

ABSTRACT

This study aims to develop an automatic classification model as a diagnostic support tool for detecting bone fractures in X-ray images more quickly and accurately. The model is built using the Convolutional Neural Network (CNN) ResNet50 architecture with a *transfer learning* approach from pretrained ImageNet weights. The dataset used is a public dataset from Kaggle consisting of 10,581 X-ray images divided into training, validation, and testing sets. The preprocessing stages include resizing images to 224×224 pixels, normalization, and data augmentation to improve model generalization. The model architecture is adapted by adding classification *layers*, L2 regularization, and *Dropout* to prevent *overfitting*. *Hyperparameter* optimization is carried out using *Grid Search* by testing combinations of *Dropout* rates (0.3 and 0.5), learning rates (0.001 and 0.0001), and batch sizes (8 and 16). The best result is obtained with a *Dropout* rate of 0.3, a learning rate of 0.001, and a batch size of 8, achieving a validation accuracy of 99.7%. Evaluation on the test set resulted in an accuracy of 99.01%, *precision* of 98.31%, *recall* of 99.57%, and an *F1-score* of 97.84%. The model also includes analysis of misclassified images, including *false negatives*, as part of a comprehensive evaluation. These findings indicate that the optimized ResNet50 CNN model can serve as an effective solution to support diagnostic processes in detecting bone fractures from X-ray images. The model has potential to be implemented in healthcare facilities, especially in areas with limited access to radiology specialists.

Keywords : CNN, ResNet50, X-Ray Classification, *Transfer learning*, *Grid Search*, Bone Fracture