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Deep Learning-Based Analysis of Vertebrae X-ray Images

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Abstract: *Vertebral disorders such as scoliosis and spondylolisthesis are becoming increasingly common due to sedentary lifestyles, making early diagnosis critical for effective treatment and management. Traditional X-ray techniques are often time-consuming and susceptible to errors. This study introduces a custom Convolutional Neural Network (CNN) designed to classify vertebrae X-ray images into three categories: Normal, Scoliosis, and Spondylolisthesis. Utilizing a dataset of 338 subjects, the model achieved a training accuracy of 91.25% and a validation accuracy of 88%. The precision scores were 85% for Scoliosis, 83% for Normal, and 100% for Spondylolisthesis, accompanied by F1-scores of 88%, 83%, and 93%, respectively. The model demonstrates robust diagnostic performance, particularly for scoliosis and spondylolisthesis, providing a more efficient and accurate tool for early diagnosis that can significantly enhance patient outcomes.*

Keywords: vertebral disorders, scoliosis, spondylolisthesis, Convolutional Neural Network, validation accuracy, precision, F1- score