

CSM-392 UG Project

Work Plan

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Area of Research: Digital Image Processing and its Applications

Goal: Build a computer vision deep learning model that uses **digital image processing** to detect 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: Prof. SK Pandey

Work Plan

- 1
 - Go through of the book Digital Image Processing by Gonzalez and Woods.
- 2
 - 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
- 3
 - 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
- 4
 - 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

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 - Advanced Detection Techniques
 - YOLO Algorithm
 - Image Segmentation
 - Transposed Convolutions
 - U-Net architecture and intuition
 - Object Detection mini-project on images
- **6**
 - Sequence Models
 - Recurrent Neural Networks (RNNs)
 - Long Short Term Memory (LSTM)
 - Recurrent Convolutional Neural Networks (RCNN)
 - Semantic and Instance Segmentation
 - PyTorch Tutorials
- **7**
 - Final Project Implementation