Detecting Brain Tumors with Brain MRI Images with Image Augmentation.

Prashant Arora

Machine Learning Intern

at

AI Technology and Systems

www.ai-techsystems.com

***Abstract*— Artificial Intelligence in today's time is being used for various tasks in different fields from healthcare to technology. This paper is one such of use case of Artificial intelligence in detecting brain tumors from Brain MRI images. The main problem for such classification is the requirement of enough dataset , hence we will be using Data augmentation techniques to increase dataset size. The last step will be to compare training accuracy using the F1-score calculated on two different models with the same architecture , just with different datasets .**

Keywords—Data Augmentation , classification , Artificial Intelligence .

I. Introduction

Object detection or Object Recognition is a basic machine learning task in artificial intelligence. Starting Classification problems from detecting dogs , cats or different animals to detection problems in healthcare. There are less problems in former as there are multiple datasets available , but in the later case there is no such large dataset available. Hence , another task that begins is of Data Augmentation to increase the datasets. Here we will be explaining ways of data augmentation , acquiring big datasets and different results acquired while training.

The increase of tumor in side brain leads to brain tumor. Brain Tumor can be identified with various numbers of symptoms like mood changes , seizures , difficulty in walking or listening , stiffness in muscular movement ,etc. If detected in starting stages (primary stage) , brain tumor can easily be curated or removed , but in the final stage it leaves effects in body after removal also. This is because of the part of the brain , it occurs .

Brain tumor can be identified using :

1. MRI scans
2. CT scans
3. Ultrasound etc.

II. Methodology

1. Collecting Dataset

The first step was to search for datasets available on the web , having enough MRI scans which may be suitable for training purposes. Thanks to kaggle , someone has created a dataset on kaggle having the structure of dataset as shown in figure below.

Folder Name	Number of files Present
Yes	155
No	98

The folder named as “yes” contains 155 positive images having a brain tumor , and the other “no” folder contains the negative samples.

2. Generating new data

After Collecting Data , it was seen that amount of data available was not suitable for getting good results. So now we need to generate more data from it , hence we use augmentation techniques for performing that task..

3. AUGMENTING DATA

A Deep learning Framework , Keras provides a class specially for preprocessing images to generate new data from available dataset, named as ImageDataGenerator.

DataImageGenerator class generates batches of tensor image data with real-time data augmentation. These batches created can be looped over to retrieve those augmented tensor images.

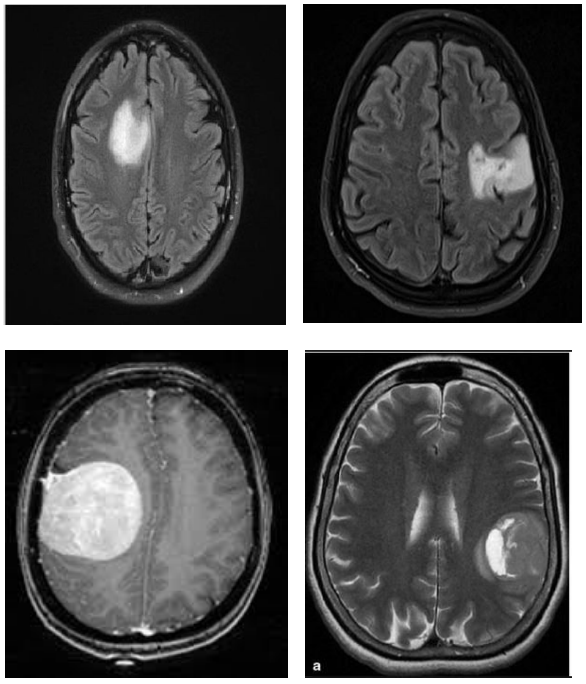
4. PREPARING DATA FOR TRAINING

We performed Data augmentation in two sets , in which we increased data-set size to 10 times and 20 times of original data-set respectively. The Images were all of different size , so firstly we resized all the images to a fixed size of (228,228,3) .

