+

MRI Image Segmentation for Alzheimer Disease

COMSATS UNIVERSITY ISLAMABAD, WAH CAMPUS

Lab Report

Submission To: Dr. Anam Nazir

Submission Date: Dec 29, 2022

(Thursday)

GROUP MEMBERS

SP20-BSE-047
HAMZA ALTAF

SP20-BSE-059
ZAID GHAURI

SP20-BSE-069
OSSAMA MEHMOOD

SP20-BSE-071
ABDULLAH

SP20-BSE-086
SAMI ALI

Lab Report

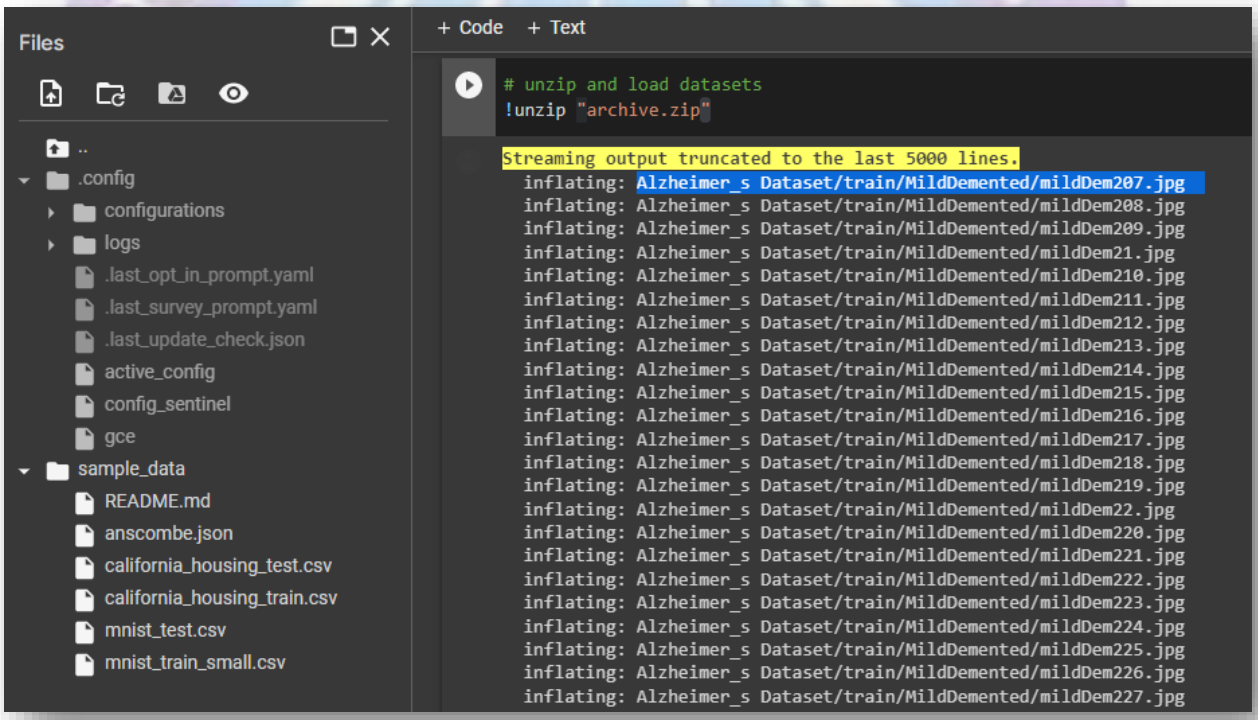
MRI Image Segmentation

for Alzheimer Disease

---

1. Dataset Details

The dataset details are redirect from the achieve.zip folder. The sample_data will display the unzip achieve.



This will load the dataset image with proper naming conventions.

"Inflating:

Alzheimer's Dataset/train/folder_name/image_name.jpg"

2. Code Repository

The Repository included the code as well as the report of our MRI Image Segmentation:

- - -

GitHub Code Repository:

github.com/ossamamehmood/MRI-Image-Segmentation-for-Alzheimer-Disease

- - -

3. Problem Statement Background

Magnetic resonance imaging **(MRI)** is a common medical imaging technique that is often used to diagnose and monitor a variety of conditions, including Alzheimer's disease. In the context of MRI image segmentation for Alzheimer's disease, the goal is to automatically identify and classify different brain structures and tissue types in MRI images of the brain.

