IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Bone Fracture Detection And Recommendation Using CNN

[1]Vasanth T,[2]Veeraragavan S,[3]Vigneshwaran K, [4]Ms Anitha R

[123]SRM VEC Student, [4]Assistant Professor,

[1234]Department of Computer Science and Engineering

[1234]SRM Valliammai Engineering College ,Chengalpattu, Tamil Nadu, India

Abstract: Fault identification using computer-based techniques is rapidly increasing these days in all field. Due to the increase in road accidents that occur day-to-day damage caused to the human body is more . Bone is the vital part in the body, which provides the capability to move. Fractures in bone are common in aged population. X-Ray is the first tool to identify the fracture in bone. Here in the present study computer based system is used to detect the specific location of the fractures in the bone through the X-Ray. There are many techniques available for edge identification like Log, Sobel, Canny, Prewitt, and Robert. Although, these methodologies lack with the capability to perform multi-resolution analysis which cause the inability to identify minor details during the period of analysis. Convolutional neural network [CNN] algorithm is used to increase the accuracy rather than any-other methodology which is used in the existing system.

Keywords: Convolutional neural network, Fracture Detection, Fracture classification.

I. INTRODUCTION

Medical imaging has led to improvements in the diagnosis and treatment of numerous medical conditions. which help physicians in detecting different types of abnormalities. There are many types - or modalities - of medical imaging procedures, each of which uses different technologies and techniques. Radiography: conventional X-ray" including mammography. All the previous techniques use ionizing radiation to generate images of the body. Digital image processing is the use of computer algorithms to perform image processing on digital images. The 2D continuous image is divided into N rows and M columns. The intersection of a row and a column is called a pixel. The image can also be a function other variable including depth, color, and time. An image given in the form of a transparency, slide, photograph or an X-ray is first digitized and stored as a matrix of binary digits in computer memory. This digitized image can then be processed and/or displayed on a high-resolution television monitor. For display, the image is stored in a rapid-access buffer memory, which refreshes the monitor at a rate of 25 frames per second to produce a visually continuous display. The II section of this paper deals with literature review. The III section of this paper deals with design and implementation. The IV section deals with performance, results and analysis. The V section of this paper deals with conclusion.

II. LITERATURE REVIEW

The paper [1]"A Study of Various Bone Fracture Detection Techniques" provides an overview of various techniques used for detecting bone fractures, which includes both traditional methods and modern approaches using image processing and machine learning algorithms. The author I. Khatik starts by discussing the importance of bone fracture detection in medical diagnosis and treatment, and then goes on to describe the various techniques used for this purpose.

The paper [2]"Automatic Fracture Detection Using Classifiers" presents a literature review on the use of classifiers for the automatic detection of fractures in different fields such as geology, civil engineering, and medicine. The authors S. K. Mahendran and S. S. Baboo highlight the importance of automated fracture detection, which can save time and reduce errors compared to manual detection methods.

Thepaper[3]"Bone fracture detection using edge detection technique" proposes a new method for the automatic detection of bone fractures using edge detection techniques. The authors N. Johari and N. Singh highlight the importance of accurate and timely detection of bone fractures, which can help in the proper diagnosis and treatment of patients.In addition they have introduced their proposed method, which involves the use of edge detection techniques to identify the edges of the bone in X-ray images.

The paper [4]"3D segmentation and labeling of fractured bone from CT images" proposes a method for the 3D segmentation and labeling of fractured bone from CT images and provides a brief overview of bone fractures, their types, and causes, and discusses the challenges associated with their segmentation in CT images. The authors F. Paulano, J. J. Jiménez, and R. Pulido highlight the importance of accurate and efficient segmentation of fractured bone for surgical planning and treatment in addition they have introduced their proposed method, which involves a combination of several image processing techniques, including filtering, thresholding, and region growing.

The paper [5]"IBFDS: Intelligent bone fracture detection system" proposes a new intelligent system for the detection of bone fractures using X-ray images and provides a brief overview of bone fractures, their types, and causes, and discusses the challenges associated with their detection. The author K. Dimililer highlights the importance of early and accurate detection of bone fractures to ensure proper diagnosis and treatment in addition they have introduced the proposed system, which involves a combination of several image processing and machine learning techniques.

