

# CHAITANYA RAJESH BANALA

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## EDUCATION

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**Indian Institute of Technology Bombay,**

*Bachelor of Technology in Computer Science & Engineering*

GPA: 8.00 / 10.00

*Jul. 2014 – May. 2018*

## RESEARCH EXPERIENCE

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### **Interpretable Deep Learning Models\*\***

*Aug'20 - present*

- Researching different ways to increase the interpretability in deep learning models
- Exploring techniques like Hierarchical Tree models and Neural Additive models.

### **Efficient on-device Motion Deblurring model for Mobiles**

*Jan'20 - Mar'20*

- Implemented and Deployed ML models for Mobiles that detects and rectifies motion blur efficiently.
- The architecture of deblurring network is based on **Dense Deformable modules** and **Self Attention**.
- Deployed the model at system level (Samsung HAL layer) to reduce the latency for performing deblurring.

### **GAN based Image Compression**

*Jun'19 - Jul'19*

- Proposed a novel approach in the area of Lossy Image Compression based on **Generative Adversarial Networks**.
- Used a multi-variate loss function to overcome various artifacts introduced during reconstruction of the image from compressed format.
- Achieved high compression rates of 43% , 68% , 84% and reconstruct original images that are structurally very similar to original image with SSIM  $\sim 0.95$ .

### **Auto ML : Implementation of ENAS**

*Sep'19 - Dec'19*

- Implemented a simple variant of ENAS (**Efficient Neural Architecture Search**) , an approach for automatic model design. Designing macro search strategy, where each layer in the network can take inputs from any previous layer independent of how other layers choose their inputs on CNN architectures for classification task on MNIST.

## SCHOLASTIC ACHIEVEMENTS

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- Secured **All India Rank 227** in **IIT JEE Advanced 2014** out of **150 thousand** candidates (2014)
- Among top **0.02%** in **JEE Main (B.Tech)** out of **1.3 million** candidates (2014)
- Obtained **99.98 percentile** in **EAMCET** out of **0.29 million** candidates (2014)
- Awarded with prestigious **Prathibha** Scholarship by Ministry of Human Resource Development , Govt. of India (2014)
- Successfully completed a course under Green Campus ,National Service Scheme ,IIT Bombay 2014

## RELEVANT COURSES

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Practical Deep Learning for Coders - fast.ai

Bayesian Methods for Machine Learning

Digital Image Processing

Computer Graphics

Data Structures & Algorithms

Artificial Intelligence (Theory + Lab)

Practical Reinforcement Learning

Computer Vision

Operating Systems (Theory + Lab)

## ACADEMIC PROJECTS

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### **Solar Flare Detection using CCNN**

*Jan'17 - Apr'17*

- Implemented **Cascade-Correlation Neural Network** , a self-organizing architecture that autonomously adapts to the application and makes the training much more efficient.
- Used the CCNN to generate a classifier model that detects Solar Flare using astronomical data . Achieved accuracy greater than 90% to outperform classical ML models like SVM , RF and simple ANN.

### **AugmentBOI : Markerless AR enabled Mobile App**

*Jan'18 - Apr'18*

- Employed Markerless Augmented Reality technology to develop an Android App in which the users can place any type of multimedia content on real world objects and view them augmented on the real-world objects/textures.

- Content is stored and retrieved through Web API's using a Django-based server hosted on AWS. Used AR SDK for object/texture detection and augmenting the content on the detected object.

#### **eRailSeva: Food Ordering Android App**

*Jan'17 - Apr'17*

- Ideated and designed an interactive Android application to order food while traveling in a train from upcoming stations.
- Used Django based server hosted on Heroku in the backend with multiple Web API's such as User-authentication, form validation. Used PostgreSQL Relational Database Management System for efficient storing of data and processing of SQL-based queries.

#### **Face Detection : OpenCV Implementation**

*Aug'16 - Nov'16*

- Used Hue and Chrominance on top of standard RGB with pre-trained filters for detecting skin pixels. Classified the detected skin areas into faces and non-faces using Box Ratio, Eccentricity by dividing them into Connected Components.
- Achieved real-time face detection with accuracy  $\sim 85\%$  (in bright light conditions) by implementing it in C++ using OpenCV2 library.

## **WORK EXPERIENCE**

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#### **JPMorgan Chase, Bengaluru**

*(May'17 - Jul'17)*

- Worked as a Software Development Intern with the App Developing Team in designing and developing a windows-based application for Clients.
- Developed a Web Application as an extension to the app using Athena Framework and a Python-based backend server that displays all the Trade Details of the client with interactive graphs and other real-time trade metrics.

#### **Novanet, Mumbai**

*(Dec'15)*

- Worked as a Research Intern and researched on various instant messaging protocols like MQTT and XMPP. Updated and Tested the audio module of WebRTC for Novanet's application called Tlkn.
- Prepared a report on Protocols using Latex stating the merits and de-merits of them and the possible implementation of messaging capability in Tlkn.

## **TECHNICAL SKILLS**

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**Frameworks:** OpenCV, PyTorch(Advanced), Tensorflow(Intermediate)

**Web Development:** Django , PHP , Ajax

**DataBases:** PostgreSQL, MySQL

**Softwares:** : MatLab, GnuPlot, WireShark, Octave, Perforce, Git, L<sup>A</sup>T<sub>E</sub>X

**Languages:** C++, C, Java and Python

## **OTHER PROJECTS**

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- **C++ Compiler** : Developed a compiler for subset of C++ grammar. Implemented Optimization using Dead Code Elimination
- **Improvement to xv6** : Added features like copy-on-write fork, Data Deduplication, Priority based Process Scheduling to existing xv6 OS
- **Distributed Computing** : Used Socket Programming libraries in C++ to enable communication between worker and server nodes to crack a password of given length, type and hash
- **Branch Change Portal** : Developed a Web App using Django web framework for branch allocation using modified Gale-Shapley Algorithm
- **Traffic Management System** : Designed a traffic control service and implemented it in VHDL which simulates transitions of red, yellow and green signals at different junctions
- **Bowling Machine** : Used Box2D, a physics simulation engine, to create a series of events which let a ball topple the pins. Created entities like pulleys, conveyer belts
- **Sudoku Auto Solver** : Used simplecpp graphics library of C++ to create a sudoku interface and Back-tracking Algorithm to generate a solution