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Deep Learning Based Detection and Classification Bone Fractures

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Abstract

Bone fracture is a typical issue because of mishap, osteoporosis and pressing factor. Also, bone is unbending segment and supports the entire body. Consequently, the bone fracture is taken as a significant issue as of late. Bone fracture location utilizing PC vision is getting increasingly more significant in Computer Aided Diagnosis framework since it can assist with diminishing responsibility of the specialist. AI and image classifier can be utilized to effectively identify bone fracture and can characterize them. In this work X-beam/CT images are utilized for bone fractures investigation. The point of this venture is to build up a image preparing based proficient framework for a speedy and exact characterization of bones from the data acquired from the X-beam/CT. Images of the broken bones are acquired from emergency clinics and handling procedures like pre-preparing, division, edge recognition and highlight extraction strategies are received. The prepared image will additionally arranged into broke or non-fractured bone and look at the exactness of various strategies. This venture is completely evolved in python with the programming apparatus for stacking image, image preparing and UI advancement. Results got exhibit the presentation of the bone fracture identification framework.

Keywords--. *Deep Learning, Bone Fracture, Convolutional Neural Network*

I. INTRODUCTION

Bone fracture is regular issue even in most created nations and the quantity of bone cracks is expanding quickly. Bone fracture can happen because of a straightforward mishap or pressing factor. In this way, speedy and exact finding can be urgent to the accomplishment of any endorsed treatment. Practically speaking, specialists and radiologists hand-off on X-beam images to decide if a crack has happened or not and the exact idea of the fracture. Manual assessment of X-beams for crack recognition is a drawn-out and tedious interaction. A drained radiologist may miss a crack image among sound ones. Computer aided design framework can assist with screening X-beam images for dubious cases and caution the specialists. Contingent upon the specialists alone for a particularly basic matter has caused terrible blunders and subsequently, the possibility of programmed conclusion framework has consistently been an engaging one. Image preparing and AI based investigations are being utilized in a few zones, for example, face acknowledgment, unique mark acknowledgment, tumor location and division.

The bone is a significant segment of the human body. Bone gives the capacity to move the body. The bone cracks are basic in the human body. The specialists utilize the X-beam image to analyze the cracked bone. The manual crack location strategy is tedious and furthermore mistake likelihood chance is high. Accordingly, a robotized framework needs to create to analyze the cracked

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bone. The Convolutional Neural Network (CNN) is broadly utilized for the demonstrating of the force electronic gadgets. A profound neural organization model is created to order the crack and solid bone, information expansion methods are utilized. Contingent on the human specialists alone for a particularly basic matter have cause bigotry mistakes. Subsequently the possibility of programmed ID technique has never-endingly been partner degree engaging one. The fundamental objective of the undertaking is to recognize the bone crack from X-beam images utilizing programming created in python. Among the four modalities (X-beam, CT, MRI, Ultrasound), X-beam conclusion is generally utilized for bone crack discovery because of their ease, fast, and wide accessibility.

II. LITERATURE SURVEY

A deep neural network model to classify the fracture and healthy bone. The deep learning model gets over fitted on the small data set. Therefore, data augmentation techniques have been used to increase the size of the data set. The three experiments were been performed to evaluate the performance of the model using softmax and Adam optimizer. The classification accuracy of the proposed model is 92.44% for the healthy and the fractured bone using 5 fold cross validation. The accuracy on 10% and 20% of the test data is more than 95% and 93% respectively. [1] They defined the key points which should be taken into account when trying to accomplish this purpose and compared each study with our baseline. In recent years, deep learning and, in particular, the convolution neural network (CNN), has achieved results comparable to those of humans in bone fracture classification. Adopting a correct generalization,they are reasonably sure that a computer-aided diagnosis (CAD) system, correctly designed to assist doctors, would save a considerable amount of time and would limit the number of wrong diagnoses. [2]. Currently there is a lack of consensus on treatment or interpretation of computed tomography (CT) images for calcaneus fractures. They proposed a novel computer-assisted method for automated classification and detection of fracture locations in calcaneus CT images using a deep learning algorithm. [3].

Proposed a new deep learning method called dilated convolutional feature pyramid network (DCFPN), and apply it to thigh fracture detection. To evaluate method, they establish a dataset including 3842 thigh fracture X-ray radiographs collected from Linyi People's Hospital. The experiment results show that the Average Precision (AP) of DCFPN reaches 82.1% in the detection of 358 testing thigh fracture images, which is 3.9% higher than that of state-of-the-art FPN. [4]. Harris corner detection is used to find the broken points. Decision Tree is used to classify image as fractured or non-fractured. KNN is used to classify the fracture type as Transverse, Oblique, and Comminuted fracture types. Accuracy they achieved was nearby 85%. [5].