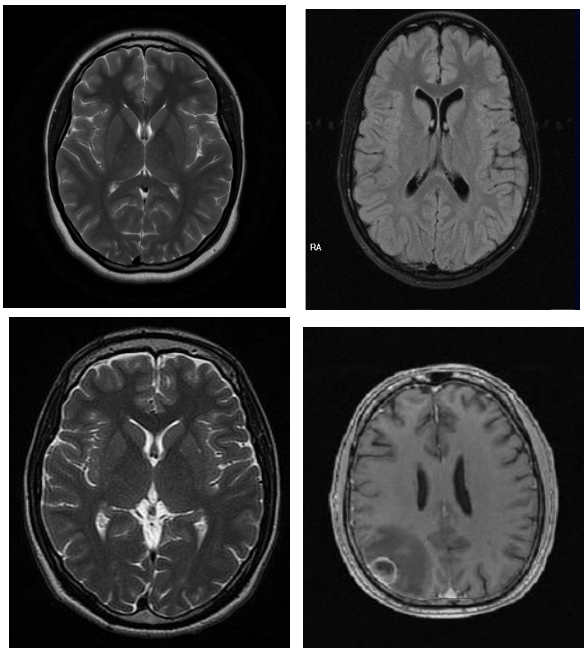
Now we have 2 folders for 10x and 20x images having yes and no sub-folders in them , which contained images respectively to their names.

Now it's time for training and testing.

Some samples of positive images are :



Some samples of negative images are :

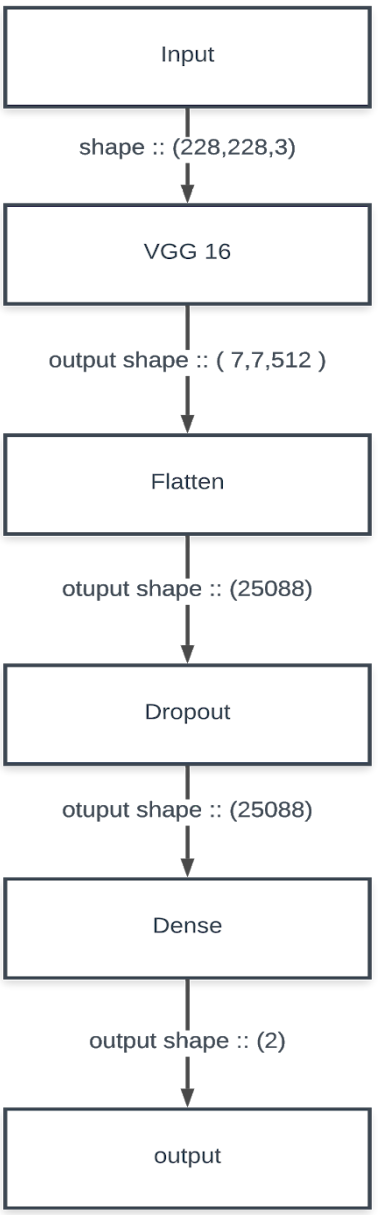


III. MODEL

In our model , we have used a VGG16 model ,easily accessible from keras framework to work as base layer for our model. VGG-16 is convolutional neural network . It has shown some good results on various large image dataset available. Along with VGG-16 to be as our base layer , we flatten the output from this layer and passes them through dropout layer to drop some un-useful data and then finally through a Dense layer with sigmoid activation to get final desirable output.

The final output consists of 2 values , indicating probability to which the input belongs to.

Below figure shows the architecture of the model used in this paper.



IV. RESULTS AND CONCLUSION

F1 Score was used to compare the model.

The **F**1 **score** is the harmonic average of the precision and recall, where an **F**1 **score** reaches its best value at 1 (perfect precision and recall) and worst at 0.

The following table shows the results achieved by this network trained with different augmentation but with the same number of iterations as 15.

augmentation	*f1-score*	*accuracy*	*loss*
10x	0.83	0.9486	0.9658
20x	0.84	0.9506	0.7468

Hence in the end , we conclude that more augmented our data is, the more will be our accuracy , better is our model's performance.

REFERENCES

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