Hippocampus Volume Analysis Validation Plan

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This algorithm is intended for assisting the radiologist to evaluate the volume of the hippocampus in patients, ages 53-72, using T2 MRI scans of the full brain.

The training data was collected by Vanderbilt University Medical Center. It contains 394 3D volumes of mono-modal MRI data. The dataset consisted of MRI acquired from 90 healthy and 105 adults with non-affective psychotic dispers taken from the Psychiatric GenoType/Phenotype Project data repository at Vanderbuilt. Structural images were acquired with a 3D T1-weighted MPRAGE sequence (TI/TR/TE, 860/8.0/3.7 ms; 170 sagittal slices; voxel size, 1.0 mm3). All images were collected on a Philips Achieva scanner (Philips Healthcare, Inc., Best, The Netherlands)

The training data was labeled slice by slice by an expert radiologist manually using previously published protocols to set the ground truth.

The training performance was evaluated using Dice and Jacaard coefficients. Both of these are means to evaluate the similarity of a binary segmentation prediction to the ground truth. Most of the training data scored around 0.90 dice and jaccaard scored around .85 on average. Both scores are between 0 and 1 where 0 is no overlap and 1 is perfect overlap. Givem high scores we can be confident that the overall volume analysis is close to the actual ground truth volume. Real-world performance can be estimated periodically by comparing a prediction to a radiologist analyst ground truth. As long as the dice and jaccard scores remain similar, the algorithm is holding its accuracy over time.

The algorithm will perform well on full brain scans that only include the cranium. Full body scans would be inappropriate and may cause false volume analysis. Also given the data was collected for MRI, it is not recommended to evaluate hippocampus volume using other imaging modalities like CT scans. Also the age of the patient should be considered as the model has only been trained on patients in a particular age range.

References:

1. **Medical Decathlon Segmentation**. http://medicaldecathlon.com/. Retrieved 7/19/2020.
2. **Automated Brain volume - by - age percentile calculator.** http://www.smanohar.com/biobank/calculator.html. Retrieved 7/19/2020.
3. Amber L. Simpson, et. al. **A Large Annotated Medical Image Dataset for the Development and Evaluation of Segmentation Algorithms. https://arxiv.org/pdf/1902.09063.pdf**. Retrieved 7/19/2020.