**MRI Brain Classification**

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# **Project description**

For our project, we are planning to compare the performance of existing algorithms for different applications. The main objective we will be working on is to benchmark the performance of different algorithms for object detection in images. Specifically, we will be looking at MRI images of brains where there is a classification of has a tumour or don’t have a tumour. An example is a normal brain or an abnormal brain. This will result in a binary choice for the algorithm making the testing simple and easy to understand. This is because we are not in the field of biology. There are many models out there to choose from and papers that have done similar studies. There are also many datasets to choose from as stated before there are many papers on the topic.

Our sub-objectives would be the comparison of the models. The models specifically that we will be looking into are YOLO, Resnet-50, VGG16, and Inception V3. All these models have been used in previous papers, proving that they are usable with an MRI dataset. We will be then be comparing the models off of 4 components. Them being processing time, accuracy, f1 score, and the p-value. After comparing we plan to see how can we change parameters to potentially get better scores. Once all testing is complete we will comment on the best performing model.

# **What we want to accomplish, improve, evaluate**

We are planning to accomplish the comparison between object detection models when it comes to MRIs of the brain. Specifically the comparison between a normal brain and an abnormal brain. We plan to improve the area by determining the best model and potential change parameter to reach a better score. Evaluating will be done by comparing the models pre-trained on a dataset. The components we will be looking at are processing time, accuracy, f1 score, and p-value.

# **Implement**

The dataset we plan to be looking at will be MRI scans of brains. The plan is to have a binary of normal brain vs. abnormal brain. Normal being no tumour and abnormal being having a tumour. There is a dataset out there already that we do have our eyes on when it comes to development.

Potential dataset:

* <https://www.kaggle.com/datasets/sartajbhuvaji/brain-tumor-classification-mri>
* <https://www.kaggle.com/datasets/mateuszbuda/lgg-mri-segmentation>
* <https://www.kaggle.com/datasets/navoneel/brain-mri-images-for-brain-tumor-detection>

From these datasets, we plan to use pre-trained models as training these models would take an extreme amount of time and resources not available to us. The models specifically we plan to use are YOLO, Resnet-50, VGG16, and Inception V3. We have found studies that have done similar already that could be useful in determining how to evaluate and test with the datasets.

Existing Studies:

* <https://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-023-02114-6>
* <https://www.mdpi.com/1999-4893/16/4/176>
* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9468505/>
* <https://www.csbj.org/article/S2001-0370(22)00373-7/fulltext>
* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10453020/#:~:text=Our%20proposed%20deep%20learning%20model,99.5%%20accuracy%20in%20our%20analysis>

# **Expected outcome, deliverables, findings**

The expected outcomes we are looking for would be one model outperforming the other models. When evaluating we will be looking for one model with better scores we will then make graphs and analyze the results. From there we will be able to perform a proper conclusion and submit our findings as a deliverable.

# **Resources that you will use to complete your project**

We will be using Python throughout this project with a mix of Pytorch and Keras. Results and programming will be done on a jupyter notebook where we can use Matplot to show graphs of the results.

# **Work division between the team members**

The division of work for this project will be equivalent at 50:50. This is because both of us are interested in the topic and ready to contribute. One of us may be more theory focused on the project whereas the other would get deep into the coding and representing the data. If problems arise we can rely on one another and participate in pair programming. Any further problems will be brought up to the professor and negotiated.