

Detection of Knee Osteoarthritis using Light-weight CNN

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ABSTRACT

Osteoarthritis is one of the most common diseases among elderly people worldwide. This disease affects bone joints causing the movement of the joint very painful. Proper and timely diagnosis is the key in controlling the disease. This study deals with knee osteoarthritis *X*-ray images for disease detection purpose. As the disease severity increases, the knee joint space gets reduced and the associated bone shapes change. Based on this femur and tibia shape change and knee joint space narrowing, presence of osteoarthritis can be detected. This change of appearance can be easily identified in higher severity levels, but in case of early osteoarthritis the changes are minimal. This makes detection of lower grade osteoarthritis from the healthy ones very difficult. The dataset used here is taken from a publicly available dataset named Knee Osteoarthritis Severity Grading Dataset (Mendeley Data) which is organized from well known OAI dataset. For the purpose training phase of osteoarthritis detection, the data has been divided into two classes having 3332 healthy and 2446 diseased *X*-ray images. Since changes caused by the disease is not visible in *X*-ray properly until grade 2 of the disease as per medical literature, this study considers the grade 0 and grade 1 osteoarthritis as healthy group while grade 2, 3 and 4 are considered as parts of diseased group. Pre-processing activities have been carried out on the *X*-ray images based on pixel intensity profiles. Disease detection has been done here using a light-weight CNN based on MobileNet V1. Lesser number of layers have been used in the proposed approach. Depth-wise convolution has been done in each of the layer which makes the whole process computationally inexpensive.

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