

ADITYA AHUJA

adiah80.github.io
github.com/adiah80
ahuja.aditya1452@gmail.com

RESEARCH INTERESTS

My research interests lie in the fields of Deep Learning and Probabilistic Logic Reasoning, and novel ways of combining them to build robust and interpretable AI models. I'm also interested in Computer Vision, specifically in the areas of continual (lifelong) learning. I have also worked on projects involving Natural Language Processing, Signal Processing, and Neuroscience in the past.

EDUCATION

TECHNICAL PROFICIENCY

- **Frameworks** : PyTorch, Tensorflow, Keras
 - **Libraries** : Numpy, Pandas, Matplotlib, Scikit-learn, OpenCV, MNE
 - **Languages** : Python, C++, C, MATLAB, Prolog, MySQL, LATEX
 - **Experience** : Computer Vision, Image Processing, Natural Language Processing, Logic Programming, Algorithms and Data Structures

WORK EXPERIENCE

- **Head Office, Bank Of Maharashtra** Pune, India
Software Development Intern May. 2019 - Jul. 2019
 - Developed a framework for automatic signature verification using computer vision techniques.
 - Built a Siamese Neural Network that converted signatures into high dimensional representations that were used for signature classification.
 - Achieved an accuracy of about 98% on the test set over 750 iterations, training over 75K triplets.
 - Encapsulated the scripts into a python package for use from the bash terminal. Used previously-trained weights for predictions over unseen signature samples.

RESEARCH PROJECTS

- **Developing a framework to model solutions for Bongard Problems**
Advisor: Prof. Ashwin Srinivasan In Progress
 - Areas: Deep Learning, Probabilistic Logic Programming.
 - Using the DeepProbLog framework to model solutions to the Bongard problems by evaluating different hypotheses and then calculating their respective likelihoods.
 - Using Neural Nets for pattern detection and symbolic reasoning for estimating likelihoods and probabilities.
 - In collaboration with TCS Research.

• Schizophrenia detection using Electroencephalography Signals.

Advisor: Prof. Amalin Prince

In Progress

- Areas: Deep Learning, Signal Processing.
- Developing Deep Convolutional Neural models for automated diagnosis of Schizophrenia using EEG signals.
- Exploring various Signal Processing techniques for building better representations such as Short Term Fourier Transform (STFT) and Empirical Mode Decomposition (EMD).

• Implementing STDP on a Basal Ganglia model of a Layered Spiking Neural Network.

Advisor: Prof. Basabda Sen Bhattacharya

July 2019 - December 2019

- Areas: Spiking Neural networks, Neuroscience.
- Implementing reinforcement learning in a spiking neural network using Spiking-Timing-Dependent Plasticity.
- Developed a Basal Ganglia model that makes use of the Three-Factor Learning rule.
- In collaboration with the Human Brain Project (HBP), and the SpiNNaker neuromorphic computing framework.

PERSONAL PROJECTS

• Emotion Recognition from Audio Signals [1]

- Developed a Deep Learning pipeline for Emotion recognition and classification using speech data, on the MELD Dataset.
- Classified emotions across various emotions : [Disgust, Fear, Neutral, ...] across a highly unbalanced data sample.
- Used Mel-frequency cepstral coefficients (MFCCs) to form speech representations.

• Memotion Sentiment Analysis [1] [2]

- Integrated deep text and image processing models to build a Multimodal Sentiment Analysis system.
- Classified sentiments on Internet Memes across different categories using the fused model.

• Image generation with Generative Adversarial Networks [1]

- Implemented Vanilla and Deep-Convolutional GANs over a training set containing CIFAR 10 images.
- Trained Discriminator and Generator neural networks to discern and generate new images based on the training set.
- Added sample noise and random flips to the generated images to prevent the discriminator from high confidence.

• Obtaining word embeddings using the GloVe Algorithm [1]

- Implemented the GloVe algorithm on the Large Movie Review Dataset from Stanford and obtained clustered word embeddings.
- Visualized the embeddings, each a 15-dimensional vector on a 2d plane using the t-SNE algorithm.
- Used the obtained word embeddings to test the models semantic understanding by querying for word similarities.

• Visualizing Genomic Data [1]

- Used PCA to project high dimensional genomic data onto a 2D plot for population cluster identification.
- Demonstrated a correspondence between population groups and geographical origin using the plotted graphs.

• Simulating an IC Tester

- Designed an IC tester by writing Assembly Language code to program an 8086 processor and the accompanying components.
- Simulated the IC tester in Proteus by connecting various virtual ICs to it and evaluating the outputs over the input space.

MENTORSHIP EXPERIENCE

• Teaching Assistant - BITS F464 [Machine Learning]

Aug. 2019 - Current

- Responsible for conducting practical Labs and theoretical Tutorials sessions for the Machine Learning course taught by Prof. Ashwin Srinivasan.
- Also responsible for developing the course projects and evaluating them.
- Developed the ML-Lab Book, available at : <https://bits-f464.github.io/>

• Technical Mentorship Programme, BITS Pilani

Aug. 2019 - Current

- Mentoring a group of 15 first-year Undergrads, under the Department Mentorship Programme.
- Introducing them to various fields of Computer Science and helping them get started with programming.

- + **Mentor for Deep Learning - Technology Incubator Programme** Aug. 2019 - Dec. 2019
 - Co-Leading a group of 50 undergrads on a semester-long project aimed at exploring Deep Learning methods for analyzing and modelling EEG data.
- + **Mentor for Machine Learning - Quark Summer Technical Projects** May. 2019 - Jul. 2019
 - Was responsible for teaching and mentoring a group of over 200 undergrads and helping them get started with Machine Learning and Data Science.
 - Duties included designing and evaluating assignments to grade their performance and helping them with their course doubts.

AWARDS

- + **CBSE Group Mathematics Olympiad [National Level]** Dec. 2014
 - Secured and All India Rank 12 in the CBSE Group Mathematics Olympiad in class 10.
 - Was among the 33 students from CBSE grades 9-11 to qualify for Indian National Mathematical Olympiad (INMO).

CERTIFICATIONS

- + **Deep Learning Specialization** - deeplearning.ai [5 Courses]
- + **Algorithms Specialization** - Stanford University [4 Courses]
- + **Machine Learning** - Stanford University

COURSES

Machine Learning, Neural Networks and Fuzzy Logic, Artificial Intelligence, Foundations of Data Science, Object Oriented Programming (OOP), Logic in Computer Science, Data Structures and Algorithms (DSA), Database Systems (DBMS), Linear Algebra.

COMPETITIONS

- + **Codechef CodeSence 2020, Global rank : 14/480.** Jan. 2020
- + **Codechef Jan. CookOff, Global rank : 24/3245.** Jan. 2020
- + **Codechef Long Algorithmic Challenges** Jan. 2019
 - A 10-day algorithmic challenge focused on designing optimal and efficient solutions to programming problems.
 - **Jan. 2019:** Ranked 259/14588 on Division 1/2 combined.
 - **Dec. 2018:** Ranked 130/10754 on Division 1.
 - **Handle:** adi_ahuja
- + **Snackdown 2019 - Codechef** Nov. 2018
 - Qualified for the third round of Codechef Snackdown '19. Ranked : 1672 / 27875
 - **Handle:** g_e_b

EXTRA CURRICULAR ACTIVITIES

- + Active member of the institutes' AI research group - SAIDL.
- + Bash Scripting, Watching Art-house Films, Swimming and Squash.