There are **several challenges** associated with MRI image segmentation for Alzheimer's disease, including:

Complexity of brain anatomy: The brain is a complex organ with many different structures and tissue types, making it difficult to accurately segment and classify different regions in an MRI image.

Presence of abnormalities: In individuals with Alzheimer's disease, there may be abnormalities present in the brain, such as plaque and tangles, which can affect the appearance of the brain in an MRI image and make it more difficult to accurately segment the image.

Limited annotated data: In order to train machine learning algorithms for image segmentation, large amounts of annotated data are typically required. However, obtaining annotated MRI images of the brain can be time-consuming and costly, which can limit the amount of data available for training.

4. Code (Libraries & Functionality)

Following are Steps to define the Library and Functionality of Code.

- **Pandas, Numpy, Matplotlib, Tensor flow** library to load the datasets in code.
- Collection of **datasets** of MRI Images from **Kaggle**.

Here's the **link** of **dataset**:

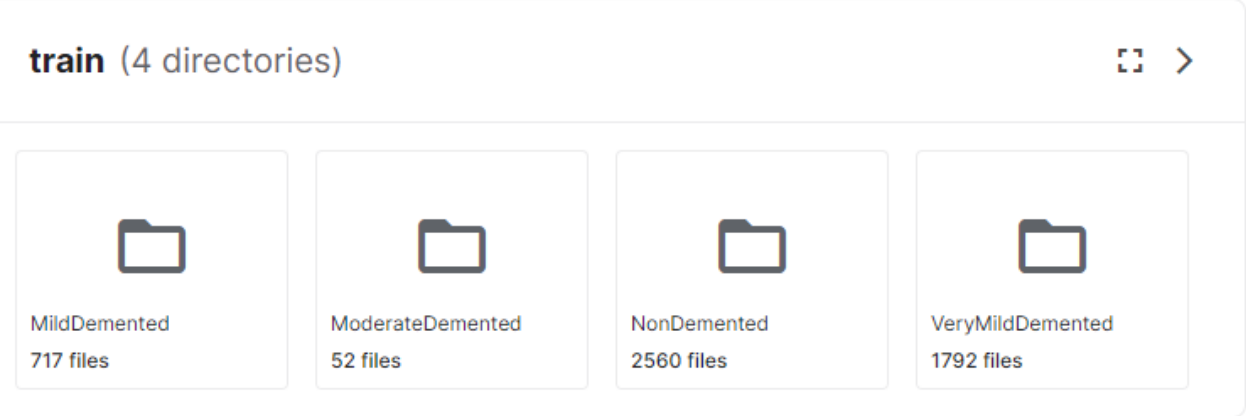
kaggle.com/datasets/tourist55/alzheimers-dataset-4-class-of-images

- Pre-Processing the MRI images for Segmentations.
- Feature Extraction from MRI images of **white, gray** pixels and **black hole** using **SVM Classifiers.**

