

PRETRAINED DEEP LEARNING MODELS FOR MULTICLASS CLASSIFICATION OF HIP REGION FRACTURES IN X-RAY IMAGING

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Hip region fractures, including pelvic, femoral neck, intertrochanteric and subtrochanteric fractures, are critical medical conditions, especially when diagnosed early. These fractures impair mobility, increase the risk of complications, and cause additional issues. Early diagnosis using X-ray imaging is vital for effective treatment. Recent advances in computer vision, particularly the use of pre-trained models, have revolutionized fracture detection by combining various models to improve classification accuracy and stability. This research developed and evaluated pretrained deep learning methods for multiclass classification of hip fractures on X-ray images. The dataset consists of 1000 X-ray images from Sri Lankan hospitals (2022-2023), categorized into five types: non-fracture, femoral neck, intertrochanteric, subtrochanteric, and combined fractures. Preprocessing and data augmentation techniques were used to increase dataset diversity. The data was split into 70:15:15 for training validation, and testing to evaluate performance. The pre-trained model architectures include ResNet-101, ResNet-50, EfficientNetB0, and EfficientNetV2, with ResNet-101 being trained at different levels with parameterized training. ResNet101 achieved the highest test accuracy of 0.8000, followed by ResNet-50 (0.7786), EfficientNetB0 (0.7286), and EfficientNetV2 (0.7500). These pre-trained models significantly enhance multiclass hip fracture classification, yielding more accurate results compared to customized vision models trained from scratch. This approach has potential clinical applications, aiding early and reliable diagnosis. Furthermore, it can be used to differentiate the components of the hip region individually, utilizing sophisticated data augmentation techniques that help in classification. This research proves that pre-trained models can be effective in biomedical applications rather than building and training them from scratch.

Keywords: Hip region fracture, Multiclass fracture classification, Pretrained deep learning models, Vision models, X-ray images