



Knee Osteoarthritis Severity Detection Using CNN Algorithm

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ABSTRACT

Arthritis is used to describe any disorder which affects the joints especially for old people. There are many different types of arthritis with different causes and treatments, osteoarthritis is the most prevalent. It detects signs of osteoarthritis in knees instantly and informs severity of arthritis. In proposed system the Django framework is included with python as the programming language. The Dataset that we have used includes 1650 digital X-ray images that are collected from well reputed hospitals and even from diagnostic centers too. The CNN algorithm automatically extracts the cartilage region based on density of pixels The target is to evaluate the CNN algorithm performance to predict per Kellgren and Lawrence grades in the given X-ray.

Keywords: CNN, Kell grade, Lawrence grade, Cartilage region-Based, instant

1. Introduction

Arthritis is a term used to describe any disorder that affects the joints. Osteoarthritis, the most prevalent type of arthritis, affects almost 237 million people worldwide. Even though arthritis has no known cure, early detection and treatment can be very helpful along with assisting in alerting patients to the beginning of knee osteoarthritis. Additionally, this research informs them of the seriousness of their disease. Convolutional neural network was used as the algorithm, and Python was the programming language.

2. Background

Rheumatoid arthritis in the knee was identified using the fuzzy C means segmentation technique. (2019)

Authors: Rajalakshmi, Snekalatha

In this paper thermal photography and segmentation methods are used. The segmentation which refers to delineation in the areas of interest in terms of pixels. Different Imaging modalities are used Statistical features should be extracted.

A New Approach to Classify Knee Osteoarthritis Severity from Radiographic Images based on CNN-LSTM Method (2019)

Authors: Wahyuningram, Eddy purnama, Anifah

In this study, a novel method for assessing the severity of knee osteoarthritis (OA) utilizing radiographic X-ray pictures is presented. Our novel method combines preprocessing, feature extraction using CNN algorithm and classification using a long short-term memory (LSTM). The knee joint is manually cropped with a certain dimensions during preprocessing. The Osteoarthritis Initiative data set contains data on the KL grade assessment for both knees was utilized to assess our methodology. This dataset has shown highly encouraging results compared to the current approach.

3. Method

a. Sign In page

In order to access the website, the administrator must first log in using their current login information. After successfully logging in, the admin can access all modules and effectively conduct and manage each task.

b. Upload an Image

After successful login the image should be uploaded as an input.

c. Data Preprocessing

The X-ray image which is given as input is preprocessed with the trained model in which the CNN algorithm was included.

d. Detection and Classification

The X-ray which is processed will produce the severity of the knee which is done through the given data set and the CNN algorithm predicts per Kellgren and Lawrence grades in the given X-ray image which leads to notice the severity clearly. The proposed system helps the Osteoarthritis in knees instantly and in short period of time the result will be known. It provides the good detection and classifies the severity of osteoarthritis in the knees more accurately.