DESIGN AND IMPLEMENTATION

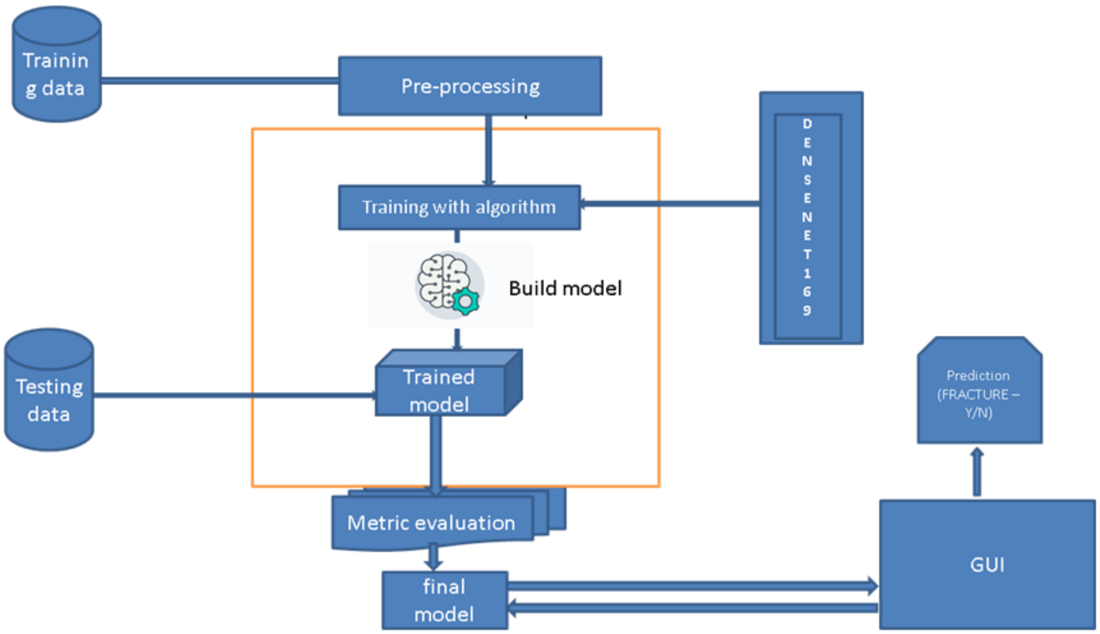


Fig.1 Shows the Architecture Diagram of the proposed system

MODULES

1. Data Collection
2. Data Augmentation
3. Data Preprocessing
4. Model Creation
5. Model Training
6. Prediction

3.1 Data Collection

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

3.2 Data Augmentation

Data augmentation is a process of artificially increasing the amount of data by generating new data points from existing data. This includes adding minor alterations to data or using machine learning models to generate new data points in the latent space of original data to amplify the dataset. This module is referred from the paper[1].

Data Preprocessing

Preprocessing data is a common first step in the deep learning workflow to prepare raw data in a format that the network can accept. For example, you can resize image input to match the size of an image input layer. You can also preprocess data to enhance desired features or reduce artifacts that can bias the network.

```
import os
import numpy as np
import cv2
from sklearn.utils import shuffle

from netconfig import NetConfig


class DataLoader:
    def __init__(self, net_config):

        self.x_train = None
        self.y_train = None
        self.x_valid = None
        self.y_valid = None
        self.conf = net_config

    @staticmethod
    def get_label(img_name):
        if img_name.split('_')[-1] == "positive":
            return [1, 0]
        elif img_name.split('_')[-1] == "negative":
            return [0, 1]
        else:
            raise Exception("Error in label detection")

    def __get_train_data(self):
        training_set = []
```

3.3 Model Creation

A machine learning model is built by learning and generalizing from training data, then applying that acquired knowledge to new data it has never seen before to make predictions and fulfill its purpose. This module is referred from paper [4].

3.4 Model Training

Model training is the phase in the data science development lifecycle where practitioners try to fit the best combination of weights and bias to a machine learning algorithm to minimize a loss function over the prediction range.

```
import os
import numpy as np
import cv2
import random
import pandas as pd
from tqdm import tqdm

import matplotlib.pyplot as plt

from tensorflow.keras.models import Model
from tensorflow.keras.layers import Input, Dense, Conv2D, Conv3D, DepthwiseConv2D, SeparableConv2D, Conv3DTranspose

from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau, ModelCheckpoint, Callback
from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img#, image


from tensorflow.keras.applications.densenet import DenseNet169, DenseNet121, preprocess_input
from time import time


from focal_loss import BinaryFocalLoss


import datetime
from zipfile import ZipFile
file_name = "MURA-v1.1.zip"
with ZipFile(file_name,'r') as zip:
  zip.extractall()
```

