# PRANEETH CHANDRA BOGINENI

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## EDUCATION

**Boston University** *January 2021 -*
Master of Science in Artificial Intelligence ***GPA: 3.94***
Research Assistant, Semantic Forensics *Guides: Prof Kate Saenko, Prof Bryan Plummer*
Teaching Fellow(TF/TA) *CS 585, Image and Video Computing*

**Indian Institute of Technology, Bombay** *July 2014 - August 2018*
Bachelor of Technology in Electrical Engineering
Minor in Computer Science and Engineering
Bachelors thesis on Lung Nodule Segmentation using CT scans *Guide: Prof Amit Sethi*

## TECHNICAL SKILLS / INTERESTS

| | |
|---|---|
| **Programming** | ***Python***, C/C++ |
| **Deep/Reinforcement Learning** | ***Pytorch***, Tensorflow, OpenAI Gym, Keras, Scikit-learn |
| **Web Development** | HTML, CSS, Django |
| **Interests** | ***Learning Algorithms***, Computer Graphics |

## RESEARCH EXPERIENCE

**Semantic Forensics, Authorship Attribution** July 2021 - Jan 2022
*Research Assistant* *Boston University*

- Scrapped more than 67**k** topic specific news articles from web to create and generate a dataset
- Built a **RoBERTa** based model to verify the purported source of a news article for 10 sources of interest
- Achieved $2^{nd}$ place in a competition conducted by **DARPA** even with a crippled model

**Segmentation of Lung Nodules in CT scans** June 2017 - April 2018
*Bachelor's Thesis Project* *IIT Bombay*

- Investigated different training methods of Segmentation networks on **CT scans** taken from LIDC/IDRI database
- Optimized the training process to ignore the tracheal dimension saving training time and compute resources
- Isometrically resampled 2D slices along the trachea are used at full resolution in training to prevent data loss
- The proposed method gave better results in segmenting smaller nodules sized around 3mm

## WORK EXPERIENCE

**Data Scientist, Fractal Analytics** June 2018 - January 2021
*Deep Learning, Computer Vision* *Mumbai*

- Implemented the paper **MixMatch: A Holistic Approach to Semi-Supervised Learning** in Pytorch and achieved similar results reported in it for classification tasks. Integrated the method into existing projects where a large amount of unlabelled data is available and observed upto 2% increase in performance
- Developed a generic and dense object detection inference module, which supports a tree-like ensemble of classification models after an object detector. The inference module is integrated into a **Django web server** hosted on a cluster of **GPUs** and dynamically loads the models into memory at startup ***US Patent App No: 17155369***
- Proposed and developed neural networks as cost attribution models, which attribute the transportation cost of products from the production warehouses to storage warehouses using **Integrated Gradients**. Advocated for the usage of neural networks as interpretable solutions rather than a black box ***Spot Award for innovation***
- Developed a generic Image classification framework in **Pytorch** which supports **Distributed training**
- Developed a Semantic Segmentation framework for images in **Pytorch** that supports distributed training, dynamic scaling of batch sizes, synchronized batch norm, and group norm
- Developed a Deep Learning model for extracting non-generic key-value pairs from banking invoices
- Designed an **ML** algorithm to extract tabular data from scanned documents preserving the tabular structure
- Developed a customer churn model from a huge tabular dataset to predict whether a given customer will cancel his cable subscription using feature reduction and machine learning techniques like PCA, Random Forest models, etc
- Built a resource management simulator for pandemics in **OpenAI** that supports compartment models in epidemiology like **SIR, SEIR**. Ran simulations on **COVID** data with actions that affect the disease transmission rate
- Implemented **Face Recognition** for employees of FRACTAL with **One-Shot Learning**
- Developed an object tracking algorithm for tracking people in security camera videos using object detection models
- Implemented auto annotation of consumer product images with clustering using **Convolutional Auto Encoders**
- Conducted various training sessions for a team of ten members on **Resnets**, **Semi-Supervised Learning** etc
- Developed action detection models for household videos with five actions of interest. Performed several experiments with different input modalities like **RGB difference**, **Optical Flow** on **TSN** architecture and **CoVIAR**

## ACADEMIC PROJECTS

**Machine Learning / NLP**

- Implemented a neural network training framework from scratch in numpy closely following the design of **Pytorch**
- Trained several **BERT** based models to detect emotions from tweets, and combined them with **CNN**s which can identify the race of person from images to verify a correlation of certain emotions like fear with the presence of east asian people in instagram posts during the **COVID** era

**Computer Vision**

- Applied the **PuppetGAN** architecture, which enables cross-domain feature manipulation, to Synaction-Weizmann dataset which contains images with complex visual attributes. Conducted several experiments to improve the disentanglement of useful embeddings from other feature embeddings
- Implemented a template matching algorithm using statistical correlation and image pyramids to detect hand shapes
- Implemented a multiple object tracking algorithm using **Kalman Filters** to track several bats in a given video

**Computer Graphics**

- Implemented a **Real-Time Skeletal Skinning Algorithm** that uses optimized centers of rotation that doesn't produce the usual unwanted visual artifacts like candy wrapper twists, collapsing elbows, and bulging
- Developed a map loader in **OpenGL** which given the geometry and textures of a map, renders it using vertex and fragment shaders as per **Phong Reflection model** and allows the user (the player) to fly around in it

**Electronic Design & Microcontrollers**

- Designed a prototype module for obtaining and displaying the **Photoplethysmograph** signal, retaining all its characteristics useful for diagnosis, on mobile using **bluetooth communication**. Obtained signal with **ten times the signal strength** as compared to traditional implementations with the same power
- Programmed an **ATMEGA2560** bot to spray fertilizer, using a rotating cylinder as an actuator, in model agricultural fields. The bot uses a line follower and a wheel to counter for navigation

## SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 155** (top 0.01%) in JEE Advanced *(2014)*
- Secured **State (Andhra Pradesh) Rank 37** in EAMCET out of **200,000** candidates *(2014)*