CHAITANYA RAJESH BANALA

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Education

Indian Institute of Technology Bombay,
Bachelor of Technology in Computer Science & Engineering *Jul. 2014 – May. 2018*
GPA: 8.00 / 10.00

Research Interests

Deep Learning, Explainable Machine Learning, Adversarial Learning and Robust Neural Networks, Applied AI

Research Experience

Interpretable Deep Learning Models **(adv. Prof. Vineeth Gandhi) *Aug'20 - present*

- Researched the existing techniques in adversarial learning and exploring different ways to increase the interpretability and robustness in Neural Networks.
- Explored networks like Tree-Based Models, Neural Additive models and Bayesian Neural Nets for different Vision tasks and working on designing different forms of interpretable functions, based on the nature of task.
- Formulating architectures as a function of model-agnostic interpretable functions to automate model selection for a given task.

Efficient on-device Motion Deblurring model for Mobiles *Jan'20 -Mar'20*

- Designed an efficient, lightweight architecture for highend Mobiles that detects and rectifies motion-blur in images.
- Network is based on Spatial Transformer Networks like Dense Deformable module, 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.
- Designed a controller model based on LSTM and, a constrained loss using a reinforcement learning approach.
- Implemented macro search strategy that automatically 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)*
- Awarded with prestigious **Prathibha** Scholarship by Ministry of Human Resource Development , Govt. of India *(2014)*
- Secured **99.98 percentile** in **EAMCET** out of **0.3 million** candidates *(2014)*
- Among top **2%** students in Indian National Mathematics Olympiad, Astronomy and Junior Science Olympiads *(2009-2013)*
- District Rank under 2 for four consecutive years in Ramanujan Mathematics Olympiad *(2008-2012)*

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

* Online

Academic Projects

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

Frameworks: PyTorch(Advanced), Tensorflow(Intermediate), openCV, scikit-learn
Web Development: Django , PHP , Ajax
DataBases: PostgreSQL,MySQL
Softwares: : MatLab,GnuPlot,WireShark,Octave,Perforce,Git,LaTeX
Languages: C++, C,Java and Python

Extra Curriculars

- 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.
- Tutored a batch of 40 employees as part of the AI workshop, taught the basics of Machine Learning and evaluated team projects, Samsung 2019.
- Successfully completed a course under "Green Campus" by planting about thirty trees inside the campus,National Service Scheme ,IIT Bombay 2014.

Other Projects

- **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