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Bone Fracture Detection Using Machine Learning

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ABSTRACT: Identification of faults via computer-based techniques is a growing trend in all fields these days. Two main characteristics of fast identification and high precision describe a highly sensitive device by incorporating advanced techniques and effective resource usage. The effect of undue external stress above the limits of what the bone may tolerate is a crack in a bone or bone fracture. Canny Edge detection is an image processing technique that identifies bone fracture by utilizing automatic fracture detection efficiently and overcomes the question of noise reduction. There are many methodologies accessible in today's world for edge detection, such as Sobel, Canny, Log, Prewitt, and Robert. These processes, though, are hampered by crucial limitations such as a lack of capacity to conduct multiresolution research, culminating in the failure to identify small information during the analysis. The other major drawback of the techniques is that they operate well with high resolution and high-quality pictures, but because of their intrinsic lack of ability to differentiate between edges and noise elements, they do not work well with blurry images. The approach being suggested uses the CNN algorithm to solve these issues. The findings of the simulations carried out suggest that the approach proposed is a far more effective system for conducting edge detection on aggregate scales. The suggested system has also shown to be sufficiently resilient to retrieve the required details and do the necessary analysis on key portions of the images and manage noise in a much better way than the edge detectors currently usable.

KEYWORDS : Machine Learning, CNN, Image processing.

I. INTRODUCTION

Bones are the structural pillars of the human body which, by their rigidity, protect the essential organs of the human body, such as the brain, heart, lungs and other internal organs. In a human body, there are, 206 bones with a diverse variety of shape, scale and objects. Bone fractures are a fairly normal condition in humans. They can be activated for a number of causes that end up exerting pressure above the level of tolerance. Some of the typical forms of fractures found in humans are oblique, compound, spiral, green stick, comminuted and transverse. Any of the commonly used diagnostic methods to diagnose fractures include electric radiation, computed tomography, magnetic resonance imaging (MRI), ultrasound. In addition, physicians use one of these options to confirm whether an injury occurs and correctly locate the site of the fracture if it exists. The proposed approach is a novel method that utilizes the CNN algorithm to leverage image edge detection. The developed Graphical user interface offers a synergistic environment for the user. The Interface is designed to bear in mind that there is nothing the end user wants to

know about the coding part. We can perform any calculation using the Interface, connect with any other components of the UI, plot graph, build tables, etc. The processing of the given images was simple with the MATLAB Interface. The procedure involves the consumer supplying the image that is then taken to transform it into the corresponding grayscale image using a processing pipeline. For detection study, the consumer then chooses the area that is impacted which is transformed into black and white. Finally, it tests the region under study and gives a final analysis.

II. MOTIVATION

Motivation to overcome several difficulties with the use of external orthopedic attachment systems for the treatment of joint fractures and leg extension therapy. More precisely, the IoT paradigm is used to develop a method that will minimize the complications and related costs of home treatment rehabilitation for bone fracture patients by enabling real-time tracking and classification of relevant data.

III. PROBLEM STATEMENT

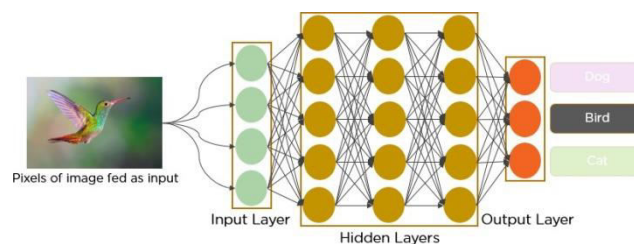
The problem of edge detection is the presence of noise that allows pixel-to-pixel levels to differ arbitrarily. Therefore, the perfect edges are seldom found in actual images. With variations in their mathematical and algorithmic properties based on the difference in gray level, a broad range of edge detection algorithms has been established. Gray level variation may be used to spot gray level discontinuity. A powerful algorithm for specifically defining edges is the visual analysis of photographs captured by a Canny edge detector. The issue of classifying different forms of fractures in the proximal humerus bone is discussed in this study.

IV. ALGORITHMS

1.1 CNN

In the past few decades, Deep Learning has proved to be a very powerful tool because of its ability to handle large amounts of data. The interest to use hidden layers has surpassed traditional techniques, especially in pattern recognition. One of the most popular deep neural networks is Convolutional Neural Networks.

