WEB-BASED DATA TOOL WITH AUTOMATIC SCOLIOSIS CURVATURE TYPE DETECTION USING X-RAY IMAGE CLASSIFICATION

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Abstract

Human musculoskeletal system is vital to our way of life and subjected to various types of disorders and conditions. Scoliosis is such condition where it presents a three-dimensional deformation of the human spine. According to experts and statistics most of the patients are in adolescent age. Adolescent Idiopathic Scoliosis (AIS) is treated at Lady Ridgeway Hospital for Children (LRH) in Sri Lanka. When diagnosing patients, x-ray images are used to determine the curvature types and to identify the severity of the curve. Clinical process is entirely paper-based and prone to physical damages and misplacement of patient records. X-Ray images are not preserved for later evaluations. This dissertation is intending to propose an application where it automatically classify the x-ray image and store patient data for later evaluations.

In the field of computer vision, image classification techniques are required to identify x-ray images according to its category. Proposing system uses convolutional neural networks which is a deep learning approach. Dataset of 600 spinal anterior-posterior x-ray images from SpineWeb was used to produce a newly labelled dataset under expert supervision. Author observed a data imbalance between classes, and it was decided to under sample the data and considered three categories of Scoliosis. Web applications are in trend nowadays and can cope well with demanding applications. Proposing system uses progressive web application technologies to implement a prototype to manage Scoliosis patient data which will enhance the current clinical environment. Classification model was evaluated using general classification metrices.

This system provides general classifications for anteroposterior x-ray images of Scoliosis. Amount of image data required to train a model for the concerning problem is a massive limitation and scarcity of such resources persuaded to data augmentation. According to domain and technical experts' opinion such applications will indeed add value to the domain.

Keywords: Spine, X-Rays, Image classification, Convolutional neural networks, Electronic medical records, Python