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Webpage Github

Interests

Machine Learning, Deep Learning, Computer Vision

Research Experience

- **Real Time Object Detection in Mobile Devices** May 2017-July 2017
  IBM India Research Laboratory, Bangalore
  - *Objective:* To detect and identify objects in real time on mobile devices such that the model is memory, space and power efficient, and adaptable on arbitrary environments with relatively less training data
  - Intelligently **prune** redundant parameters in a **deep network**, reducing model size while maintaining similar accuracy, bringing applications from high-end immobile servers to mobile devices/robotics
  - Trained and Pruned the model on COCO with over a million object instances with competitive accuracy
  - Contributed Workplace Dataset and a Visual-IOT system for instance level recognition in mobile devices
  - Awarded the **IBM Blue Scholar Program Fellowship** for the work done during summers

- **Person Re-Identification: Multi-Task Deep CNN with Triplet Loss** May 2016-July 2016
  Supervisor: Prof. Vinay Namboodiri, IIT Kanpur *Report* *Code*
  - *Objective:* To solve the problem of Person Re-Identification i.e. Identifying a person in a **Low-resolution** Dataset given a query image of that person from a Same or a Different Camera
  - *Method:* Multi-Task Deep Convolutional Neural Network with shared parameters in lower layers to Jointly Learn Attributes and Features for Pedestrain Images with Multi-Task Loss
  - Achieved Results comparable to state-of-the-art on Market-1501 with over 32000 images

- **Deep Hybrid Models for Semi-Supervised Learning** Sep 2017-*Ongoing*
  Supervisor: Prof. Piyush Rai, IIT Kanpur
  - *Objective:* Training a Deep Network in a Semi-Supervised Framework with minimum labelled examples
  - *Model:* Combined strength of Discriminative-Generative Approaches in Multi-Task Setup with Feedback
  - Gaussian Mixture VAE for Generative branch and CNNs for Discriminative Branch with shared Encoder

Relevant Projects

- **Zero-Shot Image Tagging** Report Presentation Code
  Supervisor: Prof. Piyush Rai *Course Project : Machine Learning Techniques*
  - *Problem Statement:* Automatic **Annotation** of Images with Previously Unseen Tags
  - Proposed a Deep Network for **FastTag**, experimented with **Co-occurence** based tag embedding, and suggested a **Kernelized** Ridge Regression based model to learn the Principal Direction for an Image

- **Training Sparse Neural Networks** Aug 2017-*Ongoing*
  Supervisor: Prof. Purushottam Kar
  - *Problem Statement:* To train sparse one-hidden layer Neural Network and recover the sparsity structure
  - Implemented and Experimented with **Tensor Methods** for Weight Initialization in the Sparse Setting

- **Semantic Segmentation** Survey-Report Survey-Presentation
  Supervisor: Prof. Gaurav Pandey
  - *Problem Statement:* To solve the problem of **Pixel-level** Semantic Segmentation for Images/Videos/3D
  - Conducted a **survey** and studied research papers covering all the major algorithms such as Conditional Random Fields, Fully Convolutional Networks, HyperColumns, Dilated Convolutions, Sensor Fusion

- **Texture Synthesis** Code(nps) Code(quilting)
  Supervisor: Prof. Vinay Namboodiri *Course Project : Introduction to Computer Vision*
  - *Objective:*To synthesize large Texture image from small samples,capturing important Texture Properties
  - Studied and Implemented Research Papers: *"Image Quilting for Texture Synthesis and Transfer"* by Alexei A.Efros, William T.Freeman and *"Texture Synthesis by Non-parametric Sampling"* by Efros et.al

Other Selected Projects

- **Varun : Autonomous Underwater Vehicle** Webpage Github
  Faculty Advisers : Prof. K.S. Venkatesh, Prof. Sachin Y. Shinde
  - Designed and implemented Object Detection Algorithms using OpenCV to detect various obstacles Underwater to help the vehicle maneuver autonomously around these obstacles
  - Developed the software architecture of the Vehicle using ROS(Robot Operating System)

- **ShareCab** Code
  Supervisors: Prof. Satyadev Nandakumar, Prof. Piyush Karur *Course Project: Computing Laboratory II*
  - Developed Full Stack Ride-Sharing Web Application, based on Django, for Campus Community
  - Automated Search for Suitable Ride Matching based on Timings, Train/Flight Details, Destination

- **Software Testing Tool** Code
  Supervisors : Prof. Amey Karkare, Prof. Subhajit Roy *May 2015- July 2015*
  - Developed a tool for Automatically Generating Test Cases for High MCDC coverage
  - Build the solution over open-source tools implemented in multiple languages like Ocaml,C and Python

- **NachOS: Operating Systems** Code
  Supervisor: Prof. Mainak Chaudhury *Course Project: Operating Systems*
  - Implemented System Calls such as Fork, Exec, Sleep, Yield over the basic implementation of NachOS
  - Implemented Shared Memory Interface, Demand Paging and various Page Replacement Algorithms

- **Ada Compiler in Python** Code
  Supervisor: Prof. Amey Karkare *Course Project: Compiler Design*
  - Implemented an end-to-end compiler from scratch for Ada95 in Python
  - Separate modules for parse trees, abstract syntax trees, intermediate code, and target code(x86)

- **Game-Theoretic Analysis of Climate Change** Report
  Supervisor: Prof. Harish Karnick *Course Project: Multi-Agent Systems*
  - Game Theoretic Framework to analyze the existing treaties namely, Kyoto Protocol and Paris Agreement
  - Proposed a novel system and showed that multiple local treaties may be better than a single global treaty

- **Speech Recognition - Hidden Markov Models** Report
  Supervisor: Prof. Rajat Mittal *Course Project: Discrete Mathematics*
  - Learned about the concepts related to Markov Chains and Hidden Markov Models
  - Automatic Speech Recognition using Hidden Markov Models considering the Markov assumption

Technical Skills

LANGUAGES	C/C++, Python , Matlab
LIBRARIES AND TOOLS	OpenCV, ROS, Caffe, Tensorflow, Keras, Theano, Django
OPERATING SYSTEMS	Linux(Ubuntu, CentOS), Windows , BSD(FreeBSD)

Academic Achievements

- Secured All India Rank 118 in JEE-2014 amongst 1,400,000 candidates (99.99 percentile)
- Kishore Vaigyanik Protsahan Yojana (KVPY) Scholar 2013-14 with an All India Rank 240
- Qualified for **INOI-2012** conducted by *IARCS* (Indian Association for Research in Computing Science)
- Secured 2^{nd} position in the **National Student Competition of Save**, organized by *NIOT, India, 2016*

Relevant Coursework

- Intro to Programming (A*)
- Discrete Mathematics
- Data Structures and Algorithms
- Computing Laboratory
- Probability and Statistics
- Intro to Computer Vision
- Intro to Machine Learning
- Operating Systems
- Analysis of Algorithms
- Compiler Design
- Topics in Computer Vision
- Multi Agent Systems
- Neurobiology
- Probabilistic Machine Learning
- Computer Networks

A grade for exceptional performance*