

# CHAITANYA RAJESH BANALA

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## EDUCATION

**Indian Institute of Technology Bombay,**  
*Bachelor of Technology in Computer Science & Engineering*  
GPA: 8.00 / 10.00

Jul. 2014 – May. 2018

## RESEARCH EXPERIENCE

### Interpretable Deep Learning Models **\*\***(adv. Prof. Vineeth Gandhi)

Aug'20 - present

- Researching different ways to increase the interpretability and robustness in Neural Networks.
- Explored networks like Tree-Based Models, Neural Additive models and Probabilistic NN for different Vision tasks.
- Designing different forms of interpretable functions, based on the nature of task and models robust to sparse data.
- Formulating models as a function of interpretable features, i.e., outcomes of interpretable functions encoded in the network.

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

Jan'20 - Mar'20

- Designed an efficient, lightweight architecture for high-end Mobiles that detects and rectifies motion-blur in images.
- Network is based on modules and concepts like Dense Deformable modules, DenseNet and Self Attention.
- Successfully deployed the model at system level (Samsung HAL layer) to reduce the latency.

### Constrained Neural Architecture Search

Sep'19 - Dec'19

- Proposed an approach in the area of Auto ML for automatic model design according to given latency and memory constraints based on ENAS.
- Implemented macro search strategy that designs different CNN architectures based on mobile specifications.

### Extreme Image Compression with GANs

Jun'19 - Jul'19

- Proposed an approach in the area of Lossy Image Compression based on Generative Adversarial Networks.
- Designed a ResNet model and a multi-variate loss to overcome various artifacts introduced in reconstruction.
- Achieved very high compression rates of 84%, 91% and be able to reconstruct images with SSIM  $\sim 0.95$ .

## SCHOLASTIC ACHIEVEMENTS

- 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)
- Secured **99.98 percentile** in **EAMCET** out of **0.3 million** candidates (2014)
- Awarded with prestigious **Prathibha** Scholarship by Ministry of Human Resource Development, Govt. of India (2014)
- Among top **2%** students in Indian National Mathematics Olympiad and Junior Science Olympiads (2009-2013)

## WORK EXPERIENCE

### Samsung Research Institute, Noida

(Jun'18 - Apr'20)

- Implemented Code Optimizations in the HAL layer of Camera module to eliminate various memory, latency issues.
- Designed on-device ml-models related to computer vision and modified the camera pipeline for faster throughput.

### JP Morgan Chase, Bengaluru

(May'17 - Jul'17)

- Improved the performance of a Windows app that displays Client's Trade Information with interactive graphs and real-time trade metrics. Modified the server API's to optimize data flow.
- Developed a Web Application as an extension to the app using Athena Framework and Python-based backend server.

## RELEVANT COURSES

Probabilistic Graphical Models Specialization*	Deep Learning Specialization*
Practical Deep Learning for Coders - fast.ai*	Artificial Intelligence (Theory + Lab)
Bayesian Methods for Machine Learning*	Practical Reinforcement Learning*
Digital Image Processing	Computer Vision
Computer Graphics	Foundations of Machine Learning
Data Structures & Algorithms	Operating Systems (Theory + Lab)

\* Online

## 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.

## TECHNICAL SKILLS

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**Frameworks:** PyTorch(Advanced), Tensorflow(Intermediate), openCV, scikit-learn

**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

## EXTRA CURRICULARS

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- Hosted and participated in an annual cultural event organized by TelCA, IIT Bombay 2016.
- One of the organizer in TechFest, India's biggest tech event with over thirty thousand attendees, IIT Bombay 2016.
- Participated in Hackathons like Microsoft's Code.Fun.Do conducted at IIT Bombay 2015.
- Successfully completed a course under "Green Campus" by planting about thirty trees inside the campus,National Service Scheme ,IIT Bombay 2014.

## 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