Neurology Department Report:

Brain Tumor Classification

The Neurology department is focused on analyzing brain tumors using deep learning techniques, specifically with MRI scans.

This report focuses on classifying brain tumor images into four categories: No Tumor, Meningioma, Glioma, and Pituitary.

The dataset used for this task is a Brain Tumor Dataset, which contains MRI images for training and testing the model.

The first step in the process was to create DataFrames for both the training and testing datasets.

Each entry in these DataFrames includes the image path, width, height, and label associated with each MRI image.

This approach ensures that the data is organized for efficient training and evaluation of the model.

An Exploratory Data Analysis (**EDA**) was performed on both the training and testing datasets.

The analysis included examining the class distribution to ensure that the dataset represents all four classes adequately. Additionally, the distribution of image width and height was explored to understand the variations in the data.

A few sample images from each dataset were also displayed to gain insights into the image data.

The **class distribution** showed that the training dataset was **relatively balanced**, with the highest class having 1595 images and the lowest class containing 1321 images.

The next step involved splitting the training dataset into training and validation subsets, using stratification to ensure the distribution of classes remained balanced across both subsets.

The images were then normalized and resized to 240x240 pixels, and the color channels were converted to RGB to standardize the input format for the deep learning model.

For model training, VGG16, a well-known deep learning model, was utilized. This model was chosen for its high performance in image classification tasks, particularly in medical image analysis. The model achieved a test accuracy of 99.1%, demonstrating its strong performance in classifying brain tumor images accurately.

In the deployment phase, the user is able to:

- upload MRI images

- select symptoms using a dropdown list to add new patient information to the system.
- A table is created for each department, containing personal patient details, the medical report, and the date of the report. Additionally,
- the user can search for a specific report by patient ID, download the report.
- delete a report if needed.

This functionality helps doctors and medical professionals manage patient data efficiently and ensures quick access to medical reports when required. Finally, an evaluation of the trained model was performed, and a function was created for generating predictions based on new MRI images. This function also generates detailed medical reports, providing actionable insights for doctors to make informed decisions about patient diagnoses and treatment plans.