

Automated Grade Classification of Ankle Osteoarthritis Using Advanced Neural Network Classifier

A degenerative joint condition, ankle osteoarthritis (OA) is less common than knee or hip OA, yet it has a major impact on mobility as well as quality of life. The talocrural joint, another name for the ankle joint, is a hinge joint that permits both plantarflexion and dorsiflexion motions. It is made up of three main bones: the talus (ankle bone), fibula (calf bone), and tibia (shinbone). Bone-on-bone contact and joint space narrowing are the effects of the conditions due to progressive cartilage degradation, which eventually causes pain and restricted function. Around 1% of people worldwide suffer from ankle OA, which is thought to occur in 30 instances for every 100,000 people. Remarkably, post-traumatic injuries such as fractures or persistent ligament injury account for more than 75% of instances with ankle OA. Ankle OA differs from other types due to its post-traumatic nature, which primarily affects younger, more active people and has significant socio-occupational ramifications. For prompt intervention and efficient treatment, early identification and grading of ankle OA utilizing medical imaging methods, such as MRI and X-rays, are essential. For early diagnosis and efficient treatment planning, it is essential to accurately classify the various degrees of ankle OA. Conventional grading methods rely on manual assessment by radiologists, which is subjective and prone to inter-reader variability. This study presents an automated grading classification system for ankle OA based on joint space measurement between the tibia, fibula, and talus from radiographic images by proposing an advanced neural network-based classification model. The suggested model uses an advanced neural network classifier to extract discriminative features and accurately classify the severity of OA into multiple grades. Results from experiments show that the neural network classifier performs better than conventional machine learning techniques, with higher accuracy on both clinical and benchmarking datasets. The suggested method may help radiologists grade OA objectively, which could improve patient care and treatment results.

Keywords: Osteoarthritis (OA), Cartilage damage, Neural Network (NN), Grade classification, Therapy, Diagnosis.