

AI Courses by OpenCV

DEEP LEARNING WITH TENSORFLOW & KERAS

Getting Started

1. Introduction to Artificial Intelligence

- History of AI
- Applications of AI
- AI in Computer Vision
- AI Terminology
- Introduction to Deep Learning
- Deep Learning Frameworks

2. Numpy Refresher

3. Introduction TensorFlow and Keras

4. What is inside an ML Algorithm

- Machine Learning pipeline
- Solving ML Problems
- Gradient Descent for Optimization
- Deep Learning Overview

5. Regression: A Classic Supervised Learning Problem

Assignment1: Implement Leaky ReLU, Softmax and Convolution using TensorFlow

Assignment2: TensorFlow Assignment

Assignment3: Implement Gradient Descent for two variables

Module 2 : Neural Networks

1. Understanding Neural Networks
 - Feature Vectors and Normalization
 - What is Neural Network
 - Demystifying Neural Networks
2. Building Neural Network in Keras
 - Data Processing
 - Linear Regression with Keras
 - Binary Classification with Keras
3. Building Blocks of a Neural Network
 - Loss Function for Regression
 - Loss Function for Classification
 - Types of Activation Functions
 - How does Neural Network learn
4. Multi-class Classification using Keras
 - Classifying MNIST digits with a Multi Layer Perceptron (MLP)
5. Model Complexity, Generalization and Handling Overfitting
 - Bias Variance Trade-off
 - How to Prevent Overfitting
6. Image Classification using Multilayer Perceptron
7. Understand and Implement the building blocks like the different Activation Functions, Loss Functions, Hidden Layers.

Assignment4: MLP Assignment

Convolutional Neural Network

1. Image Classification

- Image classification using CNN

2. CNN

- CNN Building Blocks
- The Convolution Operation
- Layers in CNN
- Implementing LeNet in Keras

3. Building custom models from scratch using your own data.

- Keras Image_Dataset_from_Directory
- Overfitting and Data Augmentation

4. Working with pretrained Networks

- Important CNN Architectures
- Pretrained Models for Keras Applications
- Training VGGNet from Scratch on Balls Dataset

5. Transfer Learning and Fine-Tuning

- Transfer Learning with VGGNet as Feature Extractor on Balls Data
- Transfer Learning with VGGNet as Feature Extractor on ASL Data
- Fine Tuning VGGNet using ASL Data

Assignment5: Sequential vs Functional API

Assignment 6: Image Classification using CNN

Project1: Implement an Image Classifier from scratch

Semantic Segmentation

1. Introduction to Semantic Segmentation

- Introduction to Semantic Segmentation
- Overview of Semantic Segmentation

2. Custom Data Loader

- Semantic Segmentation Datasets
- Introduction to Segmentation Datasets and Custom Data Loader

3. Transposed Convolution

4. Fully Convoluted Networks

- FCN Architecture

5. Evaluation Metrics for Semantic Segmentation

6. UNet

- UNet Architecture
- UNet on Road Data: Metrics and CE Loss
- UNet on Aerial Data: Metrics and CE Loss

7. Custom Losses for Semantic Segmentation

- UNet on Aerial Data: Metrics and Losses

8. Dilated Convolution

9. DeepLabV3

- DeepLabv3 Architecture
- DeepLabv3+ on Road Data: Metrics and CE Loss
- DeepLabv3+ on CamVid Data

Project2: Kaggle Competition on Image Classification for American Sign Language Classification



Object Detection

1. Introduction to Object Detection
 - History of Object Detection
 - Object Detection Datasets
2. Hands on with Object Detector
 - Inference using Object Detection Models from TensorflowHub
3. Classification to Detection
 - Image Classification vs Object Detection
 - Revisiting Classification Pipeline
 - Encoding Bounding Boxes using Anchors
 - IoU
 - Encoding of Ground Truth
 - Multiple Anchors
4. Non Maximum Suppression (NMS)
 - Introduction to NMS
 - NMS vs Soft NMS
5. Evaluation Metrics
 - Why we need Evaluation Metrics
 - Building Blocks of mAP
 - Precision vs Recall
6. Popular Object Detection Architectures
 - Traditional Object Detector
 - Two Stage Object Detector
 - YOLO: You Only Look Once
 - SSD: Single Shot MultiBox Detector
 - RetinaNet

Assignment6: Encoding and Decoding of Ground Truths for Anchor box implementation

Module 7 : Pose Estimation

1. Real time Pose Estimation using mediapipe
2. Create your own Gym Trainer

Project2: Sports Classification using Transfer Learning and Fine Tuning.

Project3: Flood Aerial Imagery Segmentation

Project4: Safety Kit Detection using Object Detection