

Achint Soni

Graduate

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Education

- **Master's of Mathematics** **University of Waterloo, Canada**
Major: Computer Science *Ongoing*
- **Bachelor of Technology** **Indian Institute of Technology Kanpur**
Major: Electrical Engineering, Minor: Machine Learning, Theory of Computing *May 2023*
- **Grade XII: 95.0/100** **Sir Padampat Singhania School, Kota**
Stream: Science *July 2019*

Publications

- **Social Media Analytics for tracking COVID-19 vaccination demand** **EJIS**
Achint Soni and Faiz Hamid, Manuscript submitted *2022*
- **Energy efficient time table scheduling for metro systems using machine learning** **2022**
Achint Soni and Faiz Hamid, Manuscript in preparation

Work Experience

- **Mobility data to address public health decision making post COVID-19** *Jun. 2022 –Ongoing. 2022*
Mentor: Sahar Saeed, Queen's University, Canada
 - Evaluated the viability of monitoring mobility data to specific points of interest in Canada in order to continue informing post-COVID-19 pandemic public health decision making.
 - Accessed the representativeness of SafeGraph mobility data in Canada by comparing the number of sampled devices with Census population counts at different geographic levels.
 - Described the temporal patterns of visits to healthcare institutions at several epochs and contrasted these patterns across provinces and Material Deprivation Indices by utilising a quasi-Poisson hierarchical generalised additive model.
 - Estimated the utilization patterns of each facility during the pandemic using geographic catchment analytical methods.
 - The ratio of expected and observed healthcare utilization over time for each census block group was used to construct an inequity map.
- **Student Research Associate** *Sept. 2021 – Nov. 2021*
Department of Biotechnology, Government of India
 - Developed a fully manual and assisted real-time voice based control and GUI based tactile control in a team of two to automate BCI controlled wheelchair for motor-impaired support.
 - Deployed a classification model involving deep learning that can detect motor imagery brain signals using an open-source brain-computing interface electroencephalogram (OpenBCI-EEG) headset.
 - Implemented intelligent EEG artefacts removal such as eye and tongue movements, electrode and sweat artefacts by Autoregressive-Deep Variational Autoencoder model.
- **Undergraduate Research Programme- SURGE'21, IIT Kanpur** *Jun. 2021 – Sept. 2021*
Mentor: Laxmidhar Behera, IIT Kanpur
 - Built a lightweight keyword spotting system that can recognize multiple different short speech commands.
 - Calculated Mel-Frequency Cepstral Coefficients (MFCC) to extract spectral features and gain more perceptually-relevant representation of speech audio.
 - Deployed a classification model involving deep CNN that can detect speech commands based on their mel spectrograms.
 - Assembled the model on unmanned mine safety inspection vehicle and tested on English and Hindi language speakers.

Projects

- **Document Image Classification with Intra-Domain Transfer Learning** *Sept. 2022 – Oct. 2022*
Prof. Tushar Sandhan, Image Processing (EE604A)

- Implemented a region-based DCNN framework for document structure learning on RVL-CDIP dataset.
- Separated the image into four different regions and applied transfer learning using Vgg16 architecture trained on ImageNet.
- Combined the predictions from individual base deep neural network using a stacking generalisation based ensembling.
- Achieved a maximum mean F1-Score of 79.5% on test and 92% on train dataset and secured an All India Rank 21.

Fast and accurate bayesian polygenic risk modelling using variational inference

- Prof. Sahir Bhatnagar, McGill University, Montreal, Quebec, Canada May. 2022 – Jul. 2022
 - Implemented fast and efficient Bayesian polygenic risk score method that approximates posteriors for the effect sizes of genetic variants on the phenotype using variational inference techniques.
 - Conducted comprehensive set of experiments using simulated and real traits to assess the predictive ability of the model in comparison with some of the most popular Bayesian and non-bayesian methods.
 - Observed fast model convergence enabled by variational inference algorithm in contrast to stochastic MCMC approaches implemented by other methods.

Acoustic Event Detection

- Prof. Vipul Arora, Advanced topics in Machine learning (EE698R) Apr. 2022 – May 2022
 - Identified onset, offset times and labels of multiple acoustic events present in audio clips on millisecond level by extracting mel-spectrogram features.
 - Employed CNNs, RNNs, hybrid CRNNs, LSTM, and HMM based models to detect audio events and achieved 0.91 F1 score
 - Implemented various statistical methods including Gibbs sampling, Importance and Rejection sampling, Monte-Carlo sampling and Normalizing Flows.
 - Implemented Generative Adversarial Networks (GANs) and Variational Auto Encoders from scratch using neural networks for Gaussian Mixture Models.

Twitter Sentiment Analysis

- Prof. Faiz Hamid, Data mining and Knowledge Discovery (IME672) Aug. 2021 – Oct. 2021
 - Designed and implemented an information retrieval and classification system for sentiment analysis on Twitter.
 - Cleaned, parsed and segmented tweets content; counted most frequent words, ngrams and hashtags.
 - Used TF-IDF and GloVe pretrained Word Embeddings to obtain vector representations for words.
 - Modeled Support Vector Machine and Naive Bayes algorithm to determine sentiment polarity of data set.
 - Implemented a Bidirectional LSTM model using Tensorflow to classify the tweets into appropriate categories of sentiment.

Technical Projects

Deep learning approaches for COVID-19 detection based on chest X-Ray images

- Self project Jul. 2020 – Sept. 2020
 - Designed a deep learning system to extract features and detect COVID-19 from chest X-ray images.
 - Automated the process of analyzing X-ray images with high accuracy using deep Convolutional Neural Networks (CNNs).
 - Three powerful networks, namely ResNet50, InceptionV3, and VGG16, were fine-tuned on an enhanced dataset.
 - Implemented transfer learning to train a ResNet50 model on the same data to achieve an accuracy of **96.32%** on train data and **94.53%** on validation data

Technical Skills

Programming Skills: C++, Python, C, HTML, CSS, JS, Haskell, SQL

Frameworks: PyTorch, Tensorflow, Keras, OpenCV

Software and Utilities: Tableau, MATLAB, Linux, Git, Autocad, L^AT_EX, AWS

Achievements and Accolades

- National top 0.05% in JEE Advanced (2019) among the 230k shortlisted candidates
- National top 0.1% in JEE Mains (2019) among 1.6 million candidates
- Academic Excellence Award for exceptional performance in Mathematics and Science.

Management and Leadership Skills

Captain – Table Tennis team: During the 2021-22 academic year, led the IIT Kanpur Table Tennis team in multiple contests and camps.

Secretary – Cultural Festival: Successfully guided 50+ universities participating in the cultural festival of IIT Kanpur from all over India