

# Quantifying Hippocampus Volume for Alzheimer's Progression

## 1. General Information

### **Intended Use Statement:**

The segmentation algorithm is determining volume of the hippocampus in MRI brain data acquired in T2 weighted sequence. It is intended to assist radiologist in the measurement of the hippocampal volume.

### **Indications for Use:**

The algorithm can be used in monitoring the hippocampus volume over the time, to assess the rate of Alzheimer progression.

### **Device Limitations:**

The algorithm must be run on a computer meeting minimum requirements of GPU and RAM.

### **Clinical Impact of Performance:**

Radiologists using the algorithm are required to review the MRI scans and to validate the algorithm segmentation. The algorithm should accelerate the data analysis done by a radiologist.

## 2. Dataset

The algorithm was trained on the "Hippocampus" dataset from the Medical Decathlon consisting of NIFTI files with T2 MRI scans of the full brain.<sup>1</sup> Scans were taken from 90 healthy adults and 105 adults with a non-affective psychotic disorder at Vanderbilt University Medical Center.<sup>2</sup> From this dataset, the 260 scans were used for training, validation and testing of the algorithm. Before that a "HippoCrop" tool was used to cut out a rectangular portion of a brain scan containing hippocampus.

The dataset includes labels, which represent the ground truth. Following convention is used:

- 0 – background
- 1 – posterior part of the hippocampus
- 2 – anterior part of the hippocampus

## 3. Algorithm performance

### **Performance on the training dataset:**

On the test set (20% of the dataset) the Dice Similarity Coefficient amounted to 0.90, whereas the Jaccard Index to 0.82.

### **Real-world performance estimation:**

The algorithm will be tested against the segmentation done by 5 radiologists. Dice Similarity Coefficient and Jaccard Index will be calculated and compared to the training data.

**Algorithm limitations:**

The algorithm will not perform well in following cases:

- Data from other MRI sequences than T2.
- Data from other modalities, such as CT.
- Data from other anatomical structures than hippocampus.

**References**

1. Antonelli, M. *et al.* The Medical Segmentation Decathlon. *ArXiv210605735 Cs Eess* (2021).
2. Simpson, A. L. *et al.* A large annotated medical image dataset for the development and evaluation of segmentation algorithms. *ArXiv190209063 Cs Eess* (2019).