CNNs, Darknet, and YOLO

In this task, we move from foundational neural networks to modern convolutional architectures used in real-world computer vision systems. You will explore the Darknet framework, understand ImageNet fundamentals, study popular CNN architectures, and get hands-on exposure to YOLO (You Only Look Once) using the **Ultralytics ecosystem**.

This week focuses on understanding how state-of-the-art vision models are built, trained, and deployed.

Concepts to Explore

1. Darknet Framework

Darknet is an open-source neural network framework written in C and CUDA, designed for efficiency and speed. It became widely popular due to its use in the original YOLO object detection models and laid the foundation for real-time vision systems.

2. ImageNet Fundamentals

ImageNet is a large-scale visual database that played a crucial role in advancing deep learning for computer vision. Many popular CNN architectures were trained and benchmarked on ImageNet, making it a cornerstone for transfer learning and modern vision models.

3. Common CNN Architectures

Familiarize yourself with the intuition behind widely used CNN architectures:

- AlexNet
- VGG
- ResNet
- EfficientNet

Focus on **why** these architectures were introduced and **what problem they solved**.

YOLO and Ultralytics

Explore the official Ultralytics documentation:
https://docs.ultralytics.com/

YOLO Modes

Understand the purpose of the following modes:

- Train
- Val
- Predict
- Export
- Track

YOLO Tasks

Explore how YOLO can be used for:

- Detect
- Segment
- Classify
- Pose

You are not expected to master everything, focus on building intuition and familiarity with the workflow.

Tasks

Explore the following dataset using Roboflow:
https://app.roboflow.com/cxrdataset/skin-ga5ww/

Understand:

- Type of images
- Number of samples
- Classes
- Dataset splits
- Any imbalance or challenges

Model Training

- Train a **classification model** using YOLOv8 or YOLOv11 (Ultralytics) on Kaggle/Collab.
- You may use Notebook and available GPUs.
- Sample Code for Reference

Submission Requirements

1. **Notebook**
2. **Results PDF**
    - Dataset overview
    - Model used
    - Training results (accuracy, loss, confusion matrix if available)
    - Sample predictions
    - Brief observations

Deadline

3rd January, 2026