Brain Tumor Segmentation with YOLOv8 and SAM2

Python Basics (If Needed)

If you do not have any experience with Python, watch the following tutorial to get familiar with the basics.
However, if you already know Python, you may skip this and proceed to the next task.

Tutorial:
Python Tutorial for Beginners – Learn Python in 1.5 Hours by *Apna College*

Understanding Google Colab and VS Code (If Needed)

If you are already familiar with **Google Colab** and **VS Code**, you may skip this task. Otherwise, watch the following videos to understand how to set up your development environment for Machine Learning projects.

Access Google Colab: Google Colab
Make a new notebook and follow this video:
• **Google Colab Tutorial for Beginners — Get Started with Google Colab** by *Doga Ozgon*

To run code offline using VS Code:
• **Getting started with Python in VS Code (Official Video)** by *Visual Studio Code*

Project: Brain Tumor Segmentation with YOLOv8 and SAM2

This project involves using advanced computer vision techniques to perform **brain tumor segmentation** using **YOLOv8** and **SAM2** models.

Overview:

- **YOLOv8** – A state-of-the-art real-time object detection model that identifies multiple objects in an image with high speed and accuracy.
- **SAM2 (Segment Anything Model 2)** – A powerful segmentation model designed for precise object separation in images.
- **Segmentation** – The process of partitioning an image into meaningful regions to detect and analyze objects.

Task Requirements:

- Understand how **YOLOv8** and **SAM2** work for segmentation tasks
- Set up the necessary **Python environment** for implementation
- Train and test the model using a **brain tumor dataset**
- Evaluate the segmentation results and fine-tune the model if needed
- Document the **implementation process**, **findings**, and **observations**

Follow this implementation video:
• *YoloV8 and SAM2 for Custom Instance Segmentation* by **Code With Arohi (Hindi)**

Machine Learning Overview

Once you have completed the Brain Tumor Segmentation Project, watch the following video for a general **overview of Machine Learning**. This will help you understand different ML techniques and how they fit into the broader AI landscape.

Course:
• *Machine Learning for Everybody – Full Course* by **freeCodeCamp.org**

What You'll Learn:

This course offers a comprehensive introduction to Machine Learning concepts and hands-on implementation.

Topics Covered:

- **K-Nearest Neighbors (KNN)** – Concept and implementation
- **Naive Bayes** – Theory and application in classification
- **Logistic Regression** – Understanding and practical use
- **Support Vector Machines (SVM)** – Introduction and usage
- **Neural Networks** – Basics, TensorFlow usage, training models
- **Linear Regression** – Concept, code, and its neural network equivalent
- **Unsupervised Learning** – K-Means Clustering and Principal Component Analysis (PCA)

The course includes **hands-on demonstrations** using **TensorFlow** and **Python**, making it ideal for both beginners and intermediate learners.