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# Detection of Bone fractures with Enhanced Performance with Better Combination of Filtering and Neural Networks: A Review

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**ABSTRACT:** Automated fracture detection is an essential part in a computer-aided tele-medicine system. Fractures often occur in human's arbitrary bone due to accidental injuries such as slipping. In fact, many hospitals lack experienced surgeons to diagnose fractures. Therefore, computer-aided diagnosis (CAD) reduces the burden on doctors and identifies fracture. We present a new classification network, Crack-Sensitive Convolutional Neural Network (CrackNet), which is sensitive to fracture lines. In this paper, we propose a new two-stage system to detect fracture. Firstly, we use Faster Region with Convolutional Neural Network (Faster R-CNN) to detect 20 different types of bone regions in X-ray images, and then we recognize whether each bone region is fractured by using CrackNet. Total of 1052 images are used to test our system, of which 526 are fractured images and the rest are non-fractured images.

**KEYWORDS:** Machine Learning, CNN

## I. INTRODUCTION

One of the first methods for determining the form of a bone is an X-ray. Images of the bones in the body, such as the hand, wrist, arm, elbow, shoulder, etc., are captured on a bone x-ray. The term "fracture" refers to a break in a bone's normal alignment, which happens when the bone is unable to tolerate external forces. The accurate diagnosis of patients can be improved by automatic fracture identification using x-ray pictures. The segmentation algorithm is used for fracture detection to find the edges, which distinguish between the object and background and also show where the boundaries overlap. The collecting of thousands of medical photographs each day in medical institutions has led to a significant increase in the use of medical images. There is a growing requirement for data management and reliable access due to the increase in medical pictures. It's still challenging to identify the proper boundaries in noisy photos. For boundary detection in noisy pictures, it provides a new edge following technique. Use of the suggested method shows how it can be used to various medical picture instances. The suggested method uses information from fracture detection on x-ray images to identify object boundaries in noisy images. Edge orientation, noise environment, and edge structure are some of the factors that are taken into consideration while choosing an edge detection operator. However, as they are unable to accurately determine the borders of objects in noisy images, performance evaluation of image segmentation findings remains a difficult issue. The limits of some objects may be established by a gradual decrease in intensity due to factors like refraction or inadequate focus. The approach used by edge-based approaches is to first use an edge detection operator to find the object borders, and then use edge information to extract the boundaries. Noise, which causes random level variation from pixel to pixel, is the issue with edge detection.

The correct diagnosis of bone fractures must meet exceedingly high standards in the contemporary social milieu, and it is currently primarily determined by the doctor's manual reading. A huge number of X-ray films to read not only makes one tired from reading but also establishes the divergence. On the other hand, it is simple to misdiagnose during the diagnosis process due to diverse clinicians' experiences and interpretation standards. By using computer-aided diagnosis (CAD) to achieve automatic classification of bone fracture images, before the doctors read the X-ray images, the automatic classification of the fractures, and then the classified images are given to the doctor for diagnosis, not only can this reduce the number of doctors who must read and overcome people's eye inertness and defects that are insensitive to grayscale, but it can also improve the diagnostic efficiency and accuracy of radiologists.



**Motivation**

The bones serve as the body's framework and as places of attachment for the muscles. People are becoming more and more prone to bone fractures as society develops. Fractures can disrupt bone blood flow and cause other problems, but they can also harm both the surrounding soft tissues and the affected bones collectively. Fracture problems can also develop if the identification and treatment of the fractures are delayed. The occurrence of bone fractures has seriously harmed people's bodies, so it is important for people to make an accurate and successful diagnosis of bone fractures.

**Names of Conferences / Journals where papers can be published**

Sr.No	Paper Title	Author	Year	Problem solved in this paper : Existing Problem Statement	Technique used to solve problem : Existing Problem Solution	What will be future work : Future Scope
1	Computer-Aided Fracture Detection Of X-Ray Images	R.Aishwariya1, M.Kalaiselvi Geetha2, M.Archana3	2020	The task of determining the correct boundary in noisy images is still challenging.	of a new method of detecting boundaries in noisy images via edge following. With the use of the data on which fracture identification on x-ray pictures is based, the suggested technique can identify object boundaries in noisy images.	Furthermore, they work on accuracy.



