Achint Soni

a2soni@uwaterloo.ca • trickyjustice.github.io • achintsoni
Achint Soni

Education

- **M.Math., University of Waterloo** — **Ontario, Canada**
  Major: Computer Science , 86.5% — *Sep'23 - May'25*
- **B.Tech, Indian Institute of Technology Kanpur** — **Kanpur, India**
  Major: Electrical Engineering | Minor: Machine Learning, Theory of Computing — *Jul'19 - May'23*

Publications

(*: equal contribution)

- **LOCATEdit : Graph Laplacian Opt. Cross Attention for Localized Image Editing** **[paper][website]**
  Achint Soni, *Meet Soni, Sirisha Rambhatla*
  ICCV, 2025
- **Understanding and Enforcing Precise Control in Generative models** **[paper]**
  Achint Soni
  Masters thesis
- **VideoAgent: Self-Improving Video Generation for Embodied Planning** **[paper][website]**
  Achint Soni*, *V. Sreyas**, *Abhranil Chandra**, *Sebastian Fischmeister, Percy Liang, Bo Dai, Sherry Yang*
  Preprint - Submitted to NeurIPS, 2025
- **Leveraging Large Language Models for Automated Depression Screening**
  *B. Taferra, A. Perivolaris, W. Hsiang,..., **Achint Soni**,..., S. Rambhatla, S. Krishnan*
  PLOS Digital Health, 2025
- **Opinion: Mental Health Research: To Augment or Not To Augment** **[paper]**
  *Argyrios Perivolaris, Alice Rueda, Karisa B Parkington, **Achint Soni**,...,Sri Krishnan and Venkat Bhat*
  Frontiers of Neuroscience, 2025
- **VIDEOSCORE: Building Automatic Metrics to Simulate Fine-grained Human Feedback for Video Generation** **[paper][website]**
  *Xuan He**, *Dongfu Jiang**, *Ge Zhang, Max Ku, **Achint Soni**,..., Bill Yuchen Lin, Wenhu Chen*
  EMNLP Main, 2024
- **Why do VAEs *really* promote disentanglement** **[paper][code]**
  *Pratik Bhowal, **Achint Soni**, Sirisha Rambhatla*
  ICML, 2024

Research Internships

- **Mobility data for public health decision-making post-COVID-19** — **Mentor: Prof. Sahar Saeed**
  Queen's University, Canada — *Jun'22 – Dec'22*
  - Analyzed SafeGraph mobility data across Canada to support decision-making in post-pandemic public health strategies.
  - Assessed mobility data representativeness by comparing sampled devices with Census counts across geographic levels.
  - Modeled healthcare visit patterns across provinces using a quasi-Poisson model, examining disparities in visits.
  - Estimated healthcare facility utilization during the pandemic using geographic catchment analysis to assess regional demands.
  - Constructed an inequity map by comparing expected and observed healthcare utilization across Census Block Groups.
- **Fast and accurate Bayesian Polygenic Risk Modelling using Variational Inference**
  MITACS GRI, McGill University, Canada — *May'22 – Jul'22*
  - Implemented a Bayesian polygenic risk score method using variational inference to estimate posterior effect sizes from genome data, ensuring efficiency, accuracy, and scalability for large datasets and various genetic architectures.
  - Reproduced results on real and simulated traits, validating predictive performance on datasets with over 9.6 million SNPs.
  - Showed efficiency by comparing to MCMC methods, highlighting speed and accuracy in polygenic risk estimation.
- **Student Research Associate**
  Department of Biotechnology, Government of India — *Sep'21 – Nov'21*
  - Deployed a classification model to detect motor imagery brain signals using an open-source OpenBCI-EEG headset.
  - Implemented a Variational Autoencoder to disentangle and remove distinct EEG artifacts, such as eye movements, tongue movements, and electrode noise, improving signal quality for downstream tasks.