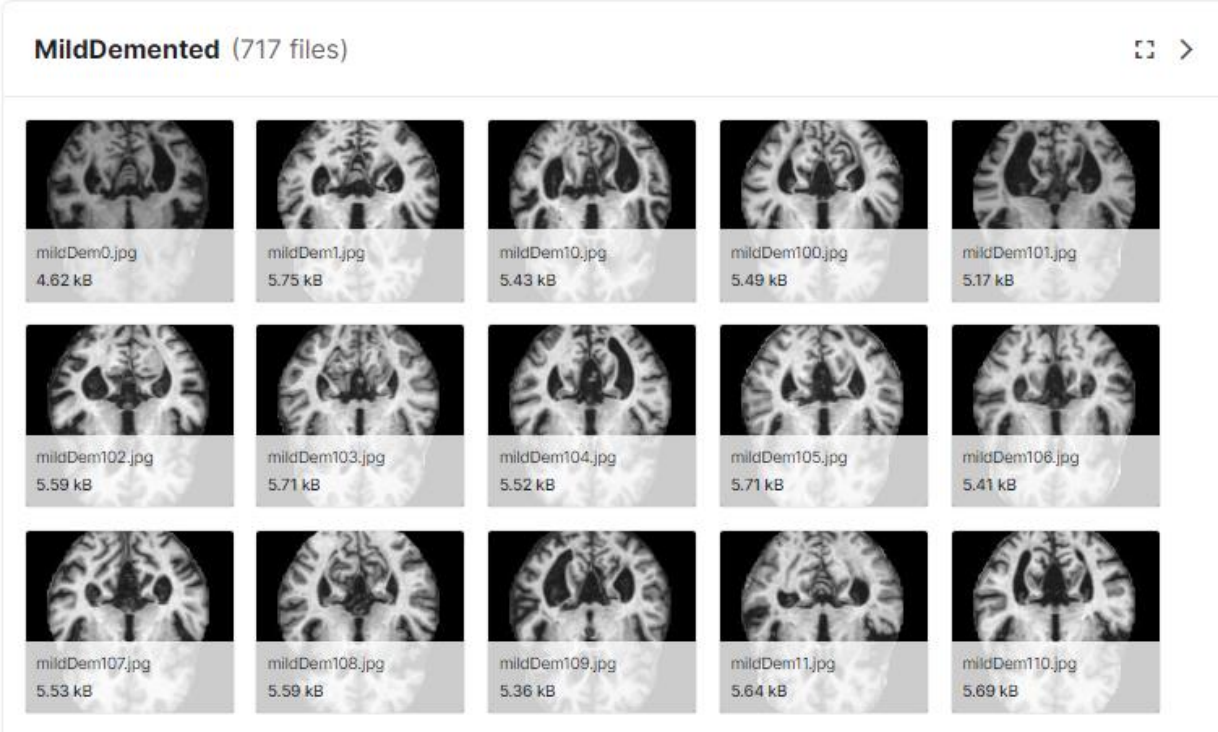
- Finally, we're display the result weather the image : **Normal MRI (1)** or **Alzheimer MRI image (0).**

5. Sample Image Folder

Here's the haggle Dataset of sample images classified in to four **(4)** different classes



Above folders shows the train datasets classes.



Above image shows the train datasets classes of Mild Demented

To view the complete datasets with classified sample image.

You can view the kaggle dataset link below:

kaggle.com/datasets/tourist55/alzheimers-dataset-4-class-of-images

6. Code Explanation with Model

Magnetic resonance imaging (MRI) is a commonly used medical imaging technique that produces detailed images of the inside of the body. MRI images can be used to diagnose and monitor a wide range of medical conditions, including Alzheimer's disease.

Image segmentation is the process of dividing an image into distinct regions or objects. In the context of MRI image segmentation for Alzheimer's disease, the goal is to identify and separate different structures within the brain.

7. Result (Output)

Dataset Results

We have loaded thousands of images dataset in order to select the later on and match with the images we'll provide based on patent MRI scan.

```
Streaming output truncated to the last 5000 lines.
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem207.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem208.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem209.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem21.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem210.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem211.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem212.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem213.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem214.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem215.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem216.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem217.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem218.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem219.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem22.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem220.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem221.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem222.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem223.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem224.jpg
  inflating: Alzheimer_s Dataset/train/MildDemented/mildDem225.jpg
```

Classification

We have clean the datasets and divided them into classes applying the rescale and validation.

```
Found 4098 images belonging to 4 classes.
Found 1023 images belonging to 4 classes.
Found 1279 images belonging to 4 classes.
```

Uploading the MRI scanned Images

We have loaded the patent images in order to detect whether it's an **Alzheimer Disease**. The black, gray and white cells display in the image allow us to matching images in datasets.

Accuracy and Output

The Accuracy of our Alzheimer Disease using

MRI Image Segmental are:

Loss: 1.0344475507736206

Accuracy: 0.7803845405578613

```
[ ]  loss, accuracy = model.evaluate(validation_dataset)
     print("Loss: ", loss)
     print("Accuracy: ", accuracy)

     128/128 [==============================] - 1s 11ms/step - loss: 1.0344 - auc: 0.7804
     Loss:  1.0344475507736206
     Accuracy:  0.7803845405578613

[ ]  len(train_dataset[0])

     2
```

Representation of a Normal Mental Health: **1.**

While, the representation of Alzheimer Disease: **2.**

Output: **2**

END

"Lab Report Completed

(JAZAK-ALLAH)"

- - - - - - - - - - - - - -

"Thank You So Much,

Respectful Dr. Anam Nazir"

- - - - - - - - - - - - - -