III BONE DATASET

MURA (musculoskeletal radiographs) is a large dataset of bone X-rays. Algorithms are tasked with determining whether an X-ray study is normal or abnormal. Musculoskeletal conditions affect more than 1.7 billion people worldwide, and are the most common cause of severe, long-term pain and disability, with 30 million emergency department visits annually

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and increasing. We hope that our dataset can lead to significant advances in medical imaging technologies which can diagnose at the level of experts, towards improving healthcare access in parts of the world where access to skilled radiologists is limited. MURA is one of the largest public radiographic image datasets. We're making this dataset available to the community and hosting a competition to see if your models can perform as well as radilogists on the task.

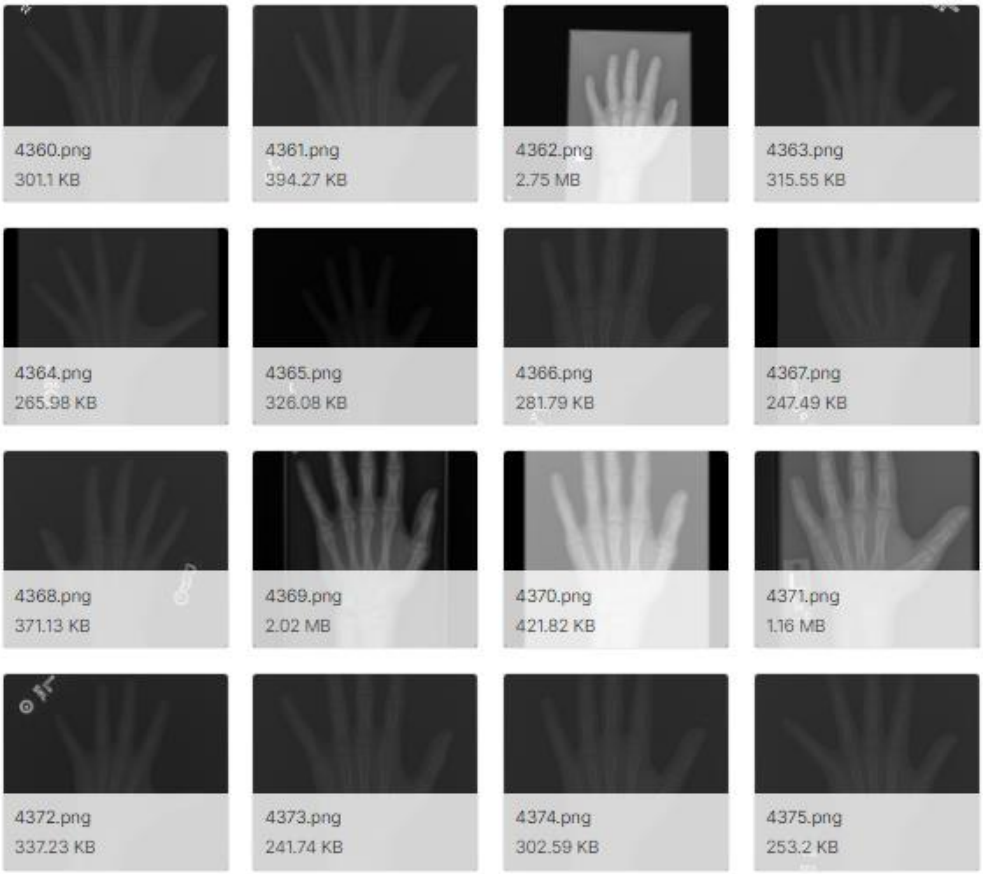

Fig.1. Sample Dataset images

IV. PRAPOSED METHODOLOGY

The basic proposed system consists of 4 stages as shown in figure

A. Pre-processing

B. Feature Extraction

C. CNN

D. Output Prediction

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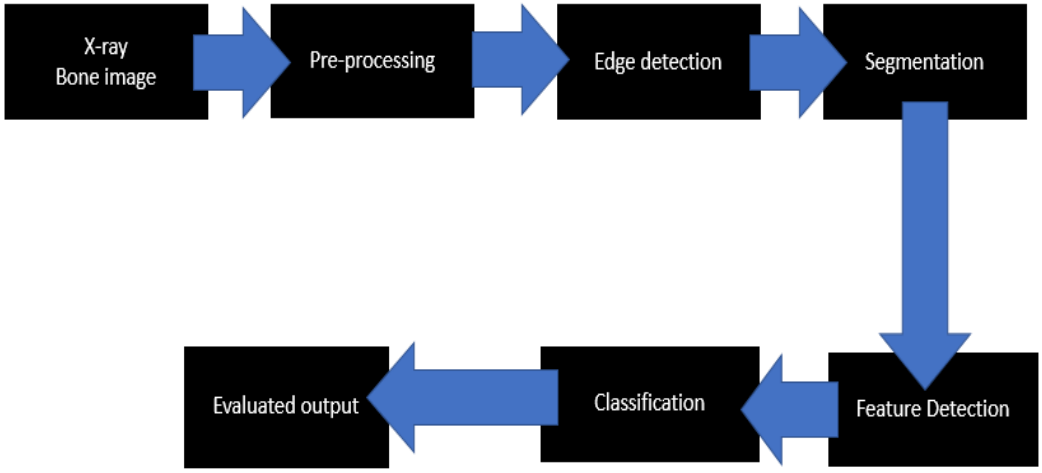

Figure: 2.Block Diagram

The X-ray images i.e dataset are obtained from hospitals that contains normal as well as fractured bones images. In the first step, applying pre-processing technique such as RGB to greyscale conversion and enhance them by