Brain Scan Tumor Classification

Functional Specifications

Jordan Fields, Aaliyah Hänni, Vanessa Hsu, Trevor Nims, Alyson Suchodolski, Sabrina Wang

Contents

Background 2
User Profile 3
Data Sources 3
Use Cases 4

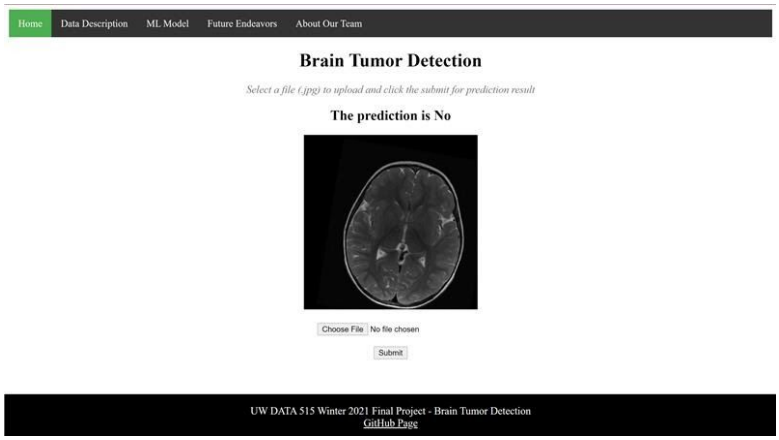
Background

What are MRIs?

Magnetic Resonance Imaging, commonly known as MRI, is a medical imaging tool used to create detailed images of the inside of the body. MRIs use strong magnetic fields and radio waves to produce images of the organs within the body. MRIs can be used to detect and help diagnose different maladies that a person might have. These scans are often used over X-rays, CT scans, and ultrasounds because they can provide clearer images of the brain that might not be picked up by these other scans. These scans are very powerful in detecting health problems when a physical examination is insufficient, but an expert physician is still needed to look over the image to determine what the image contains.

Our Goal:

Our group plans on using the ‘Brain MRI Images for Brain Tumor Detection’ data set to create a model that can predict whether an MRI of the brain contains a tumor. We would then like to create a website that a user can go to where they can upload an image and the model assesses if there is a tumor present.



This website will contain an area to upload an MRI image, where it is shown and processed along with the indication of whether there is a tumor or not. We would also like to include background information on Brain Scans, a description of the model, future endeavors, and information about the team. If enough time is allotted, instead of creating a scrolling webpage, we would like to create tabs

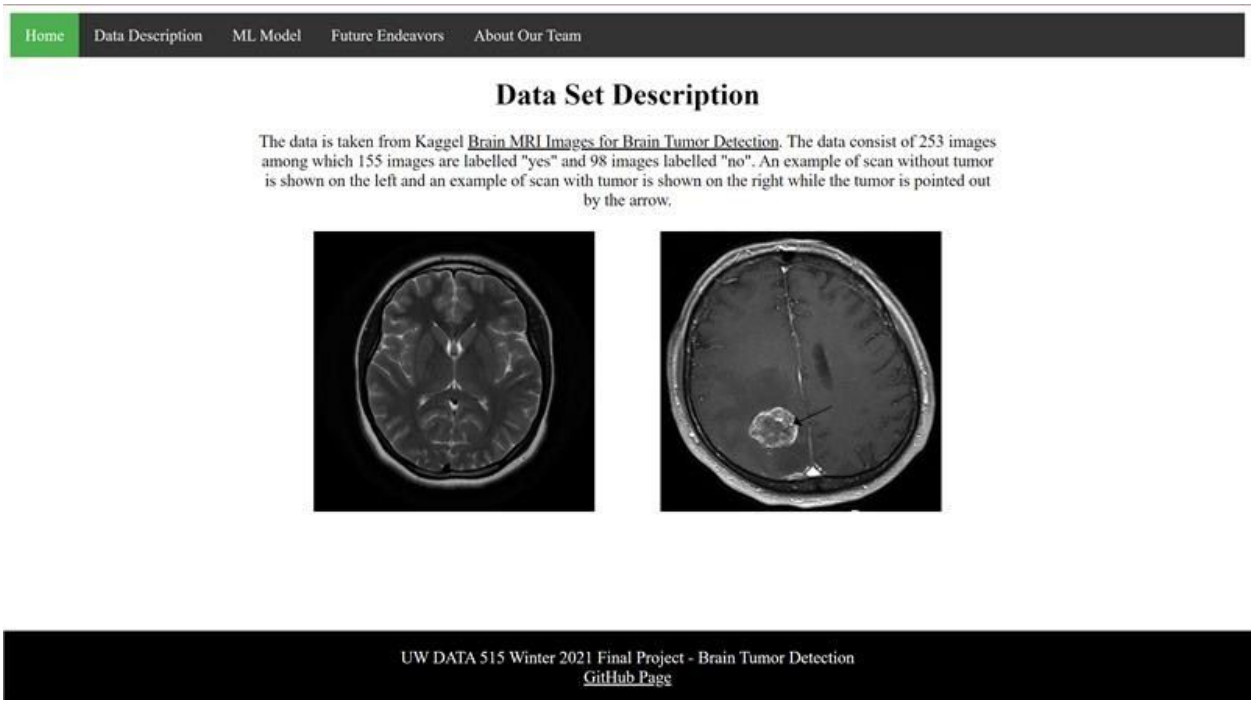
that a user can click between to get to the different sections. A convolutional neural network will be used to make these image based predictions.
We originally planned on creating a model to identify whether a tumor was a Low Grade Glioma (LGG) or a High Grade Glioma (HGG), but when we ran the model we created, we found that the time it took to run was significantly longer than what would be efficient or effective. This is due to the unavailable computing power we have.

