FRACTURED: AUTOMATED FOREARM BONE FRACTURE DETECTION SYSTEM

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A dissertation submitted in partial fulfilment for Bachelor of Engineering (Honours) degree in Software Engineering

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in collaboration with
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2020

Abstract

In the medical Imaging field X-Ray, Magnetic Resonance Imaging (MRI), Ultrasound are the frequently used technologies for medical imaging with the scope of, for example, diagnosis, prognosis and decision making. These technologies have enabled doctors/physicians for early detection and address medical conditions decisively and confidently. X-ray, in particular, is widespread technology used in a multitude of resource settings primarily to detect bone fractures. Since X-ray images are widely examined by the naked eye, the process is rendered cumbersome, tedious and prone to human-error especially through practitioners fatigued by processing a high image load in a given shift. According to existing work, it consumes more time and resources for this examination process. This can be minimized by using the new method proposed herein. Although technologies exist to address this problem, their accuracy is under scrutiny. New algorithms that are superior in detection are currently been developed to replace these outdated technologies. Identification of minuscule fractures is a challenging task, even for the most experienced practitioners, and some existing systems have failed in identifying such fractures.

The Fracture detection system developed herein consists of a classification and localization module, where the detected fracture is identified by bounding boxes. Through deep learning techniques specially designed for this purpose, a high accuracy rate can be accomplished to minimize human diagnostic errors. This software is specially designed for forearm bone (Radius and Ulna) fracture localization to showcase the possibility of expanding the approach to other bones as well.

The test results show that this system can detect minuscule fractures and displaced fractures in the forearm bone. The outcomes of this deep learning-based project were positively acknowledged by the experts who evaluated the system while suggesting more features for further enhancement.

Key Words: *Deep Learning, Image Processing, Bone Fracture Detection, Convolutional Neural Network, Object Detection, X-Ray*