Undergraduate Research Associate - SURGE'21, IIT Kanpur **[code]**
Intelligent Systems and Controls Lab, IIT Kanpur *Jun'21 – Sep'21*
- Developed and trained a CNN-based system using mel spectrograms for real-time speech command recognition.
- Optimized the model to improve accuracy and response time, making it suitable for practical voice-controlled applications.
- Extracted spectral features using Mel-Frequency Cepstral Coefficients (MFCC) for relevant speech audio representation.
- Integrated the model into an unmanned mine inspection vehicle, successfully testing it on both English and Hindi speakers for voice-activated control.

Research Projects

Novel Noise Warping Method for Temporal Correlation in Video Generation **Mentor: Wenhu Chen**
Tiger AI Lab, University of Waterloo *Jan'24 – May'24*
- Developed a noise warping approach for accurate, distribution-preserving transport of Gaussian noise in video generation.
- Utilized integral noise, reinterpreting individual noise samples in diffusion models as continuously integrated noise fields.
- Derived a noise transport equation and designed a method to enhance temporal correlation while preserving noise properties.

Acoustic Event Detection **Mentor: Prof. Vipul Arora**
Machine Analysis of Data for Human Audition and Vision lab, IIT Kanpur *Apr'22 – May'22*
- Detected acoustic event onset, offset, and labels in audio clips with millisecond precision using mel-spectrogram features.
- Utilized models such as CNNs, RNNs, CRNNs, LSTMs, and HMMs, achieving a 0.91 F1 score for accurate event detection.
- Applied techniques like Gibbs sampling, Monte Carlo sampling, and Normalizing Flows to improve analysis robustness.
- Developed Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) to model Gaussian Mixture Models, enabling detailed exploration of acoustic event distributions and improving the generation of realistic event patterns.

Optimizing Plastic Bag Pricing for Carbon Footprint Reduction **Mentor: Prof. Faiz Hamid**
IIT Kanpur *Jan'22 – Apr'22*
- Developed an optimization model to find the best pricing strategy for plastic bags, balancing profits and carbon footprint.
- Developed a reward policy to reduce plastic use while maintaining sales, balancing environmental impact and profitability.

Forecasting COVID-19 Vaccination Demand Using Twitter **[code]**
IIT Kanpur - in collaboration with University of Hull *Sep'21 – Jan'22*
- Developed a semi-supervised learning approach using RNNs to predict COVID-19 vaccination demand from tweets.
- Designed a mathematical model to calculate the likelihood of demand based on tweet timing and content.
- Built a data dictionary to capture supportive and request words, enhancing model robustness to temporal dependencies.
- Demonstrated the model's superiority over other neural network-based approaches in forecasting accuracy.

Projects

Document Image Classification with Intra-Domain Transfer Learning
Mentor: Prof. Tushar Sandhan, IIT Kanpur *Jan'23 – Mar'23*
- 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.

Twitter Sentiment Analysis
Independent course project, IIT Kanpur *Aug'21 – Oct'21*
- 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.

Deep learning approaches for COVID-19 detection based on chest X-Ray images
Independent course project, IIT Kanpur *Jul'20 – Sep'20*
- Designed a deep learning system to extract features and detect COVID-19 from chest X-ray images.
- Automatized the process of analyzing X-ray images with high accuracy using deep Convolotional Neural Networks (CNNs).
- Three powerful networks, namely ResNet50, InceptionV3, and VGG16, were fine-tuned on an enhanced dataset.
- Utilized transfer learning with ResNet50, achieving 96.32% accuracy on training data and 94.53% on validation data.

Technical Skills

Programming Skills: C/C++, Python, CUDA, LaTeX
Libraries: PyTorch, Jax, Tensorflow, HuggingFace, Keras, Einops, OpenCV, Sklearn
Tools & OS: Git, VS Code, MacOS, Linux(Ubuntu)

Achievements and Accolades

- Received MITACS Graduate Fellowship for aiding my graduate research
- Top 0.05% in JEE Advanced 2019, outperforming 230,000 candidates nationally in India
- Top 0.1% in JEE Mains (2019), among 1.6 million candidates nationally in India
- Among the top ten recipients of the INFORMS Scholarship,2022.