User Profile

Users of this system would be medical professionals or patients interested in their own scans. This system could also be used as a teaching tool for future professionals in medicine.
A system like this could be used by medical professionals to assist their diagnostic process or used by patients who would find it beneficial or useful to check on their own scans. As an instructional tool, it can also provide basic information on brain scans and predictive models.
Users would have to have a domain knowledge of what MRIs are and how they work. They must also have a computing knowledge that consists of being able to access and use the internet. It would be helpful if users had a basic knowledge of image processing, as well, so that they have a mild background of what is happening behind the scenes. This can be supplied through the explanation of the model being used.

Data Sources

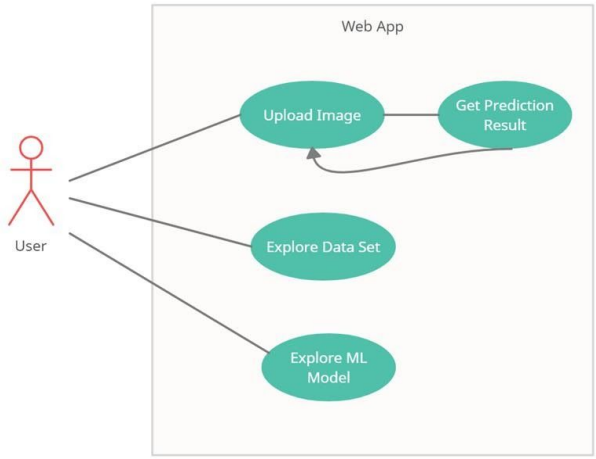
The data source we are using is ‘Brain MRI Images for Brain Tumor Detection’ that was retrieved from Kaggle and contains 253 jpeg images of brain MRIs. These images are then also tagged as yes or no, which is identifying whether there is a tumor or not in the scan. There are 98 images that are tagged no and 155 images that are tagged yes. This data set will be used as a training set to train our model. The input of the model will be the scans, while the output will be the determination of yes or no.



[Link to Data Set]

Use Cases

Case 1: A Medical Technician would like help identifying tumors in scans



A technician would like to determine whether there is a tumor located in the scan of the brain. The website we will provide will allow the technician to upload the image they choose by clicking on a dialog box that says “Browse computer for file…” and choosing from their saved files. A brief description of image requirements will be provided so that the user knows what the image file format

should look like. When the image is uploaded, it will be presented on screen and the machine learning model we created, which will be a convolutional neural network, will output its prediction on whether a tumor is located in the brain.

Case 2: A Medical Student would like information on the model and its structure

A medical student would like to use predictive analysis models in the future of their work and wants an understanding of the technology and power behind the model that was created. At the top of the website will be tabs that the student can click on to navigate through the website. The tab they would like to explore will be “The Model” which will provide information such as: description, type, accuracy, assumptions made, method of design, etc. Included within this tab will be figures on design flow and methodology. The medical student can also access our model class and utilize any of the functions that we have available for our model, such as utilizing it directly or training it on a different dataset.