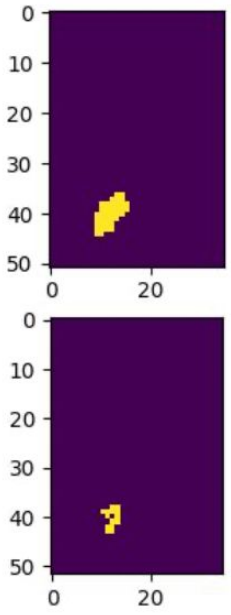
Algorithm Report

Alzheimer’s disease is a type of dementia that causes problems with memory, thinking and behavior. Symptoms usually develop slowly and get worse over time, becoming severe enough to interfere with daily tasks.
It is not a normal part of aging. The greatest known risk factor is increasing age, and the majority of people with Alzheimer's are 65 or older. But Alzheimer’s is not just a disease of old age. Approximately 200k Americans under age of 65 have younger-onset Alzheimer’s disease.

The hippocampus is a critical structure of the human brain (and the brain of other vertebrates) that plays important roles in the consolidation of information from short-term memory to long-term memory. In other words, the hippocampus is thought to be responsible for memory and learning (that's why we are all here, after all!)

According to Nobis et al., 2019, the volume of hippocampus varies in a population, depending on various parameters, within certain boundaries, and it is possible to identify a "normal" range taking into account age, sex and brain hemisphere.

In the below image, you can check the mask part which highlights the hippocampal area and volume abnormalities are flagged for further inspection.



Input of the model is a 3D image. The model classifies the above images based on the image position and the volume abnormalities. Every part of the image is taken into consideration by the classification model.

Jaccard similarity coefficient is defined as the size of the intersection divided by the size of the union of two label sets. It is used to compare a set of predicted labels for a sample to the corresponding set of labels in `y_true`.

$$J(A,B) = \frac{|A \cap B|}{|A \cup B|}$$

Jaccard similarity coefficient achieved: 0.81

The **Dice similarity coefficient** is a statistic used to gauge the similarity of two samples. Given two sets, X and Y, it is defined as

$$DSC = \frac{2|X \cap Y|}{|X| + |Y|}$$

where $|X|$ and $|Y|$ are the cardinalities of the two sets

Dice similarity coefficient achieved: 0.8943

Sensitivity (also called the **true positive rate** or **probability of detection** in some fields) measures the proportion of actual positives that are correctly identified as such (e.g., the percentage of sick people who are correctly identified as having the condition).

Specificity (also called the **true negative rate**) measures the proportion of actual negatives that are correctly identified as such (e.g., the percentage of healthy people who are correctly identified as not having the condition).

$$\text{sensitivity} = \frac{\text{number of true positives}}{\text{number of true positives} + \text{number of false negatives}}$$

$$\text{specificity} = \frac{\text{number of true negatives}}{\text{number of true negatives} + \text{number of false positives}}$$

Reference:

- https://www.alz.org/alzheimers-dementia/what-is-alzheimers
- https://en.wikipedia.org/wiki/Sensitivity_and_specificity
- https://www.displayr.com/how-to-calculate-jaccard-coefficients-in-displayr-using-r/
- https://en.wikipedia.org/wiki/S%C3%B8rensen%E2%80%93Dice_coefficient