PREDICTING BRAIN TUMORS FROM MRI SCANS

Table of Contents

1. Problem Statement

What are the options for a Hospital to correctly identify if the patient has a Brain Tumor or not by automating the MRI scanning and study to produce results within a day when the MRI was performed?

2. Context of the Problem

Brain Tumors are complex. There are a lot of abnormalities in the sizes and location of the brain tumor(s). This makes it really difficult for complete understanding of the nature of the tumor.

Also, a professional Neurosurgeon is required for MRI analysis. Often times in developing countries the lack of skillful doctors and lack of knowledge about tumors makes it really challenging and time-consuming to generate reports from MRI'. So an automated system might solve this problem.

3. Criteria for Success

The proposed solution should be able to correctly read an MRI scan and categorize it to whether a Tumor exists or not.

4. Scope of Solution Space

The proposed solution shall only be applicable to the study of MRI scans and tumor detection and shall not consider any other aspects of Tumor like its location, type, size or severity.

5. Constraints with solution space

- Availability of high quality MRI scans for both type of patients.

6. Data Sources

- https://www.kaggle.com/navoneel/brain-mri-images-for-brain-tumor-detection?
- https://www.kaggle.com/sartajbhuvaji/brain-tumor-classification-mri?

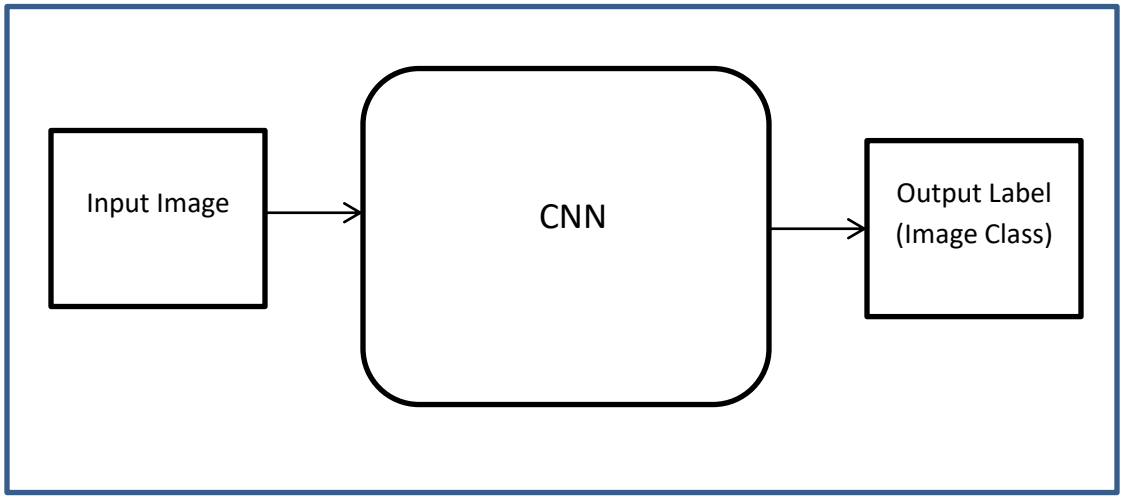
7. Stakeholders

- Hospitals with high volumes of daily patient inflow.
- Neurosurgeons.

8. Details

- Solution shall consist of a trained image classification model created by using Convolutional Neural Networks (CNN).

- The Input Dataset will consist of Grey scale images of MRI scans divided into two categories for Training purpose – 1) Without Cancer & 2) With Cancer.
- Since we will be using the MRI scans as parameters to create a Classifier, we won't have to deal with Missing data.
- Different Data Transformations possible might include: enhancing the contrast/brightness of the MRI scans so that it can be read properly, compressing the Scans to improve performance of the model, applying different kinds of filters to the image.



Basic Flow of the Model

9. Details of proposed CNN

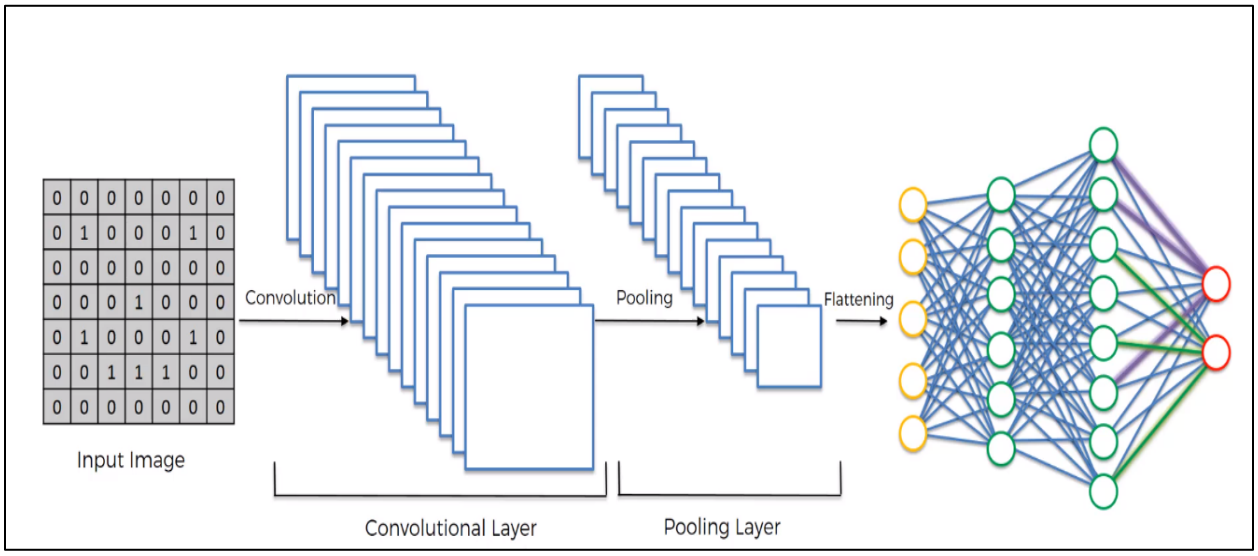
The proposed Convolutional Neural Network (CNN) implementation can be broken down into below steps:

1. ***Convolutional Operation:*** A number of Feature detectors will be identified at this step to create multiple Feature Maps. It can be a 3x3, 5x5 or 7x7 Matrix.

2. ***Pooling/Down sampling:*** This step will make sure that the images which are tilted or have any other problems will still be usable and will enable the model to improve its accuracy. This step will reduce the size of the image by removing the unnecessary noise and retaining the features. There can be multiple Convolutional Operations and Pooling Layers in a model.

3. ***Flattening:*** This will flatten the Pooled Feature map and convert it into a Column Vector which will act as an Input to Artificial Neural Network layers.

4. ***Full Connection:*** This step will create a fully connected layer of Artificial Neural Network whose input will be a Flattened Feature array obtained from the first 3 steps of CNN workflow. Its output will be a classified Image.



Steps of CNN

10. Deliverables

- Trained Classification Model with code in GitHub Repository.
- A presentation slide deck.
- A Project Report.

11. Conclusion

The proposed solution will create an Image Classifier by using Convolutional Neural Networks which will be used to predict if a patient-X has a brain tumor or not. As a future enhancement, the model can be trained to detect type & location of Brain Tumor as well.