

MACHINE LEARNING FOR DETECTION OF ACUTE ISCHEMIC STROKE ON NON-CONTRAST ENHANCED CT



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ABSTRACT

Introduction: Identifying the presence and extent of infarcted brain tissue at baseline plays a crucial role in the treatment of patients with acute ischemic stroke (AIS). One of the greatest achievements of cerebrovascular management in recent years has been the capacity to give reperfusion therapy to a broad group of patients with AIS, which has been made possible by using non-contrast- enhanced CT due to its broad availability and cost-effectiveness. However, Early ischemic changes are subtle, and human assessment is highly variable, requiring training and experience.

Our aim to develop an automated method for detecting and assessing brain tissue damage in patients with AIS using non-contrast enhanced CT images. **Aims:** anterior cruciate ligament injury is the most injured among young athletes. It could be a complete or partial tear. This study aimed to evaluate the role of MRI and physical examination in diagnosis of anterior cruciate ligament tears among athletes.

Method: Firstly, we preprocess 653 non-contrast enhanced CT scans from DICOM format to images. Then, we utilized a Convolutional Neural Network (CNN) called You Only Look Once (YOLO) version 4, which recognizes ischemic changes and distinguishes between abnormal and normal brain tissue among the CT scans by using 162 convolutional layers. We applied two sets of data, one of them with augmentations by change in the Rotation, Exposure and noise, then split them by 70%, 20%, and 10% for training, testing, and validation, respectively.

Results: Detecting 83% of AIS in the validation and test sets with an average precision range between 68.04% to 73.35% and an average IoU of 61.62% achieved the best results within this limited batch of training data. In addition, the recall was 0.63 in the training process.

Conclusion: The YOLO system demonstrated an impressive start of the CNN in the impact of AIS detection, allowing us to identify most of the cases. It is necessary to compare it to other CNN-based models, and it has been found that augmentations of the data set can add more accuracy to be applied in practical situations.

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