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
   - NumPy Refresher Part-1
   - NumPy Refresher Part-2
   - NumPy Refresher Part-3

3. Introduction TensorFlow
4. What is inside an ML Algorithm
   - Machine Learning pipeline
   - Solving ML Problems
   - Gradient Descent for Optimization

5. Regression: A Classic Supervised Learning Problem

Assignment 1: Implement Leaky ReLU, Softmax and Convolution using TensorFlow

Assignment 2: Implement Gradient Descent for two variables
Module 2 : Neural Networks

1. Understanding Neural Networks
   - Deep Learning Overview
   - What is a Neural Network
   - Feature Vectors and Normalization
   - Demystifying Neural Networks

2. Building Neural Network in Keras
   - Introduction to Linear Regression
   - Auto-MGP 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 the 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

Assignment 3: Applying a MLP on the Fashion MNSIT Dataset
Module 3: 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. Evaluation metrics for Classification
   - Performance Metrics for Classification
   - Evaluation metrics for Classification

4. Building Models with Custom Data
   - Keras Image _Dataset_from_Directory
   - Overfitting and Data Augmentation

5. Working with pretrained Networks
   - Important CNN Architectures
   - Pretrained Models for Keras Applications
   - Training VGGNet from Scratch on Balls Dataset

6. 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

Assignment 4: Sequential vs Functional API

Assignment 5: Image Classification using CNN
Module 4 : Advance Training Concepts

1. Optimizers
2. Handling Data in TensorFlow
   - Introduction to TF Data
   - Custom Data Loader using Sequence Model
   - TF Records
3. Learning Rate Schedulers
   - Learning Rate Decay Models
   - LR Schedulers
4. Gaining Insights
   - GradCam

Module 5 : Semantic Segmentation

5. Introduction to Semantic Segmentation
   - Introduction to Semantic Segmentation
   - Semantic Segmentation Datasets
   - Overview of Semantic Segmentation
6. Custom Data Loader
   - Introduction to Segmentation Datasets and Custom Data Loader
7. Transposed Convolution
8. Fully Convoluted Networks
Module 6 : 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 and Recall
   - Average Precision (AP) and Mean Average Precision (mAP)

6. Popural Object Detection Architectures
   - Traditional Object Detectors
   - Two Stage Object Detectors
   - YOLO: You Only Look Once
   - SSD: Single Shot MultiBox Detector
   - RetinaNet

7. TensorFlow Object Detection API
   - Installation of TFOD
   - Introduction and Inference using TFOD Pretrained Models
   - Data Preparation in TFOD
   - Pipeline Configuration in TFOD
   - Inference with a Pretrained Model

8. Create a Custom Object Detector
- Detector Architecture
- Anchor Boxes and Label Encoding
- Anchors Generation using Keras
- Loss Function
- Decode NMS
- Evaluator in the Pipeline
- Create a Custom Data Loader
- Training from Scratch

**Assignment 7:** Encoding and Decoding of Ground Truths for Anchor box implementation

**Project 4:** Object Detection

**Module 7: Introduction to Generative Adversarial Networks**

1. Introduction to GANs
2. Vanilla GAN using Fashion MNIST
3. DCGAN using Flickr Faces
4. CGAN using Fashion MNIST

**Module 8: Introduction to Mediapipe and Applications**

1. Introduction to Mediapipe
2. Posture Analysis using Mediapipe
3. Drowsy Driver Detection using Mediapipe