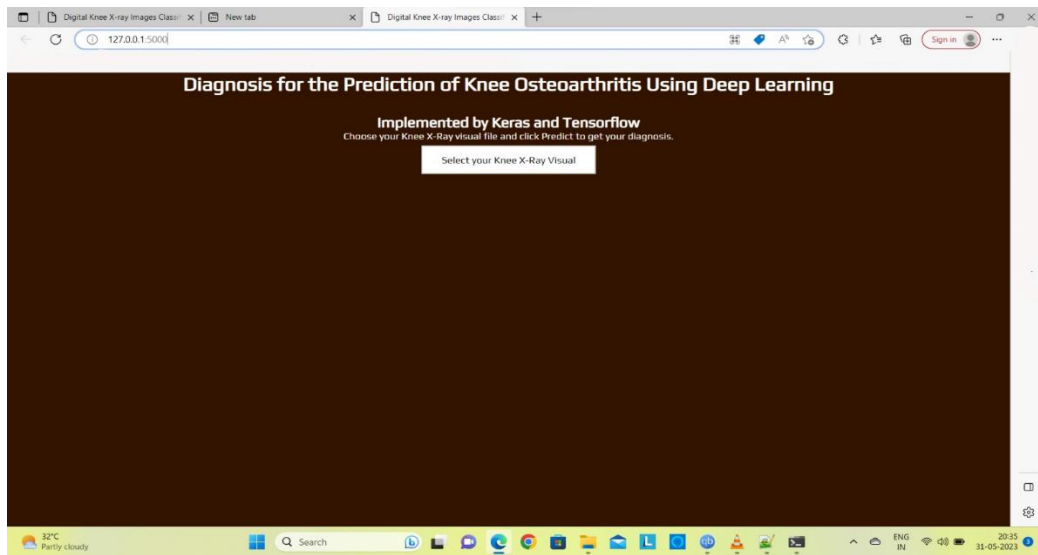
4. Algorithm

CONVOLUTION NEURAL NETWORK (CNN)

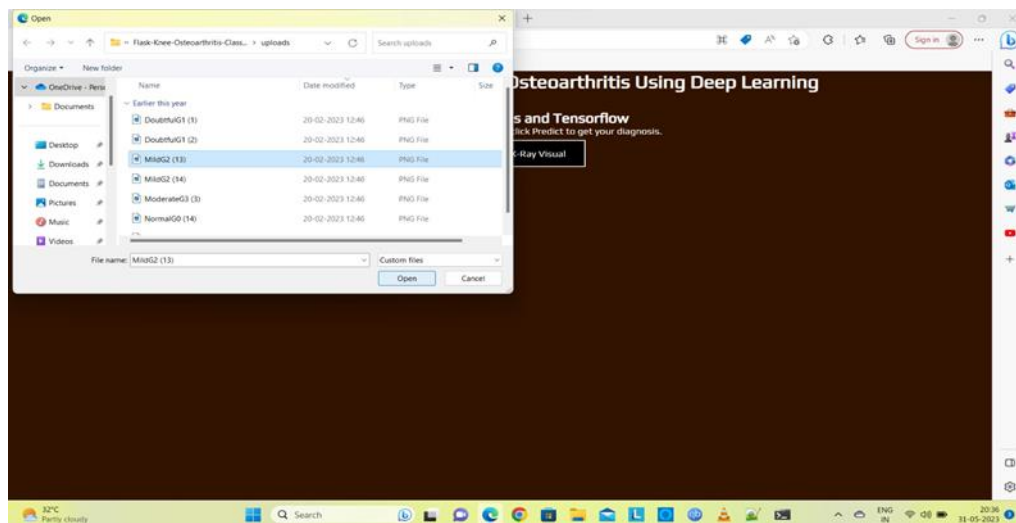
CNN algorithm is a Deep Learning method that can take in an input image. With no loss of information its integrated convolutional layer reduces the high dimensionality of images. Each image is given a filter or kernel to create an output that is better and more detailed after each layer. By searching for patterns in the images the algorithm CNN are highly useful for identifying items, classes and photographs.

The convolutional layer takes input from the pixels in the image and performs the convolution function. It produces a distorted map as a result. A ReLU function is used to apply the convolved map to produce a corrected feature map. This algorithm predicts the results more accurately which leads to a better result.

