CSM-291 Exploratory Project Work Plan

-Ayush Gupta

Goal: Build a computer vision deep learning model that detects different objects in a video, outputs their probability and demarcates the objects within a box with the help of the YOLOv3 (You Only Look Once, Version 3) algorithm.

Prior Knowledge at hand: Regression, Losses, Neural Networks, Deep Learning, Hyperparameter Tuning, Optimization Techniques (Stochastic Gradient Descent, Momentum, Adam etc.), Basic Probability, Statistics and Linear Algebra.

Project Supervisor: Dr. Santwana Mukhopadhyay

Work Plan

- **30 Aug - 12 Sept**
  - Convolutional Neural Networks (CNNs)
    - How do convolutional layers work?
    - Multilayer convolutions
    - Pooling layers
  - TensorFlow Tutorials
    - Tensor Basics
    - Sequential and Functional API of TensorFlow
    - CNN Implementation using TensorFlow
- **13 Sept - 26 Sept (Mid Semester Examinations : 17 Sept - 25 Sept)**
  - Case Studies of Famous Model Architectures
    - ResNet-50
    - AlexNet
    - VGG-16
    - Inception Network
    - MobileNet
  - Improving ConvNets
    - Transfer Learning
    - Data Augmentation
    - Image Preprocessing
    - CPU v/s GPU for training and testing
- **27 Sept - 10 October**
  - Implementation of one of the research papers of famous deep learning architectures using TensorFlow on ImageNet dataset
  - Apply knowledge of CNNs and standard models on an image classification mini-project
  - Detection Algorithms
    - Object Localization and Landmark Detection
    - Basic Object Detection Techniques

- **11 October - 24 October**
    - Advanced Detection Techniques
        - YOLO Algorithm
        - Image Segmentation
        - Transposed Convolutions
        - U-Net architecture and intuition
    - Object Detection mini-project on images
- **25 October - 7 November**
    - Sequence Models
        - Recurrent Neural Networks (RNNs)
        - Long Short Term Memory (LSTM)
        - Recurrent Convolutional Neural Networks (RCNN)
        - Semantic and Instance Segmentation
    - PyTorch Tutorials
- **8 November onwards**
    - Final Project Implementation