# Aditya Ahuja

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

## Education

- **Birla Institute of Technology and Science (BITS), Pilani** — Goa, India
  Bachelors of Engineering (B.E.) in Computer Science. — Aug. 2017 - Jul. 2021

## Publications

- Tirtharaj Dash, Sharad Chitlangia, Aditya Ahuja, & Ashwin Srinivasan. *Incorporating Domain Knowledge into Deep Neural Networks.* [ Arxiv Preprint ]

## Work Experience

- **Google Summer of Code (GSoC), Machine Learning for Science (CERN)** [ Project ] — CERN
  Open Source Contributor, Advisors - Prof. Sergei Gleyzer & Prof. Harrison Prosper, — Jun '21 - Current
  - Working on Fast Detector Simulation by integrating Graph Normalizing Flows with existing DeepFalcon infrastructure.
  - Machine Learning for Science (ML4Sci) is an umbrella organization for Machine Learning projects in High Energy Physics.

- **Visual Computing Group, Harvard University** [ Web ] — Cambridge, USA
  Visiting Researcher, Advisor - Prof. Hanspeter Pfister — Jan '21 - Jun'21
  - Worked on few-shot image instance segmentation for RhoANA and PyTorch Connectomics pipelines.
  - Also developed techniques for few shot training of traditional Computer Vision models from geometric instance priors.

- **Computer Vision and Robotics Laboratory, UIUC** [ Web ] — Champaign, USA
  Remote Contributor, Advisor - Prof. Narendra Ahuja — Dec '20 - Feb '21
  - Worked on developing interpretable Computer Vision architectures.
  - Also contributed code to various other projects at the lab.

- **APP Center for AI Research (APPCAIR) & TCS Research** [ Web ] [ Demo ] — BITS Pilani, India
  Undergraduate Researcher, Advisors - Prof. Ashwin Srinivasan and Dr. Shirish Karande — Jan '20 - Dec '20
  - Contributed to four projects - ① Compositional Visual Reasoning using Action Graphs, ② Joint Neuro-Symbolic training, ③ Root Cause Analysis in Time Series datasets, & ④ Optimising RL algorithms using the Winnow Learning Rule.
  1. Built methods to generate Action Graphs to model temporal reasoning on the CATER dataset (Demo above).
  2. Focused on building Neuro-Symbolic reasoning models for the Bongard Problems, by extending the DeepProbLog framework.
  3. Explored Anomaly Detection, Correlation and Root-Cause Analysis algorithms for multi-variate Time Series data.
  4. Focused on using the Winnow Learning Rule to speed up inference time on standard Reinforcement Learning algorithms.

- **European Centre for Medium-Range Weather Forecasts** [ Web | Project | Talk | Slides | Demo ] — Reading, UK
  Research Intern, Advisor - Dr. Peter Dueben — Jul '20 - Sep '20
  - ECMWF is Europe's largest meteorological research institute and serves $\sim$ 400 TB of weather data daily.
  - Built Machine Learning models for Streaming Time-Series Anomaly Detection to optimise ECMWF's data services.
  - Implemented Deep Time Series Forecasting methods like N-BEATS; reduced Server Downtimes by up to 4 hours.
  - Work was supported by a grant of £5,000 and was done as part of ECMWF's Summer of Code program - ESoWC.

- **Media.net, Directi** [ Web ] — Mumbai, India
  Software Development Intern — May '20 - Jul '20
  - Media.net is one of the largest Ad-Tech companies in the world, specifically focused on contextual advertisements.
  - 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 in foreign scripts.

## Awards & Grants

- **AI Summer School - Google Research India** [ Website ] — Jul '20
  - **Among 150 students selected across India** to attend a sponsored Summer School on Machine Learning.
  - Offered a seat in the **Computer Vision track** (containing 50 students) in line with previous research experiences.

- **ECMWF Summer of Weather Code** [ Website ] — May '20
  - **Received a grant of £5,000** to develop Time-Series Anomaly Detection methods for ECMWF's massive data services.

- **CBSE Group Mathematics Olympiad [National Level]** [ Ranklist ] — Dec '14
  - Secured **All India Rank 12** in CBSE Group Mathematics Olympiad (preliminary qualifier for IMO) in class 10.
  - Among the **33 students from CBSE grades 9-11** to qualify for **Indian National Mathematical Olympiad (INMO)**.

## Leadership & Mentorship Experience

- **President - Society for Artificial Intelligence and Deep Learning** [ Webpage ] [ GitHub ] Jun '20 - Jun '21
  - President of the University's Artificial Intelligence and Deep Learning Research Group - SAiDL
  - Helped organise the Summer Symposium on AI Research - hosting top researchers from industry and academia.
  - Leading a group ($\sim$ 30) of talented undergraduates, holding Paper Reading sessions and working on Open-Source projects.
- **Teaching Assistant - BITS G513 [ Meta Learning ]** [ Webpage ] [ GitHub ] Jan '21 - May '21
  - Study in Advanced Topics (**Graduate course**) on Meta Learning conducted in collaboration with IIT Delhi & IIIT Delhi.
  - Responsible for conducting labs and evaluating projects, working under Prof. Tirtharaj Dash and Dr. Gautam Shroff
- **Teaching Assistant - BITS F464 [ Machine Learning ] (Twice)** [ Webpage ] Jan '20 - Dec '20
  - Conducted Labs & Tutorials on topics like - Linear Regression, Bayes Nets, SVMs, Neural Nets, Decision Trees & Clustering.
  - Also responsible for developing the course projects/competitions and evaluating them.
- **Teaching Assistant - Data Science, iXperience** [ Webpage ] Jul '19 - Aug '19
  - Professionally taught Data Science & Machine Learning as a TA for iXperience's Data Science program.
  - Taught and mentored a diverse 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 8 interns for BUDS Lab, NUS, exploring data driven solutions to urban planning problems.
- **CSE Technical Mentorship Programme, BITS Pilani** Aug '19 - May '20
  - Mentored a group of 15 first-year Computer Science Undergraduates, under the Department Mentorship Programme.
  - Introduced them to various fields of Computer Science and helped them get started with programming.

## Research Projects

- **Schizophrenia detection using Deep Electroencephalography Models.** Sep '19 - Feb '20
  Advisor: Prof. Amalin Prince
  - 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 Spiking Neural Network.** [ Report ] Jul '19 - Dec '19
  Advisor: Prof. Basabdatta Sen Bhattacharya
  - Areas: Spiking Neural Networks, Neuroscience.
  - Implemented reinforcement learning in a spiking neural network using Spiking-Timing-Dependent Plasticity (STDP).
  - Developed a Basal Ganglia model that makes use of the Three-Factor Learning rule
  - In collaboration with the Human Brain Project, and the SpiNNaker neuromorphic computing framework.

## Programming Competitions

- **Google HashCode 2020** Feb. 2020
  - Ranked **86 / 3116** among all Indian teams - **Global Rank : 922 / 10724**.
- **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**.

## Technical Skills

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

[ adiah80.github.io/cv.pdf ]