ADITYA AHUJA

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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

- **Birla Institute of Technology and Science - BITS Pilani** — Goa, India
  Bachelor of Engineering in Computer Science [GPA: 7.96/10.0] — Aug. 2017 - Jul. 2021
- **GG International School** — Pune, India
  Science [Percentage: 93.8%] — Mar. 2015 - Mar. 2017
- **Indira National School** — Pune, India
  General [CGPA: 9.8] — Mar. 2013 - Mar. 2015

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** [**Github**] — 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 classified signatures by converting them into high dimensional representations.
  - Achieved an accuracy of about 98% on the test set over 750 iterations, training over 75K signature triplets.
  - Encapsulated the scripts into a python package for use from the bash terminal, adding an interface for evaluations.

Research Projects

- **Developing a framework to model solutions for Bongard Problems**
  Advisor: **Prof. Ashwin Srinivasan** — In Progress
  - Areas: Deep Learning, Probablistic Logic Programming.
  - Using the DeepProbLog framework to model solutions to the Bongard problems using Neuro Symbolic Modelling.
  - Using Deep Learning for pattern detection and Problog for estimating hypothesis likelihoods and probablities.
  - As part of the APPCAIR Lab, BITS Goa and in collaboration with TCS Research - DataLab .

- **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. Basabdatta Sen Bhattacharya** Jul. 2019 - Dec. 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** [**Github**] [**Code**]
  - Developed a Deep Learning pipeline for Emotion recognition 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, and CNNs for classification.
- **Memotion Sentiment Analysis** [**Github**] [**Code**]
  - Integrated deep text and image processing models to build a Multimodal Sentiment Analysis system.
  - Fine-tuned pretrained BERT and ResNext model and combined their representations using Late Fusion.
  - Classified sentiments on Internet Memes across different categories using the fused model.
- **Image generation with Generative Adversarial Networks** [**Github**] [**Code**]
  - Implemented Vanilla and Deep Convolutional GANs over the CIFAR 10 dataset generating artificial images.
  - Trained Discriminator & 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** [**Github**] [**Code**]
  - Implemented the GloVe algorithm on the Stanford Large Movie Review Dataset and clustered word embeddings.
  - Used the obtained word embeddings to test the models semantic understanding by querying for word similarities.
  - Visualized the embeddings, each a 15-dimensional vector on a 2d plane using the t-SNE algorithm.
- **Visualizing Genomic Data** [**Github**] [**Code**]
  - 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** [**Github**]
  - Designed an IC tester using Assembly Language to program an 8086 processor and the accompanying components.
  - Simulated the IC tester in Proteus using various virtual ICs to it and evaluating the outputs over the input space.

Mentorship Experience

- **Teaching Assistant - BITS F464 [Machine Learning]** Aug. 2019 - Current
  - Conducting Labs and Tutorials sessions for the Machine Learning course taught by Prof. Ashwin Srinivasan .
  - Also responsible for developing the course projects/competitions and evaluating them.
  - Developed the ML-Lab Book, available at `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 Techinal Projects** [**Website**] May. 2019 - Jul. 2019
  - Taught and mentored a group of over 200 undergrads, helping them get started with Machine Learning.
  - Duties included designing & evaluating assignments to grade their performance and helping them with their doubts.

Awards

- **CBSE Group Mathematics Olympiad [National Level]** [**Ranklist**] 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).

Competitions

- **Google HashCode 2020** [**Scoreboard**] Feb. 2020
  - Ranked **86 / 3116** among all Indian teams - **Global Rank : 922 / 10724**
  - Team Handle: 1939
- **Codechef - Algorithmic Challenges** Dec. 2018 - Feb. 2020
  - CodeSence 2020 - **Global rank 14 / 480.**
  - January CookOff 2020 - **Global rank 24 / 3245.**
  - January Long Challenge 2019 - **Global Rank 259 / 14588** on Division 1&2.
  - December Long Challenge 2018 - **Global Rank 130 / 10754** on Division 1.
  - Handle: adi_ahuja
- **Snackdown 2019 - Codechef** Nov. 2018
  - Qualified for the third round of Codechef Snackdown '19 - **Global Rank 1672 / 27875**
  - Team Handle: g_e_b

Courses

- **At University :** 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), Operating Systems (OS), Linear Algebra.

Certifications

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

Extra Curricular Activities

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

[adiah80.github.io/cv.pdf]