Project Proposal

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Problem or idea description:

The problem that this project aims to address is the current limitations of brain tumor diagnosis and classification using traditional methods, such as biopsy and histopathology. These methods can be invasive, costly, and time-consuming, and may not provide a complete picture of the tumor. Additionally, interpreting MRI scans, even for experienced radiologists, can be challenging and time-consuming.

The proposed project aims to train a deep learning model on a large dataset of brain MRI scans, and label them with the corresponding diagnosis. The trained model will then be tested on a separate unseen dataset to measure its performance in terms of classification accuracy, sensitivity and specificity. The goal of the project is to develop a model that can accurately classify brain tumors with high precision and specificity, reducing the need for invasive methods and ultimately improving patient outcomes.

Background information on the problem or idea:

Brain tumors are abnormal growths of cells in the brain, which can be benign (non-cancerous) or malignant (cancerous). The accurate diagnosis and classification of brain tumors is crucial for effective treatment and patient outcomes (biopsy and histopathology). However, histopathology can only provide information about a small portion of the tumor, while biopsy risks sampling errors.

MRI (magnetic resonance imaging) is a widely available and non-invasive imaging modality that can provide detailed information about the size, location, and characteristics of brain tumors. The use of machine learning algorithms to classify brain tumors based on MRI scans has the potential to improve the accuracy and specificity of brain tumor diagnosis. Additionally, it can help to reduce the time and costs associated with traditional diagnostic methods.

Available solutions with links:

“They used a deep learning model to classify the types of images such as gliomas, meningiomas, non-tumors, and pituitary tumors. The classification process was performed using recurrent convolutional neural networks (CNN). he proposed classifier obtained 95.17% accuracy in classifying brain tumor tissues from MRI images.”

Vankdothu, R., & Hameed, M. A. (2022). Brain tumor MRI images identification and classification based on the recurrent convolutional neural network. *Measurement: Sensors*, *24*, 100412. https://doi.org/10.1016/j.measen.2022.100412

How to get the data?

Brain Tumor MRI Dataset - https://www.kaggle.com/datasets/masoudnickparvar/brain-tumor-mri-dataset

This dataset contains 7022 images of human brain MRI images which are classified into 4 classes: glioma - meningioma - no tumor and pituitary.

Brief description of your solution:

Using the previously selected data set, namely training data, we will train the model to recognize brain tumors with high accuracy and classify them as gliomas, meningiomas, non-tumors and pituitary tumors. The next step is to evaluate the trained model using an invisible dataset to measure its performance in terms of classification accuracy, sensitivity, and specificity. For a better perception, we visualize various indicators, such as ROC-AUC, recall accuracy curve.

Tech stack that will be used:

Python version 3.8.8

TensorFlow 2.11.0

Seaborn, Pandas, Numpy, Matplotlib