2	Bone Fracture Detection Through the Two-stage System of Crack-Sensitive Convolutional Neural Network	Yangling Ma, Yixin Luo	2020	Many hospitals are short on skilled surgeons who can identify fractures. Computer-aided diagnosis (CAD) lessens the workload for medical professionals and detects fracture non-depression.	We introduce Crack-Sensitive Convolutional Neural Network (CrackNet), a new classification network that is sensitive to fracture lines.	We can convert this two-stage system to a one-stage method in the future. Instead of training in two steps, faster R-CNN and CrackNet are trained concurrently.
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3	An overview of deep learning in medical imaging focusing on MRI	Yanan Yang	2019	The proposed framework is designed deep learning in medical imaging focusing on MRI.	objects in an image are segmented by use of aim-segmentation technique (thresholding, edge-based segmentation, and an active contour model)	This paper will work on accuracy improvement.
4	Brain Tumor Detection and Identification Using K-Means Clustering Technique	Malathi R and Dr.Nadirabanu Kamal A R	2015	This study proposes an effective tumour detection approach based on K-Means clustering to segment brain MRI images.	K-Means clustering.	This framework to further improve the recognition performance.



5	Computer-Assisted Bone Fractures Detection Based on Depth Feature	Feng Yang	2020	<p>In this paper, The grayscale images in the MURA data set were converted to RGB images, and the data set was resized to the same proportions. The depth features of the bone pictures were subsequently extracted using a convolutional neural network (CNN).</p>	<p>convolutional neural network (CNN),support vector machine (SVM),extreme learning machine (ELM)and random forest (RF)</p>	<p>Further ideas can be investigated to improve the system performance and accurecy.</p>
6	Detection of Bone Fracture using Image Processing Methods	Anu T C, Mallikarjuna swamy M.S. and Rajesh Raman	2015	<p>In this study, bone fracture analysis is done using X-ray/CT scans. This project's goal is to create an effective system for image processing that quickly and accurately classifies bone fractures using data from x-ray and CT images.</p>	<p>X-ray/CT images, pre-processing, segmentation, edge detection and feature extraction methods</p>	<p>Future studies will fully integrate CT scans and classify the type of fracture that is present.</p>





7	A Survey of Deep Learning for Lung Disease Detection on Medical Images: State-of-the-Art, Taxonomy, Issues and Future Directions	Stefanus Tao Hwa Kieu , Abdullah Bade, Mohd Hanafi Ahmad Hijazi, and Hoshang Koliv and	2020	In this work, Their survey falls short in terms of taxonomy presentation and trend analysis of recent work. This paper's goals include providing a taxonomy of the most advanced deep learning-based lung disease detection systems,	An overview of deep learning for spotting lung diseases in medical photos is provided in this research. deep learning algorithms are used.	This section outlines potential future research that should be taken into account to enhance the effectiveness of lung disease diagnosis using deep learning.
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**II. EXISTING WORK**

The popularity of computer-aided diagnosis (CAD) systems nowadays is due to the fact that they enable doctors and other medical experts to diagnose diseases more effectively than they could otherwise. Similar to this, bone fractures are a frequent issue brought on by stress, accidents, and osteoporosis. The importance of bone fracture identification using computer vision in CAD systems is increasing since it can assist doctors' workloads by weeding out the simple cases. Among the X-ray, MRI, and CT Scan possibilities for detecting bone fractures.

**III. CONCLUSION**

In this study, a brand-new edge-following boundary detection method was developed, and it was then used to solve an object segmentation issue in medical photos. Our edge following method uses both the edge map data and a vector image model. The suggested method was used to identify object boundaries in various noisy image types where ill-defined edges were present. For the sake of the established ground realities, a number of artificially noisy photos were produced and tested. The proposed technique, canny edge detection, is superior, as evidenced by the results of identifying object boundaries in noisy images. The results of the running time on



various image sizes further demonstrate that our approach is more effective than clever edge detection. 3 kind of classifier, like ANN, BPNN, and SVM in which BPNN gives better classification of 86% when compared to other classifiers.

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