The Diagnostics of Osteoarthritis: A Fine-Tuned Transfer Learning Approach

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Abstract. Osteoarthritis (OA) is an illness that causes the wear of the protective cartilage between two bones in joints. Patients with OA disease suffer from pain in joints, stiffness, loss of flexibility, amongst others. Conventional means of identifying OA is considered laborious and prone to mistakes. Owing to the advancement of computer vision and computational models, automatic diagnostics is possible. Therefore, this paper proposes the use of transfer learning models for the classification of the different classes of OA. The pre-trained Convolutional Neural Network models used are VGG16, VGG19 and Resnet50, with their fully connected layers, are heuristically fine-tuned. It was demonstrated from this preliminary study that the fine-tuned VGG16 model could classify the classes fairly well in comparison to those that have been reported in the literature.

Keywords: CNN · Transfer learning · Fine-tuning · Osteoarthritis

1 Introduction

Osteoarthritis (OA) is a degenerative joint condition that is primarily caused by ageing and is considered one of the significant causes of impairment around the globe [1, 2].

Initially, the disease is thought to be caused by ageing, which causes the "wear-and-tear" of the articular cartilage. Nonetheless, other factors such as obesity, diabetes, family history were also found to be contributing towards OA [3]. In the United States, arthritis is the most common cause of incapacity, and it has been reported that symptomatic knee OA affects 10% of males and 13% of women who are 60 years or older [4].

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