ADITYA AHUJA

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Website: adiah80.github.io
Github: github.com/adiah80

Research Interests

- Reasoning and Scene Understanding
- Time Series Forecasting & Anomaly Detection
- Neuro-Symbolic Modelling
- Deep Learning on Signals

Education

- **Birla Institute of Technology and Science (BITS) Pilani** — Goa, India
  Bachelors of Engineering in Computer Science. [GPA: 8.03/10.0] — Aug. 2017 - Jul. 2021

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, Data Structures and Algorithms

Experience

- **APPCAIR Lab, BITS Goa & TCS Research** [**Web**] — BITS Pilani, Goa
  Undergraduate Researcher, Advisors - **Prof. Ashwin Srinivasan** and **Dr. Lovekesh Vig** — Jan. 2020 - Current
  - Currently working on two projects - [1] Compositional Visual Reasoning using Action Graphs & [2] Root Cause Analysis in Time Series datasets. Previously worked on [3] Neuro-Symbolic modelling for the Bongard Problems.
  - Jointly trained Neural and Symbolic models using the DeepProbLog framework.
  - Used Deep Models for pattern detection/localization & Problog for estimating hypothesis likelihoods/probabilities.

- **European Centre for Medium-Range Weather Forecasts** [**Web**] [**Project**] — Reading, UK
  Research Intern, Advisor - **Dr. Peter Dueben** — May. 2020 - Currently
  - Building Machine Learning models for Time-Series Anomaly Detection to optimise ECMWF's data services.
  - Exploring Deep Time Series Forecasting, to make ECMWF's data products more resilient to request surges.
  - Developing a python package corresponding to the above as part of ECMWF's summer research program - ESoWC.

- **Media.net, Directi** — Mumbai, India
  Software Development Intern — May. 2020 - Jul. 2020
  - Worked in the Ad-Experience team building models to predict and act on malicious bids for web advertisements.
  - Implemented algorithms for client-side detection and identification of malicious activities on foreign scripts.

- **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 - [Github]
  - Built a Siamese Neural Network that classified signatures by converting them into high dimensional representations.
  - Encapsulated the scripts into a python package for use from the bash terminal, adding an interface for evaluations.

- **Pixxel** — Bangalore, India
  Research Intern — Feb. 2019 - Apr. 2019
  - Worked with Pixxel, a space-tech start-up on real world Machine Learning applications for their satellite data.
  - Built use-case prototypes from existing satellite data vendors for Geological applications - [Feasibility Report]

Research Projects

- **Schizophrenia detection using Electroencephalography Signals.**
  Advisor: **Prof. Amalin Prince** Sep. 2019 - Current

  - 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 from raw signals.
  - Exploring techniques 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.
  - Implemented 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 - [Report]
  - In collaboration with the Human Brain Project, 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.
  - Visualised the embeddings, each a 15-dimensional vector on a 2d plane using the t-SNE algorithm.

- **Visualizing & Correlating Genomic Data** [**Github**]
- **Python Implementation of Conway's Game-Of-Life** [**Github**]
- **Simulating an IC Tester** [**Github**]

Mentorship Experience

- **President - Society for Artificial Intelligence and Deep Learning** Jun. 2020 - Current
  - President of the Institutes' Artificial Intelligence and Deep Learning Research Group - SAiDL
  - Helped organise an AI-Research Symposium hosting top researchers from industry and academia.
  - Leading a group of talented undergraduates, holding paper reading sessions and working on open-source projects.

- **Teaching Assistant - BITS F464 [Machine Learning]** Aug. 2019 - Current
  - Conducting Labs and Tutorials sessions for the Machine Learning course taught by Prof. Ashwin Srinivasan.
  - Covered topics like - Linear Regression, Bayes Nets, SVMs, Neural Nets, Decision Trees and Clustering.
  - Also responsible for developing the course projects/competitions and evaluating them.
  - Developed the ML-Lab Book, available at `bits-f464.github.io` .

- **Teaching Assistant - Data Science, iXperience** Jul. 2019 - Aug. 2019
  - Professionally taught Data Science & Machine Learning as a TA for iXperience's Data Science programme.
  - Taught and mentored a group of college students from various universities (Yale, Harvard, Cambridge, Princeton, UCLA, UCSD, etc) around the world, covering topics like Data Modeling, Time Series Analyis & Web Scraping.
  - Mentored a team of interns for BUDS Lab - NUS, exploring data driven solutions to urban planning problems.

- **Technical Mentorship Programme, BITS Pilani** Aug. 2019 - May 2020
  - Mentored a group of 15 first-year Undergrads, under the Department Mentorship Programme.
  - Introduced them to various fields of Computer Science and helped them get started with programming.

- **Mentor, Deep Learning - Technology Incubator Programme** Aug. 2019 - Dec. 2019
  - Co-Lead a group of 50 undergrads on a semester-long project aimed at exploring Deep Learning methods for analysing and modelling EEG data.

- **Mentor, Machine Learning - Quark Summer Technical 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.
  - Among the **33 students from CBSE grades 9-11** to qualify for **Indian National Mathematical Olympiad** (INMO) at the National Level.

Competitions

- **Google HashCode 2020** [**Scoreboard**] Feb. 2020
  - Ranked **86 / 3116** among all Indian teams - **Global Rank : 922 / 10724**. [Team Handle: 1939]

- **Codechef - Algorithmic Challenges**
  - CodeSence 2020 - **Global rank 14 / 480.**
  - January CookOff 2020 - **Global rank 24 / 3245.**
  - January Long Challenge 2019 - **Global Rank 259 / 14588**.
  - December Long Challenge 2018 - **Global Rank 130 / 10754**.

Courses

- **University: Machine Learning** (was TA too, twice), **Neural Networks and Fuzzy Logic** (rank- 3/85), **Artificial Intelligence**, **Foundations of Data Science**, Compiler Construction, Computer Networks, Object Oriented Programming (OOP), Logic in Computer Science, Design and Analysis of Algorithms (DAA), Data Structures and Algorithms (DSA), Database Systems (DBMS), Operating Systems (OS), Linear Algebra.

- **Online:** fast.ai - Deep Learning and Machine Learning courses, Stanford CS231n - Convolutional Neural Networks for Visual Recognition.

Certifications

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

Miscellaneous

- Hobbies - Bash Scripting, Watching Art-house Films, Swimming and Squash.
- Keenly interested in Technology, Futurism, History, Geopolitics & Psychology.