder and Face Decoder) and a Discriminator (Face Encoder and Audio Encoder) for generating realistic face images conditioned on audio input.

Text to Image Synthesis with GANs

- Project is related to using GANs for synthesizing 256×256 photo-realistic images conditioned on text descriptions.
- Used "Caltech-UCSD Birds-200-2011" and "Oxford Flowers-102" Datasets after pre-processing to ensure that bounding boxes of objects have greater-than-0.75 object-image size ratios.
- Used first GAN with up-sampling blocks consisting of the nearest-neighbour upsampling followed by a 3×3 stride 1 convolution, batch normalization and ReLU activation and down-sampling blocks consisting of 4×4 stride 2 convolutions, batch normalization and LeakyReLU to generate a low resolution 64x64 image based on text description converted to text embedding using a pre-trained encoder.
- Used second GAN with up-sampling, down-sampling blocks and residual blocks consisting of 3×3 stride 1 convolutions, batch normalization and ReLU to generate 256X256 images based on low-resolution images from previous GAN and the text embeddings.

Automatic Colouring of images using CNN

- Project is related to automatic colouring of Black and White images using Deep Convolution Neural Networks.
- Created own dataset with 1500 Black and White and coloured images with 256 x 256 resolution downloaded from the internet.
- Pre-processed the coloured (RGB) images from the training dataset to generate CIE L*a*b (Luminance * Chroma 1 (Green-Reg) * Chroma 2 (Blue-Yellow)) colour scheme.
- Trained Convolution Neural Network on Luminance values obtained from training images to extract the a* and b* values.
- Tested the neural network on Black and White with Luminance values (256 x 256 x 1) images to create fully colourized images by generating a* and b* values and converted them to RGB images.
- Trained model using Adam and RMSprop optimisers, different values of epochs and batch sizes, data augmentation to avoid overfitting and used Mean Squared Error (MSE) and Peak Signal-to-Noise Ratio (PSNR) as loss functions to update the model parameters.

Hand Gesture to Speech Conversion for Mute People

- Fabricated a model that converts hand gestures to speech heard on the mobile device to assist mute people.
- Programmed a micro-controller MSP430 MCU board in C language using Energia IDE to collect, interpret and send signals from resistive flex sensors positioned on hand glove to interfaced Bluetooth module HC-05.
- Developed Bluetooth Chat android application using Eclipse IDE, Android SDK and Android ADT by coding in JAVA and XML that converts text received from Bluetooth module on the glove, to speech heard on a mobile speaker.
- Modified set up by replacing the hand glove with a live video sequence of hand gestures.
- Extracted and segmented hand region from the video sequence to recognize the number of fingers with an accuracy between 60-80% by using convex hull (image processing), Jupyter Notebook and Python.

WORK EXPERIENCE

Capgemini Technology Services India Limited, Mumbai, India **August 2018 - July 2021**

SAP Technical and Functional Consultant

- Researched, designed and programmed an SAP application to convert SAP codes into flow diagrams to minimize incident resolution time by 10%.
- Achieved proficiency in debugging and programming in SAP while reducing application downtime by working as SAP Material Management consultant in the TE Connectivity account and received 4 client satisfaction awards for the same.
- Created an Analytics Cloud Chatbot using SAP Conversational AI. Built custom widget using JavaScript, SAPUI5 and Socket.IO client for connecting to bot server and developing bot server using NodeJS.

Tata Institute of Fundamental Research, Mumbai, India **June 2017 - July 2017**

Research Intern

- Planned and initiated cloud solution to offload computation-intensive non-interactive parts based on static analysis of the data acquired by frontend discriminator boards used in RPC boards of a cosmic stacker upon detection of muons.
- Designed and integrated a low pass filter for optimizing the performance of SMPS by reducing noise in wave output from 100mV to 20mV peak to peak using Proteus software to ensure constant voltage availability to ripple sensitive RPC Boards.

COURSES AND CERTIFICATIONS

- Programming in JAVA Certification - NIIT Technologies, India | Advanced Programming for Web Development Certification – NIIT Technologies, India
- Design and Analysis of Algorithms course (IIT Bombay) | Automata Theory and Formal Languages – EdX
- Deep Learning Computer Vision™ CNN, OpenCV, YOLO, SSD & GANs – Udemy

EXTRACURRICULAR ACTIVITIES

- Conducted workshop on Handwritten digit recognition using Python (AI) in 2017. Trained over 150 participants on implementing a handwritten digit recognition app using the Convolutional Neural Network and MNIST dataset.
- Oversaw a team of 4 students to organize a photography event called Mosaic in 2017. Orchestrated leadership through meticulous planning and communication with sponsors, participants and judges.
- Administered workshops to train freshmen students on PCB designing using EAGLE software and Path Finding Robot using Python in 2017.
- Conducted workshop on programming Robotic Path Finder using C++ in 2016.
- Conducted multiple workshops on Unix, HTML, CSS, Javascript and Bootstrap in 2016 for 87 students.
- Conducted 2 workshops on Android Application Development in 2016 for 93 students.
- Worked as Graduate Student Ambassador in the Office of Diversity and Inclusion in Fall 2021.