ABSTRACT

Scoliosis is a spinal disorder characterized by sideways curvature in the shape of an "S" or "C", with varying degrees of severity (0°–9°, 10°–20°, ≥45°). Manual measurement of spinal curvature is time-consuming and may lead to inconsistency. This study aims to develop an automated method based on X-ray image processing using deep learning to calculate spinal curvature more efficiently and accurately.

The model used is DenseNet due to its dense layer connectivity, which enhances classification accuracy. The system development involves image processing techniques and deep learning to classify scoliosis severity levels. Model evaluation is conducted using accuracy, precision, recall, and F1-score metrics, along with testing parameters such as batch size, number of epochs, image resolution, optimizer, and learning rate.

The best results were obtained with an image size of 224x224, yielding an accuracy of 83.18%, precision of 79.37%, recall of 78.68%, and F1-score of 79.01%. The optimal number of epochs was 16, while the best optimizer was RMSprop, achieving 88.79% accuracy and an F1-score of 84.65%. The optimal learning rate was 0.001, and the best batch size was 32.

This study successfully improves the accuracy of scoliosis detection and offers an efficient, automated method for clinical measurement, with the potential to support more consistent diagnosis and treatment.

Keywords: *Scoliosis, X-ray Imaging, Deep Learning, DenseNet, Classification, Image Processing.*