ABSTRACT

Cruciate ligament injuries such as Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) are amongst the most common knee injuries, often requiring accurate diagnosis through Magnetic Resonance Imaging (MRI). Traditionally, these injuries are assessed manually by radiologists, but deep learning-based methods, particularly Convolutional Neural Networks (CNNs) are also able to do this task. CNNs are a class of deep learning models designed for image recognition, making them well-suited for analysing medical imaging data automatically. Using 450 knee MRI dataset from SMC Telogorejo Hospital Semarang, several CNN architectures were tested with variations in hidden layers, regularisation techniques, dropout, and batch normalisation, leading to a total of 48 model variations. The model focuses on a multilabel classification which are ACL, PCL, combination of ACL dan PCL, and no sign of ACL or PCL. The best-performing model, which incorporated batch normalisation and L2 regularisation with 64 hidden units, achieved an accuracy of 65.66% and a sensitivity of 66.75% after extended training. While these results are below the ideal threshold for medical diagnosis, they provide a strong foundation for further improvements. This study demonstrates that CNNs can serve as an effective tool for ACL and PCL injury detection in MRI images, highlighting the need for further optimisation for the CNN architecture to achieve clinically viable performance.

Keywords: *cruciate ligament injuries*, *Magnetic Resonance Imaging*, *Convolutional Neural Networks*, *multilabel*