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BONE FRACTURE DETECTION

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Abstract : The project focuses on developing an accurate and efficient system for fracture detection leveraging the diverse MURA X-ray images dataset. Utilizing a Convolutional Neural Network (CNN) and transfer learning with a pre-trained ResNet50 model, the project aims to automate the detection of bone fractures. The dataset undergoes preprocessing, and the model. is trained with data augmentation techniques such as horizontal flipping to enhance generalization. The evaluation phase assesses the model's accuracy, precision, and recall on a separate test set, highlighting its potential as a valuable tool for healthcare professionals. By automating fracture detection, the project contributes to expedited medical diagnostics, showcasing the transformative impact of machine learning in medical image analysis.

I. INTRODUCTION

Bone fractures are common injuries that require timely and accurate diagnosis for effective treatment and recovery. Traditional methods of diagnosing fractures, such as X-rays, involve manual examination by radiologists, which can be time consuming and may lead to human errors.

The integration of machine learning (ML) in the field of medical imaging has shown promising results in automating and enhancing the process of bone fracture detection. This project aims to enhance the diagnostic process by automating fracture detection through the development of advanced machine learning models.

II. MACHINE LEARNING ALGORITHM

This project uses deep learning techniques, specifically convolutional neural networks (CNNs), for image classification tasks. The primary ML algorithms used are based on the ResNet50 architecture, which is a deep neural network designed for image classification. The specific ML algorithms used in the code include:

1. Convolutional Neural Networks (CNNs): • CNNs are a type of deep learning algorithm designed for image processing tasks. They excel at capturing hierarchical features from input images, making them ideal for tasks like image classification.

2. ResNet (Residual Networks):

• ResNet is a specific architecture within the family of CNNs. It introduces skip connections or residual connections, which help overcome the problem of vanishing gradients in deep networks. This enables the training of very deep networks. 3. DenseNet (Densely Connected Convolutional Networks):

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• DenseNet is another CNN architecture that promotes dense connectivity between layers. Each layer receives feature maps from all preceding layers, allowing for better feature reuse and gradient flow.

4. VGG16 (Visual Geometry Group 16): • VGG16 is a CNN architecture that became popular for its simplicity and effectiveness. It consists of several convolutional layers followed by fully connected layers.

5. Fine-Tuning: • Fine-tuning involves adjusting the pre-trained models (like ResNet, DenseNet, or VGG16) on a specific task or dataset.

III. REQUIRED TOOLS

- MS Word
- VS code
- Python3
- Data set
- Machine Learning Algorithm

IV. DATA COLLECTION

In a project focused on the identification and classification of bone fractures using Convolutional Neural Networks (CNNs) and modern models like ResNet, DenseNet, and VGG16, data collection and preprocessing are critical steps to ensure the effectiveness and accuracy of the model. Below are the key aspects of data collection and preprocessing techniques in such a project:

1. Data Collection:

• Identify and collect a diverse dataset of medical images containing bone fractures. The dataset should cover a wide range of fracture types, locations, and patient demographics. • Utilize established medical image databases, collaborate with healthcare institutions, or leverage publicly available datasets.

2. Data Annotation:

• Annotate the dataset with accurate and detailed labels indicating the type and location of each bone fracture. Expert radiologists or medical professionals can assist in this annotation process.

3. Data Augmentation:

• Augment the dataset to increase its diversity and improve model generalization. Techniques such as rotation, flipping, scaling, and brightness adjustments can be applied to generate variations of the original images.

V. METHODS&LIBRARIES

METHODS

• Dataset Preparation: Start by collecting a large and diverse dataset of X-ray images containing various types of bone fractures. A well-curated dataset is crucial for training a robust model.

• Data Augmentation: Augment the dataset to increase its diversity and prevent overfitting. Common data augmentation techniques include rotation, flipping, zooming, and changes in brightness and contrast.

• Preprocessing: Process the X-ray images to make them suitable for input to the neural network. This may involve resizing, normalization, and other techniques to enhance the quality of the input data.

• Model Selection: Choose suitable pre-trained CNN architectures for your task. You mentioned ResNet, DenseNet, and VGG16, which are popular choices due to their success in image classification tasks. These architectures have proven to capture complex features effectively.

LIBRARIES

• Os: For working with the operating system, file paths, and directories.