using filtering algorithm to remove the noise from the image. Then it detects the edges in the image using edge detection methods and segmented the image. Later on next step is segmentation, after segmentation, the image is converted into set of images by feature extraction. Here, certain features of interests within the image are detected and represented for further processing. The resulting representation can we subsequently used as an input to number of pattern recognition and classification techniques which will then classify or recognize semantic contents of the image. After feature extraction, the types of bone fractured is observed (eg. Transverse fracture, linear fracture, oblique fracture, Spiral fracture, Greenstick fracture etc.) All this is done in classification block. Last but not the least Interpretation is done that is analyzing and judging the information to the current body of knowledge. Finally, the performance and the accuracy of the proposed system is evaluated.

V. EXPERIMENTAL SETUP

Following are some of output obtained from the system, where an image of bone is given as input and some techniques like resize of image, feature extraction and classification of bone is done, whether its fracture or not fracture and type of fracture is classified by using CNN. The dataset was downloaded from kaggle. Dataset was trained and tested using CNN.

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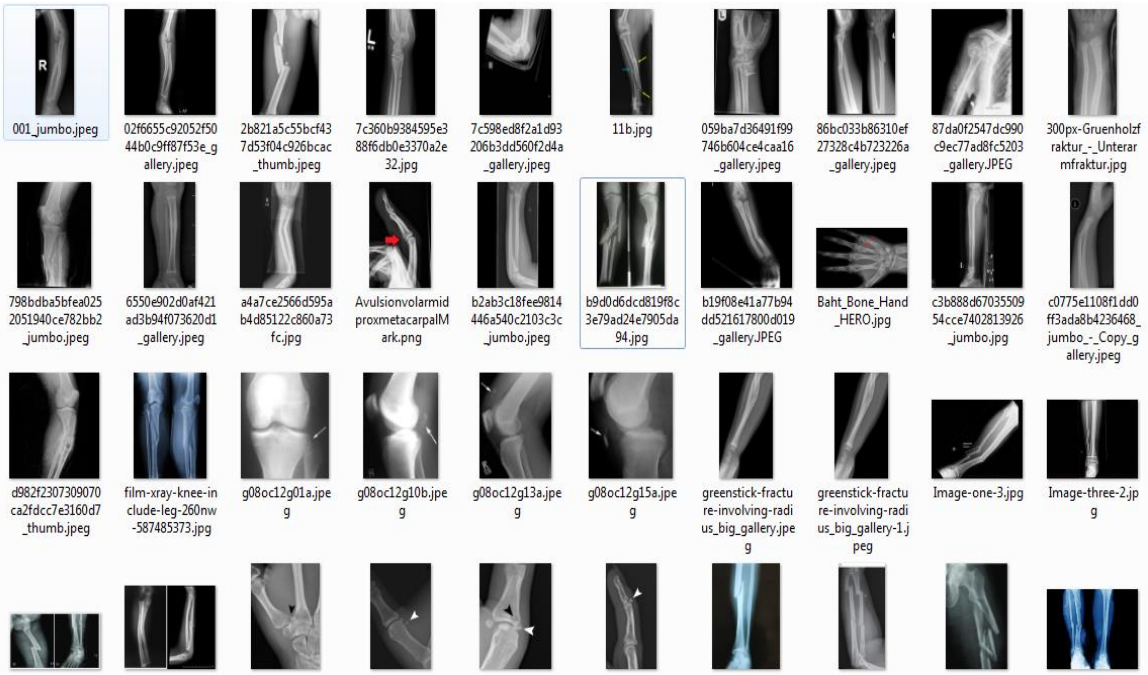

