

SOC : Diabetic Retinopathy Detection

Phase 1 :

Goal : To get high quality images with visible red spots, damage to blood vessels, Microaneurysms, haemorrhages and exudates.

Dataset : [Spreadsheet containing dataset details](#)

Week 1-2: Foundations

Week 1:

Introduction to Deep Learning

- **Topics:** What is deep learning, neural networks, activation functions, loss functions, optimizers, supervised/unsupervised learning.
- **YouTube Resource:**
 - [Deep Learning Crash Course for Beginners \(freeCodeCamp\)](#)
 - [MIT Introduction to Deep Learning \(2024\) | 6.S191](#)

Understanding Diabetic Retinopathy

- Read the highlighted parts from the research paper to get an idea of the disease, diabetic retinopathy; you will get an idea about what to detect in the retinal image, to grade it.
- **Resources:** [Research paper on DR](#)

Week 2:

Introduction to Computer Vision

- **Topics:** What is computer vision, digital images, image processing basics, and applications in healthcare.

- **YouTube Resource:**
 - [OpenCV Course - Full Tutorial with Python](#)
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Week 3-4: Application time

Week 3:

Goal: Try to get a better image by image processing with visible red spots, damage to blood vessels, Microaneurysms, haemorrhages and exudates.

Week 4:

Goal: Try to get a better image by image processing with visible red spots, damage to blood vessels, Microaneurysms, haemorrhages and exudates.

Phase 2

Goal : Build a simple DR detection pipeline using public datasets, apply learned models, and present results.

Week 5-6: Model Development

Week 5:

Convolutional Neural Networks (CNNs)

- **Topics:** CNN architecture, convolution, pooling, feature extraction, why CNNs are used in medical imaging.
- **Resources:**
 - [Explaining the Architecture of CNN](#)
 - [CNN Architecture explained](#)

Vision Transformers (ViT)

- **Topics:** Self-attention, transformer basics, ViT for image classification, comparison with CNNs.
- **Resource:**
 - [Swin Transformer Hierarchical Vision Transformer using Shifted Windows](#)
 - [Vision Transformer Basics](#)
 - [Vision Transformer from Scratch Tutorial](#)

Week 6:

Image Segmentation

- **Topics:** Segmentation basics, U-Net architecture, lesion detection in retinal images.
 - **YouTube Resource:**
 - [Image Segmentation Tutorial | UNet](#)
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Week 7-8: Real-World Applications and Project

Week 7: Real-World AI in Diabetic Retinopathy Screening

- **Topics:** Deployment challenges, interpretability, mobile models, case studies from real-world deployments.
- **Goal:**
 - Testing on the unseen dataset

Week 8: Capstone Project

- **Project:** Build a simple DR detection pipeline using public datasets, apply learned models, and present results.
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