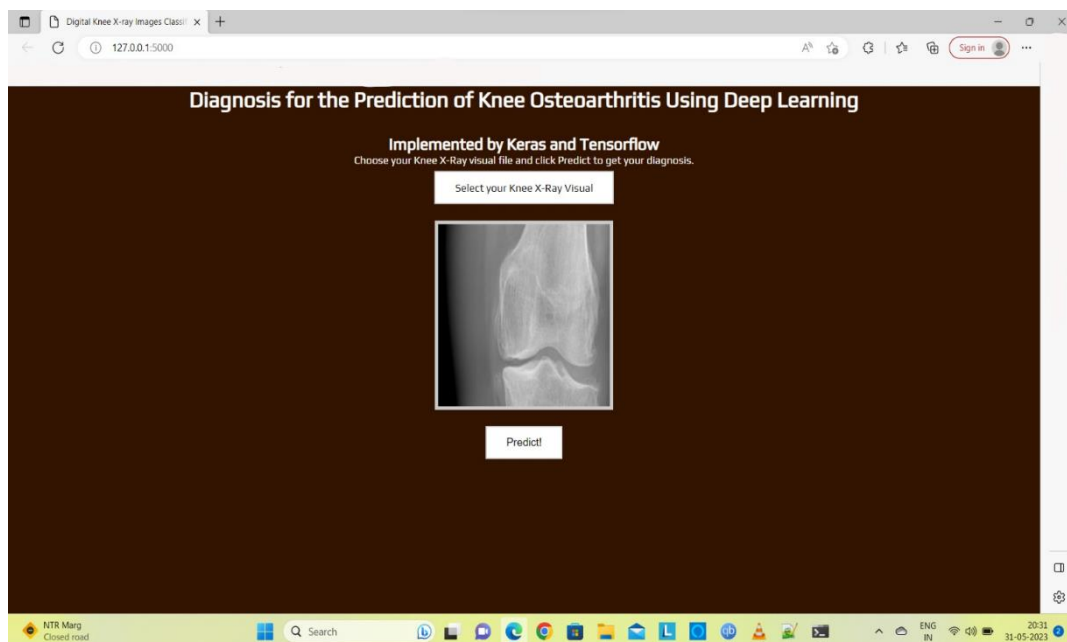
5. Results



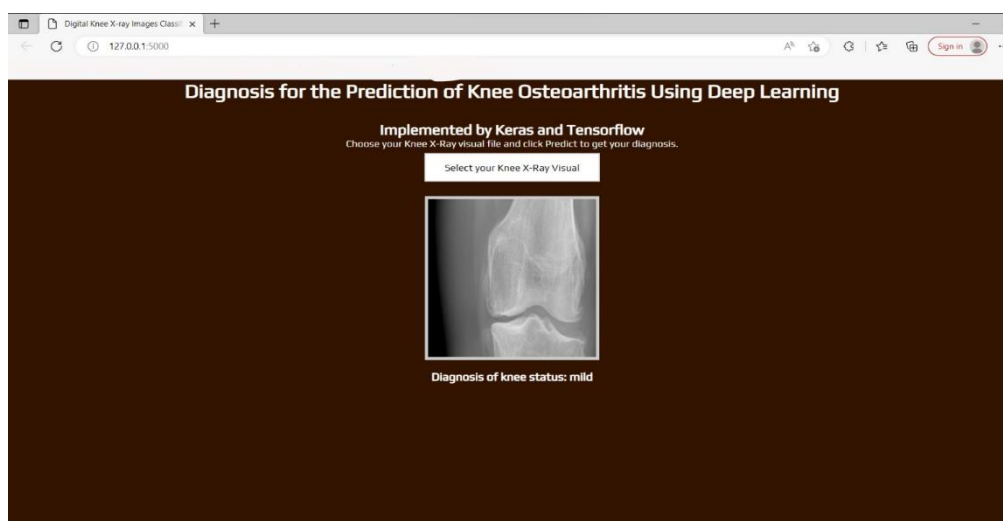
a) Webpage to upload the X-ray image



b) Select the Image to upload



c) click on predict to get result



d) results the severity status of knee

6. Conclusion

In this project we intend to develop a web application that detects knee arthritis by analyzing X-RAY images with the help of CNN algorithm. The efficiency of the project is a potential roadblock, and we intend to overcome it by more effectively training our data for exact output. By training the data with more data points, we can predict arthritis economically once we attain the target efficiency. The detection of it via MRI scans, which can be used to more accurately determine the severity, can be further researched. The prediction is also improved so that it leads to a better result.

References

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