Brain Tumor Classification

Dataset:

(https://www.kaggle.com/denizkavi1/brain-tumor?select=1)

This Kaggle public dataset contains 3064 MRI scans of 233 patients with three kinds of brain tumor patients: meningioma, glioma and pituitary tumor.

Methodology

a) Because the MRI scans contains sagittal, longitudinal, and frontal scans, the data will have to be separated accordingly. Moreover, each image will have to be tagged with a feature representing the tumor type.

b) From this dataset, I hope to accurately classify brain tumors accurately according to their types. Because Convolutional Neural Networks (CNNs) can be used for classification tasks, can develop internal representations of images and this task involves retrieving special features from the data, this ML model seems to be the best fit for this task. Indeed, this ML model is the most recurrent for computer vision tasks. However, since the dataset will be segmented according to the scan's view and the tumor's type, there might not be enough data to train the CNN model. However, to avoid overfitting considering the low quantity of data, I will use early stopping. On an individual note, since the MAIS Lecture on CNNs will happen after the beginning of this task, the application of this ML model will be more challenging.

c) Since this classification tasks involves multiple classes and a false-positive or false-negative diagnosis of a brain tumor greatly affects the treatment of a patient, using Area under Curve (AUC) for each of the tumor types as an evaluation metric allows to distinctively evaluate the performance of our model according to its application. It would also be interesting to compare the performance of the model using F1 score as an evaluation metric.

d) To demonstrate the performance of this task, I will integrate a webapp where the user can compete against the model (see Application section below).

Application

To depict the results of this model, I will integrate a simple web app (developed with Flask) which will include an interactive game where the user can compete against the model in classifying some given MRI scans of all three types of brain tumors. This sort of webpage could be used as a studying task for medical students. Additionally, the webpage will include a description of the model's specifics and a downloadable link of this task.