Figure:3 Sample images to demonstrate variation of Handwriting

VI. RESULT AND DISCUSSION

For this experiment, Python is used to implement CNN. To train the network, the dataset is divided into 2 parts (Training 80%, testing 20%)

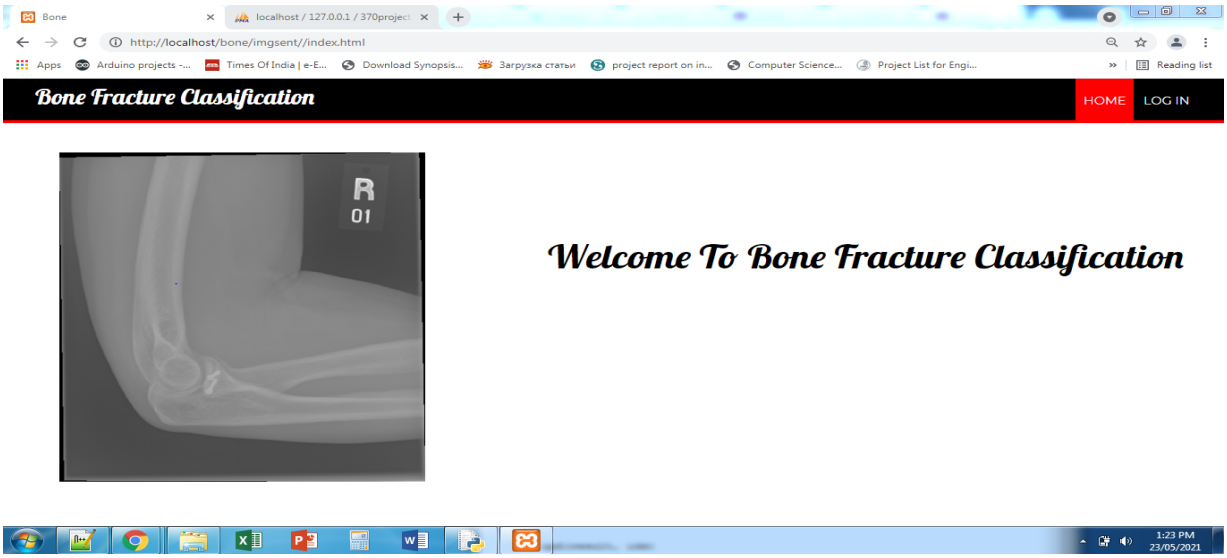

Figure:4. GUI Based Login Page

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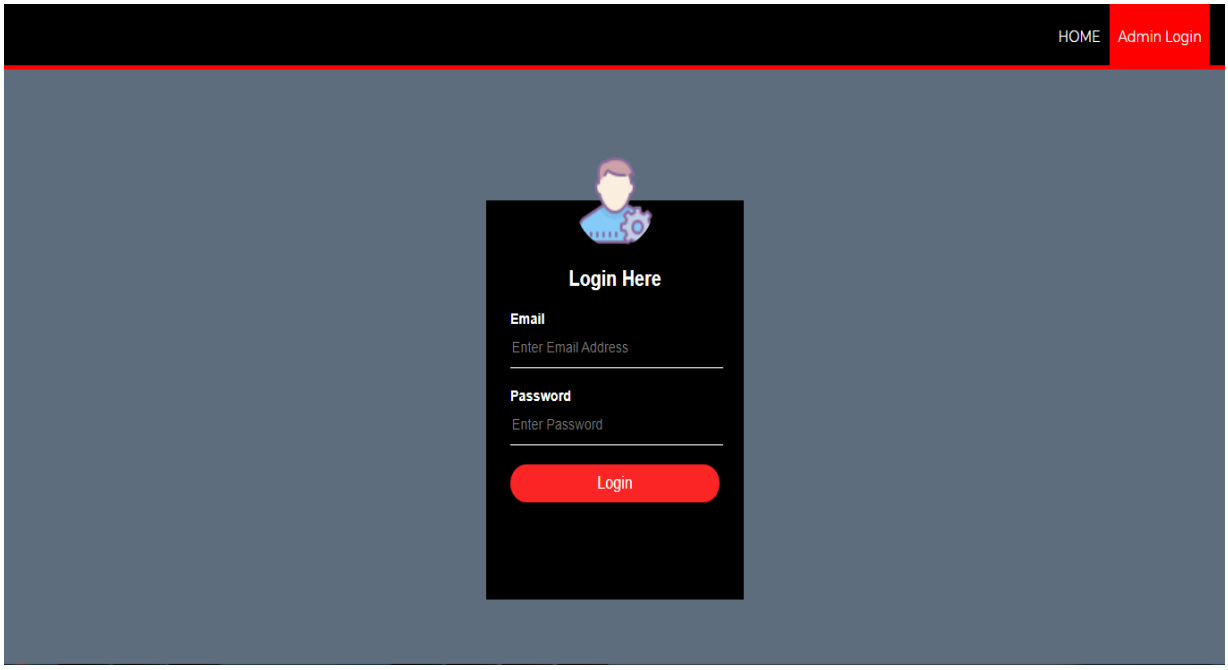

