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Balanced Approach to Detecting Human Wrist Fracture using the DCNN-LSTM Method

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INTRODUCTION

A substantial number of people with wrist fractures visit hospital emergency departments. The most significant screening approach for the clinical diagnosis of a suspected fracture is X-ray imaging. Wrist fractures pose serious health dangers to children, adolescents, and the elderly all over the world. A missing discovery of a wrist break on clinical imaging can have serious consequences for patients, resulting in deferred treatment and poor functional recovery. As a result, as a backup option for doctors, the medical department need an intelligent technique to reliably detect a wrist fracture utilising an automated diagnostic tool.

This paper suggests using a deep learning model, a Central Neural Network (CNN), and long short-term memory to diagnose wrist fractures from X-ray pictures (LSTM). It provides doctors with another alternative for using computer vision to identify wrist fractures, lowering the frequency of fractures missed. The Mendeley dataset contains 192 wrist X-ray images. In this system, image pre-processing is performed, and augmented normalised images and pre-processed images are fed into a 28-layer dilated CNN (DCNN) to extract deep useful features.

DESCRIPTION

The data augmentation strategy is used to tackle the class imbalance problem during training by creating rotated oversamples of images for minority classes. Deep characteristics are then supplied into the proposed LSTM network to differentiate wrist fractures from regular fractures. The experimental results of the DCNNLSTM, both with and without augmentation, are compared to those of other deep learning models. Furthermore, the proposed work's F1-score, kappa, and accuracy are compared to those of existing methods. A bone breaks when a great deal of force is applied to it. Bone fractures can occur as a result of trauma, osteoporosis, or overuse. A recent World Health Organization (WHO) study discovered that a considerable proportion of people suffer from fractures, and that failing to treat a fracture can result in severe harm or even death. Wrist fractures are a reasonably common injury, with the number of confirmed cases increasing on a daily basis. A wrist fracture can be caused by an accident, such as slipping over with your palm outstretched. As a result, developing a computer-assisted method for detecting organ fractures is important to make it easier for doctors to undertake the second option diagnosis. In this study, a CAD system based on a DCNN-LSTM network technique was presented to identify wrist fractures from X-ray images.

For the planned study, Mendeley provided a dataset of 111 fractured and 82 normal wrist X-ray pictures. The following picture data pre-processing operations were performed: Image enhancement, for example, was used to reduce distortion and increase the brightness of the X-ray images. The data augmentation strategy was used to avoid overfitting and increase the variety of the dataset. We sought to preserve class balance by creating an equal number of photos for both classes during the training period [1-4].

CONCLUSION

Two experiments were used in this study to demonstrate that data augmentation enhances results. A deep learning technique known as "dilated CNN" was utilised in these tests to enlarge the receptive field of the CNN by a dilated factor in order to extract meaningful characteristics from X-ray pictures. Second, the wrist fracture detection classifier was an LSTM network. Furthermore, the suggested DCNN-LSTM models' capabilities were compared to those of other deep learning models, both with and without augmentation. The overall precision of the suggested model with expansion was 88.24%, which was nearly higher than the overall precision without expansion (86.21%).

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CONFLICT OF INTEREST

The author declares there is no conflict of interest in publishing this article has been read and approved by all named authors.

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