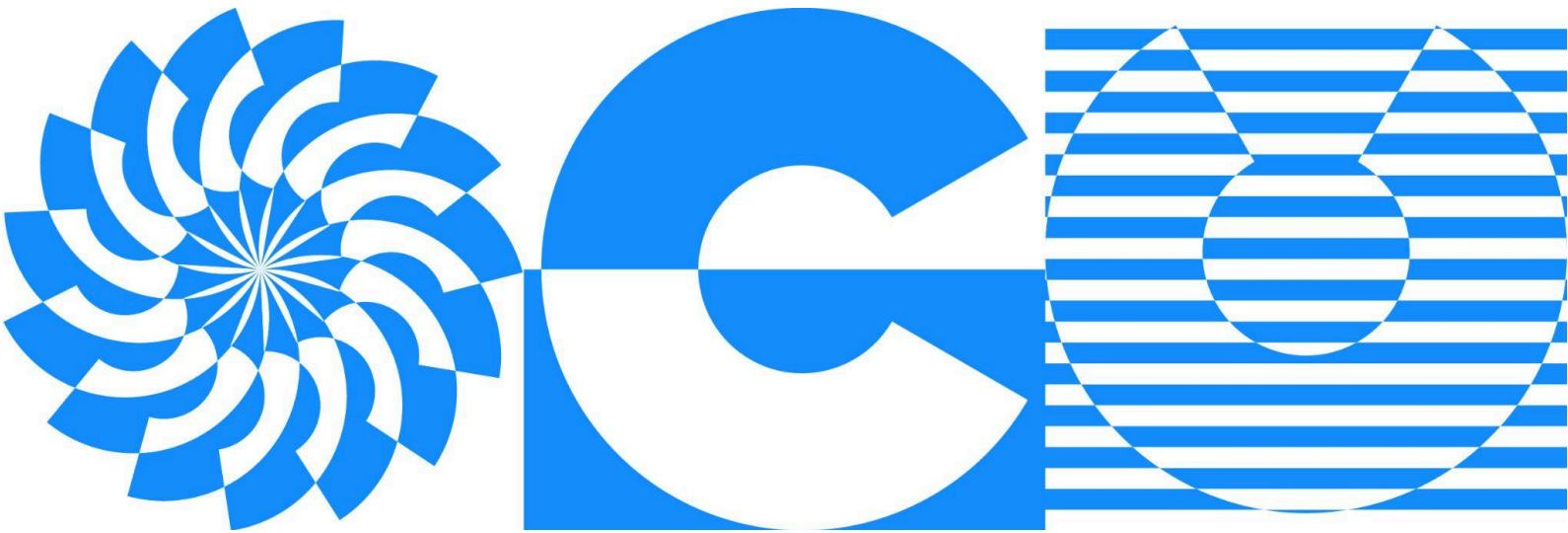


A place where legacy creates the future.



TXAP

# **Advanced Vision Applications with Deep Learning & Transformers**

Detailed Curriculum



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- 

## Introduction

## Welcome

- Welcome
- Introduce Yourself!

## Course Logistics

- How is the Course Organized?
- Grading Policy and Certification
- How to Use Online Labs
- Where can I Download the Code?
- Quiz Instructions

## Setting Up Deep Learning Tools

- Introduction to Colab
  - Introduction to Kaggle Kernel
- 

# Module 1: Neural Networks and Classification

## Download Code

- Download Code

## Introduction to Neural Networks

- What is a Neural Network?
- Deep Learning Frameworks
- How Does a Neural Network Learn?

## Introduction to PyTorch

- What is PyTorch and Why Choose PyTorch?
- PyTorch Basics and Tensor Operators
- Training Neural Networks: Overview

- Binary Classification with PyTorch
- Dataloaders in PyTorch: Classification

## **Feedforward Neural Networks**

- Why do We Need Hidden Layers?
- Training a Neural Network using Backpropagation
- Image Classification using MLP
- Example: Image Classification using MLP

## **Convolutional Neural Networks**

- The Convolution Operation
- Example: Image Classification using CNNs

## **Logging using MLOps Tools**

- Introduction to Weights & Biases

## **Transfer Learning and Fine-Tuning using Pre-Trained Models**

- Transfer Learning Notebook
- Train Image Classifier to Fine-Tune on a Difficult Dataset

## **Vision Transformers**

- Introduction to ViT
- ViT Attention Map
- Fine-Tuning ViT for Birds Classification

## **Assignment 1**

- Assignment 1: Binary Classification (Graded)

## **Quiz 1**

- Quiz 1 (Graded)

