MANAS VASHISTHA

Mail ◇ *LinkedIn* ◇ *Github* ◇ *Webpage*[1]

EDUCATION

Indian Institute of Technology Bombay, *Mumbai, India* July '17 - Present
Dual Degree in Electrical Engineering with *M.Tech* in Microelectronics
Minor in Center of Studies in Resources Engineering

EXPERIENCE

Indian Institute of Technology Bombay, *Mumbai, India* *Fall '20 - Present*
Research project under Prof. Biplab Banerjee
Improving adversarial robustness of Machine Learning models
- Designing a novel algorithm which can make ML models more robust against adversarial samples
- Preparing a model to distinguish adversarial samples in a dataset from natural samples in real time

University of California Santa Barbara, *CA, USA* *Summer '20 - Present*
Summer internship at Perceptual Engineering Lab under Prof. Misha Sra
spARk: Creating logical stories in AR with Computer Vision
- Developed an application with Unity to create and load stories in Augmented Reality
- Designed an interface where the user can decide the logic of how the story proceeds
- Employing real-time 3D object detection to enhance user interaction with real world objects

University of Cambridge, *Cambridge, UK* *Summer '19*
Summer internship under Prof. Cecilia Mascolo & Dr. Jagmohan Chauhan
Incremental Learning on Resource Constrained Devices
- Optimized various incremental learning algorithms and implemented them with machine learning classifiers
- Compared and analysed different incremental learning classifiers to justify the variations in the accuracies

KEY PROJECTS

Learning Simple Games with Deep Q-Networks *Fall '20*
Reinforcement Learning under Prof. Amit Sethi *EE, IIT Bombay*
- Developed a learning environment for game playing Reinforcement Learning agents
- Trained RL agents to learn to play games like Tic-Tac-Toe and Dots & Boxes
- Implemented algorithms like minimax and alphabeta search to train the agents
- Created a GUI for better human interaction with the agents while playing the game

Deep Image Priors *Fall '19*
Image Processing under Prof. Ajit Rajwade *CSE, IIT Bombay*
- Implemented the famous CVPR 2018 paper Deep Image Priors with PyTorch
- Used the method described in the original paper with some modifications for image inpainting
- Randomly deleted some pixels from a 512×512 RGB image and then filled them using said technique

Object Detection & Classification in Satellite Images *Winter '18*
Computer Vision *Self Project*
- Developed a Faster R-CNN model to detect objects in Satellite images & form bounding boxes
- Classified the objects detected in an image into different classes like airplanes, trees, buildings etc
- Observed the changes in the land features of a chosen locality over a certain period of time

Genre Classification *Fall '20*
Speech Processing under Prof. Preeti Rao *EE, IIT Bombay*
- Used logistic regression to classify audio samples from the GTZAN dataset on the basis of genre
- Identified the audio features which majorly contribute in the classification task like lower order MFCCs
- Compared the effect of changing the clip length of the audio samples and the effect of including tempo

ChordIt — Chord Sequence Extraction from Music *Spring '19*
Machine Learning under Prof. Biplab Banerjee *CSRE, IIT Bombay*
- Processed the audio files to retrieve $\mathbb{R}^{12}$ dimensional Pitch Class Profile vectors.
- Achieved 95% train, 86% test accuracy with *Radial Basis Function* kernel and *SVM Classifier*
- Incorporated mini-batches method in SGD Optimizer for Online Learning on real-time data
- Used Butterworth filter for creating a band pass filter to smoothen the function for better sampling.

[1]Use URL www.manasv09.github.io in case hyperlinks don't work

OTHER PROJECTS

Face Detection *Fall '18*

Computer Vision *Self Project*

· Exploited Viola Jones algorithm for fast detection of a human face in a picture
· Utilised AdaBoost to improve the performance of machine learning algorithm
· Implemented the algorithm using Haar Cascades and *Integral images*
· Achieved an accuracy of *87%* over the testing dataset

Multi-Cycle (RISC) Processor *Spring '19*

Processor Design under Prof. Virendra Singh *EE, IIT Bombay*

· Developed the architecture of a basic computer which follows a predefined set of instruction
· Created FSM (for implementation of the developed architecture) by assigning specific tasks to each state
· Tested the design on a new sequence of instructions by looping over all the instructions in the set
· Implemented the architecture & the testing part in VHDL and verified outputs using an instruction sequence

Maze Solver *Spring '18*

Robotics under Electronics & Robotics Club *IIT Bombay*

· Implemented *optimal algorithms* and techniques to obtain the *solution path* for the maze
· Analysed and mapped the maze using Ultrasonic ranging module and stored maze path data

Line Follower *Spring '18*

Robotics under Electronics & Robotics Club *IIT Bombay*

· Assembled a sensor array using IR Tx-Rx pair to detect white line on black background
· Utilised *optimal threshold* value for sensors to calculate distance of the line from the center
· Employed Proportional Integral Derivative controller to ensure smooth motion in correct direction

Heart Rate Monitor *Fall '18*

Analog Circuit Design under Prof. Siddharth Tallur *EE, IIT Bombay*

· Implemented reflective Photoplethysmography to measure the heart beat
· Analysed the heartbeat wave-form to measure *systolic & diastolic* heart-rate

SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 270** in JEE Advanced' 17 among 200,000 candidates
- Awarded the **AP Grade** (Top 1% out of 470 students) in Chemistry Laboratory
- Achieved 99.7 percentile in JEE Main' 17 among 1.2 million candidates
- Bagged State Rank 59 in UP State Entrance Exam' 17 among 142,000 candidates

TECHNICAL SKILLS

- **Programming Languages** - Python, C/C++, Java, MATLAB, VHDL
- **Libraries** - PyTorch, Tensorflow, Keras, OpenCV, SciPy, DL4J
- **Softwares** - Git, GitHub, GNU Octave, Eagle, SPICE, LaTeX, AutoCAD, Android Studio
- **Robotics** - Arduino, Raspberry Pi, Robot Operating System

RELEVANT COURSES

- **Machine Learning** - Foundations of Intelligent & Learning Agents, Advanced Machine Learning, Digital Image Processing, Machine Learning for Remote Sensing, Remote Sensing & Image Processing, Speech Processing, CS 231n (Stanford), Machine Learning (Andrew Ng)
- **Electrical Engineering** - An Introduction to Number Theory & Cryptography, Probability & Random Processes , Data Analysis & Interpretation, Network Theory, Signals & Systems, Microprocessors, Fundamentals of VLSI CAD Design
- **Mathematics & CSE** - Multivariable & Vector Calculus, Linear Algebra, Differential Equations I & II, Complex Analysis, Computer Programming & Utilisation

EXTRACURRICULAR ACTIVITIES

- Successfully completed 1 year of training under National Cadet Corps (NCC) IIT Bombay
- Attended the 10 day Annual Training Camp at IIT Bombay organized by *NCC IIT Bombay* during November-December 2017 and paricipated in various sports and cultural events
- Participated in the *Annual Republic Day Parade* held at IIT Bombay on 26th Jan 2018