At the heart of AlexNet was Convolutional Neural Networks a special type of neural network that roughly imitates human vision. Over the years CNNs have become

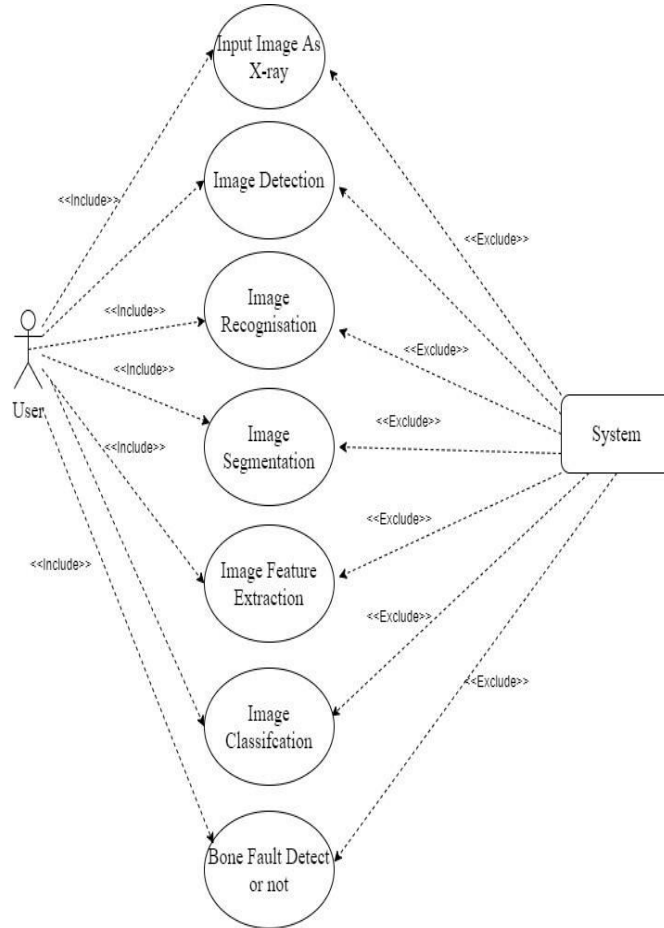


a very important part of many Computer Vision applications and hence a part of any [computer vision course](http://www.computer-vision-course.com) online. So let's take a look at the workings of CNN.

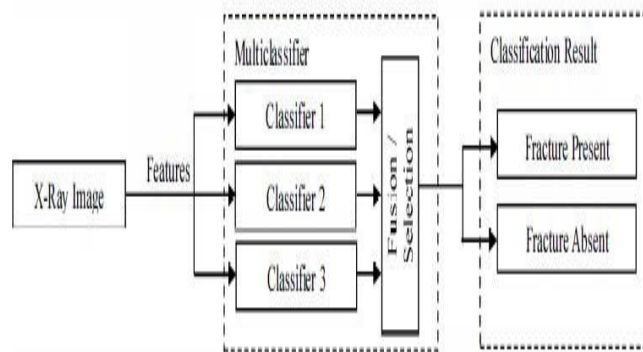
V. FUTURE SCOPE

Scope of our project is to detect the bone fracture by using image processing. In this project we are giving input as a X-ray image of a user and the system will classify this image by using an algorithm and give the output. This system is very useful for finding out bone fracture. Any one can use this system easily.

1. MLDIAGRAM



2. ARCHITECTURE



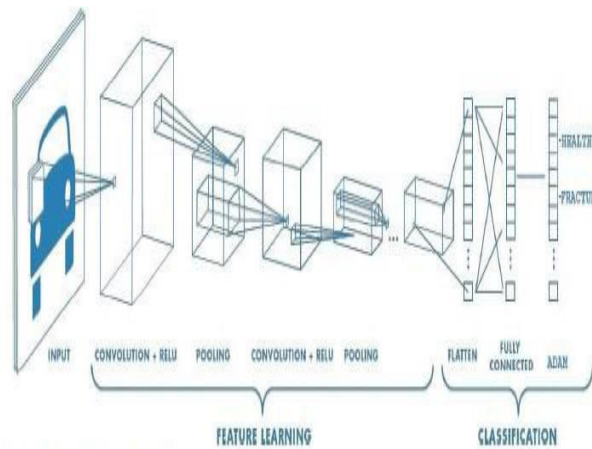


Fig. 3. CNN model for the bone classification

VI. CONCLUSION

A CNN based image segmentation algorithm is proposed to detect bone broken region using a GUI application that has been developed. The affected region of the image processing results is shown. The Affected Area Location indicates that the proposed image segmentation system senses bone structure and fracture edges more specifically even in the presence of noise when pitted against other well-known edge detection strategies such as Sobel, Prewitt and Canny. The proposed CNN-based image segmentation algorithm clearly shows the broken region of the image.

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