Comparing Neural Network Strategies to Label Tricuspid Valve on MRI Images

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Heart failure is the number one leading cause of death globally (17.9 million deaths annually). Earlier diagnosis is ideal for the implementation of treatment regimens for the patient. Diagnosis of heart failure is commonly done through assessment of MRI images taken of the heart. This can be costly and timely because of the numerous images that need to be assessed (570 MRI images daily) by radiologists and doctors. Automation of labeling would make the process of diagnosing heart conditions, such as valve diseases, more efficient and standardized. Convolutional neural networks (CNN) are a viable method of automated image labeling. In this experiment, it was hypothesized that having a CNN identify 3 points on an MRI image (centroid and two ends of valves) would result in the most accurate labeling of the tricuspid valve in comparison to labeling only 2 points (ends of valves) or 1 point (centroid). 9960 MRI images from the UCSD database were trained, tested, and validated on a CNN. A euclidean distance measurement between the ground truth labels and the CNN predicted labels was used to assess the three networks. The results revealed that there was a significantly higher accuracy between the labeling one or multiple points. The hypothesis was partially supported because there wasn't a statistically significant difference between the accuracy of the 2 points and 3 points neural networks. This investigation provides an important study into developing an accurate method to label MRI images which will save time and money in the medical field.

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