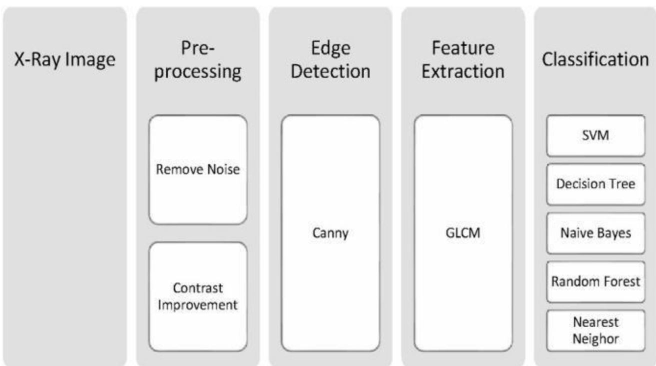
• Numpy and pandas: For data manipulation and DataFrame handling.

• Matplotlib.pyplot: For plotting accuracy and loss curves.

• Tensorflow and keras: For building and training deep learning models.

•Sklearn.model_selection.train_test_split:For splitting the dataset into training and testing sets.

VI. ARCHITECTURE :



VII. EXPERIMENTAL RESULTS

Figure 1 :interface of taking input from user

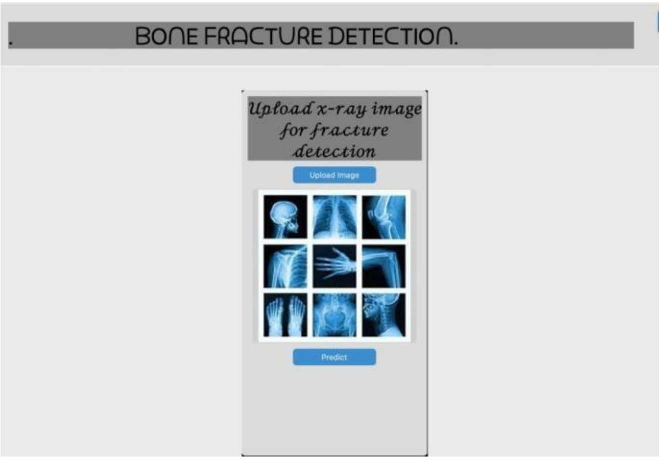
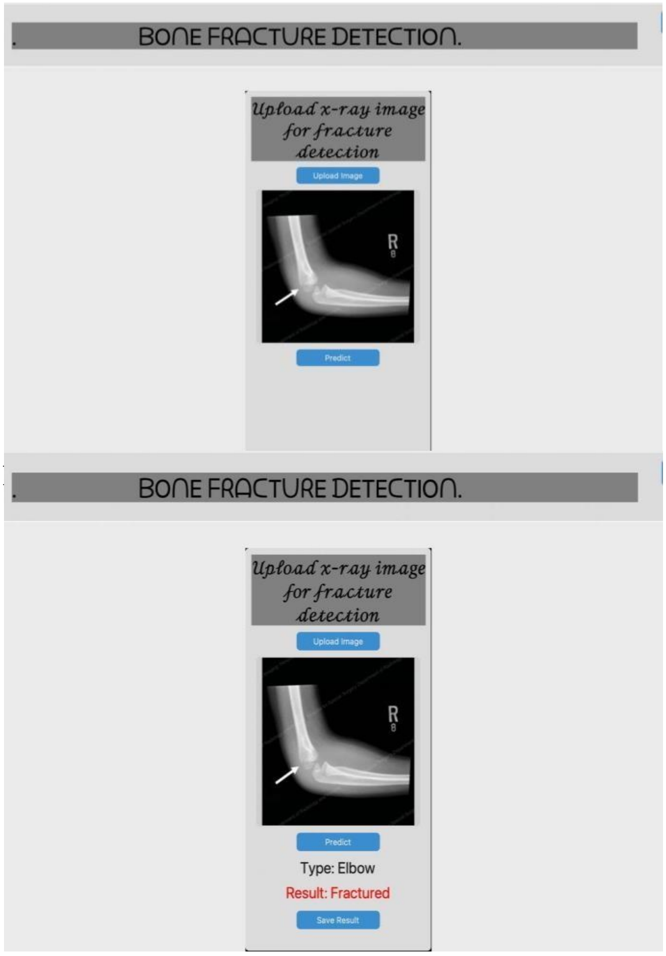


Figure 2 : fracture detection



VIII. CONCLUSION

It is to create a program that can help doctors to determine whether a patient's leg bone has been broken or not easily and quickly. This study introduces a machine learning-based strategy for the automated detection and classification of bone fractures. Both broken and unbroken human bones were used in the experiment, as were their X-ray images. The prevalence of bone fractures is rising, as reported by an increasing number of countries. The ability to recognize even a little bone fracture is very useful in medical practice.

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