## Module 2: Object Detection

### Download Code

- Download Code

### Introduction

- Object Detection Overview
- Traditional Object Detection Pipeline

### Single Stage Detectors

- SSD
- RetinaNet

### Object Detection using YOLO

- Introduction to YOLO
- Object Detection Inference
- Fine-Tuning for Aerial Images
- Tiled Object Detection using YOLOv8

### Detection Transformers

- Object Detection using RTDETR

### Case Study – Global Wheat Challenge

- Global Wheat Detection Part 1 – Training
- Global Wheat Detection Part 2 – Practical Improvements

### Assignment 2

- Assignment 2: Annotation Conversion (Graded)

## Quiz 2

- Quiz 2 (Graded)

## Project 1

- Object Detection (Graded)
-

# Module 3: Text Detection & Recognition (OCR)

## Download Code

- [Download Code](#)

## Introduction

- [Introduction](#)

## Graphic Text Recognition using Tesseract

- [What is Tesseract?](#)
- [Notebook: Introduction to OCR using Tesseract](#)
- [Notebook: Tesseract OCR Failure Cases](#)
- [Notebook: Improving Tesseract OCR Failures](#)

## Transformer OCR (TrOCR)

- [Introduction to TrOCR](#)
- [TrOCR Inference with Cropped Image](#)
- [TrOCR Inference with Text Detection](#)
- [Fine-Tuning using TrOCR on Captcha](#)

## Application – ALPR

- [Introduction to ALPR](#)
- [YOLOv10 License Plate Detection Training](#)
- [Fine-Tuning TrOCR on License Plate Text](#)
- [ALPR Inference – Combined Detection + OCR](#)

## Assignment 3

- **Assignment 3: TrOCR Invoice (Graded)**

### **Quiz 3**

- **Quiz 3 (Graded)**

### **Project 2-**

- **TrOCR (Graded)**
- 

## **Module 4: Segmentation**

### **Download Code**

- **Download Code**



## Introduction

- Introduction to Segmentation

## Deep Learning-Based Segmentation Models

- Introduction to Segmentation using Torchvision Models

## Transformer-Based Segmentation Models

- Aerial View Segmentation using SegFormer

## SAM (Segment Anything Model)

- Introduction to SAM
- Automatic Person Segmentation with YOLOv11 + SAM2
- Advanced Segmentation Techniques with SAM2

## Segmentation using Custom Backbone

- DINO UNet Road Segmentation

## Quiz 4

- Quiz 4 (Graded)

## Project 3

- Segmentation (Graded)
- 

# Module 5: Tracking

## Download Code

- Download Code

## Introduction

- Overview
- Object Tracking Algorithms

## Ultralytics Tracking

- Tracking using Ultralytics YOLOv8
- SeaDrone Dataset Detection Fine-Tuning and Tracking
- YOLO11 Grocery Cart Tracking and Counting

## Multi-Camera Tracking

- Multi-Camera Tracking using OpenVINO

## Re-Identification

- Person ReID Fine-Tuning

## Transformer-Based Tracker

- Introduction to Point Tracking using CoTracker3

## Quiz

- Quiz 5 (Graded)
- 

# Module 6: Keypoint Estimation

## Download Code

- Download Code

## Introduction

- Introduction to Pose Estimation and Landmark Detection

## Exercise Analysis using Keypoints

- Squats Analysis Pipeline Overview
- Squats Analysis Code Explanation

## Keypoint Fine Tuning using YOLOv8

- Facial Keypoint Fine Tuning using YOLOv8

## Applications of Keypoint

- Warping a Triangle
- Delaunay Triangulation
- Face Alignment
- Face Averaging
- Face Morphing
- Bug Eyes
- Face Swap
- Beard Filter
- Aging Filter

## Assignment & Quiz

- Assignment 4: Smile Detection (Graded)
  - Quiz 6 (Graded)
- 

# Module 7: Face Recognition and Applications

## Download Code

- Download Code

## Creating an Automated Attendance System using AWS

- Introduction to Automated Attendance System
- Introduction to AWS Rekognition
- How to Setup AWS with AWS Rekognition
- Registration using AWS Rekognition
- Deregistration using AWS Rekognition
- Attendance Using AWS Rekognition
- Gradio App Setup Instruction

## Assignment & Quiz

- Assignment 5: Doppelganger (Graded)
- Quiz 7 (Graded)

## Bonus Module

### Download Code

- Download Code

### CLIP

- Zero Shot Image Classification with CLIP
  - Image Captioning and VQA with Moondream2
- 

## Summary of Assessments

- Total Quizzes: 7
- Total Assignments: 5
- Total Projects: 4

[Explore Other Courses](#)