Figure 5. Login Page

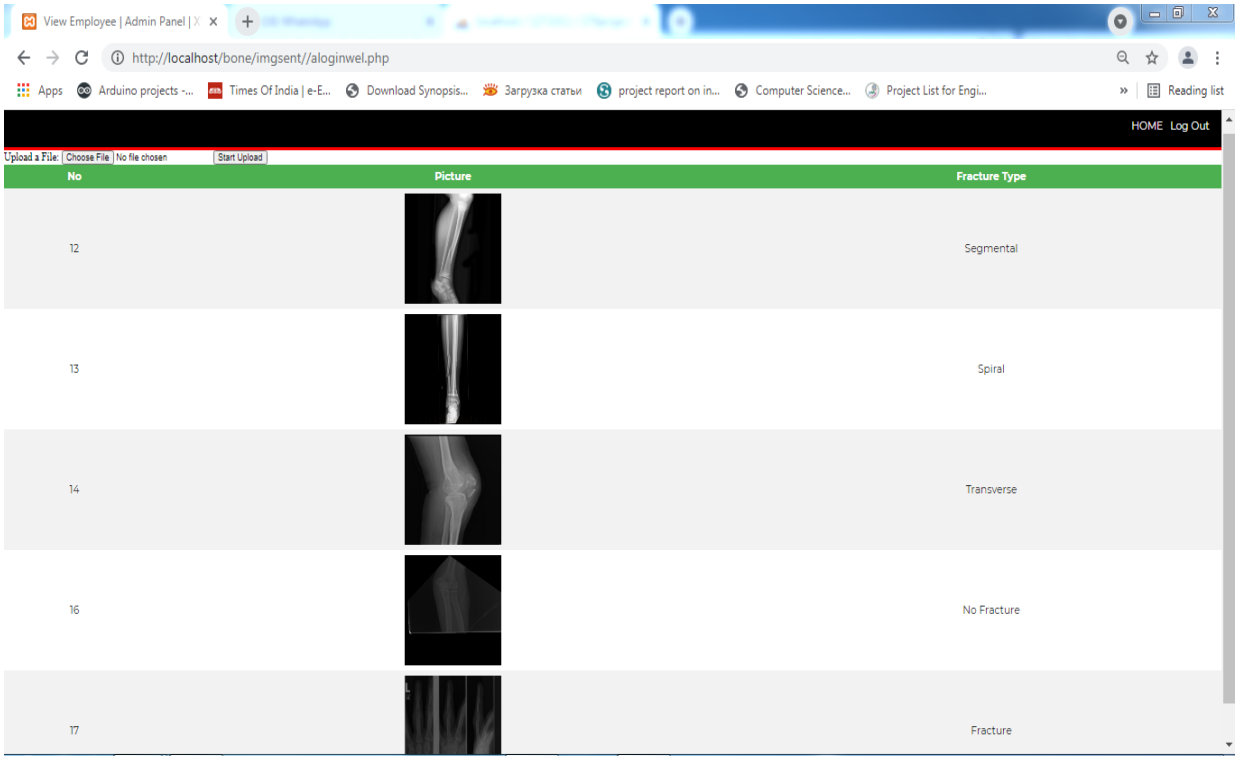

Figure6 Output Predicted Window

VII. CONCLUSION

The System is based on Bone Fracture Detection and Classification. The Deep learning is very powerful strategy for the classification of type of fracture. Several image processing techniques are used to remove different types of noise and to extract useful and distinguishing

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features. It will form an algorithm for systematic evaluation of fractured bones .This will lessen the time and efforts of doctors plus will give accurate results and remove the chances of errors.

VIII. REFERENCES

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