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ENSEMBLE DEEP LEARNING APPROACHES FOR MULTICLASS CLASSIFICATION OF HIP REGION FRACTURES IN X-RAY IMAGES

Hip region fractures, including pelvic, femoral neck, intertrochanteric, and subtrochanteric fractures, are critical medical conditions, especially when diagnosed early. These fractures impair mobility, increase risks, and cause complications. Early diagnosis using X-ray imaging is vital for effective treatment. Recent advances in computer vision, particularly ensemble pretrained models have revolutionized fracture detection by combining various models to improve classification accuracy and stability. This research developed and evaluated ensemble 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 are used to increase dataset diversity. The data was split into 70:15:15 for training validation, and testing to evaluate performance. The pretrained model architectures include ResNet-101, ResNet-50, EfficientNetB0, and EfficientNetV2, with ResNet-10 were taken with different level parametrized training. ResNet101 achieving the highest test accuracy of 0.8000, followed by ResNet-50 (0.7786), EfficientNetB0 (0.7286), and EfficientNetV2 (0.7500). These pretrained model induce as ensemble learning models and enhance multiclass hip fracture classification, yielding more accurate results rather comparing to customized vision models. This approach has potential clinical applications, aiding early and reliable diagnosis. Further it can extend to differentiate the components of hip region individually with sophisticated data augmentation techniques that helps for the classification. This research proves that pretrained models can be effective in biomedical rather building and training it in the scratch.

Keywords: Ensemble deep learning models, Hip region fracture, Multiclass Fracture Classification, Pretrained Vision Models , X-ray images