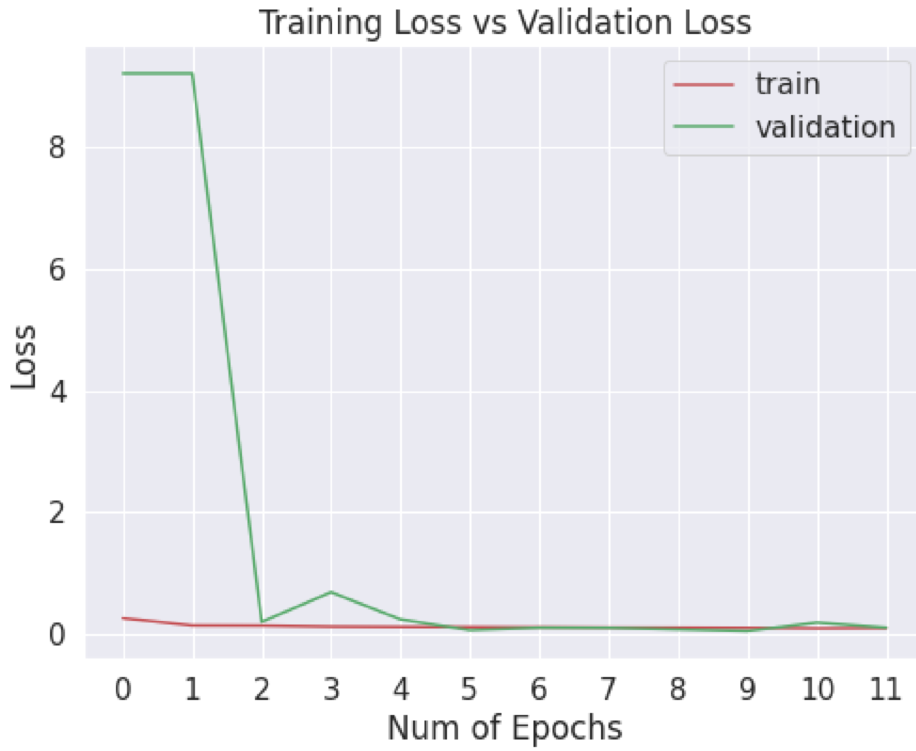
3.5 Prediction

Prediction refers to the output of an algorithm after it has been trained on a historical dataset and applied to new data when forecasting the likelihood of a particular outcome, such as whether or not a customer will churn in 30 days.

```
from flask import Flask, render_template, request, redirect, url_for, flash
from werkzeug.utils import secure_filename
import os
import tensorflow as tf
import numpy as np
from netconfig import NetConfig
from densenet import DenseNet
import cv2
from PIL import Image

app = Flask(__name__)
app.secret_key = 'some_secret_key'
app.config['UPLOAD_FOLDER'] = 'uploads'
app.config['MAX_CONTENT_LENGTH'] = 16 * 1024 * 1024  # 16MB

conf = NetConfig()
dense_model = DenseNet(conf)


def allowed_file(filename):
    ALLOWED_EXTENSIONS = {'jpg', 'jpeg', 'png'}
    return '.' in filename and filename.rsplit('.', 1)[1].lower() in ALLOWED_EXTENSIONS


@app.route('/')
def home():
    return render_template('index.html')
```

III. PERFORMANCE, RESULT AND ANALYSIS

The use of a computer-based system to detect the specific location of fractures in bones through X-ray has the potential to improve the accuracy and efficiency of fracture detection. The use of a convolutional neural network (CNN) algorithm in this study can improve the accuracy of the system compared to other existing methodologies, as it can perform multi-resolution analysis and identify minor details during the analysis period. This means that the system can potentially detect fractures that may have been missed by other methods.The use of the CNN algorithm in this study may lead to improved accuracy in the detection of fractures in bones. By performing multi-resolution analysis, the algorithm can potentially identify minor details that may have been missed by other methods, which can improve the overall accuracy of the system. The specific results of the study would depend on the dataset used and the performance of the algorithm in detecting fractures.The use of a computer-based system with a CNN algorithm for fracture detection in bones is a promising development in the field of medical imaging. By incorporating multi-resolution analysis, the algorithm can potentially detect fractures that may have been missed by other methods, which can improve the accuracy and reliability of fracture detection. However, further studies are needed to determine the specific performance of the algorithm in detecting fractures, and to validate the results of the study. Additionally, the development of computer-based systems for fracture detection could potentially lead to improved patient outcomes, by allowing for earlier detection and treatment of fractures.



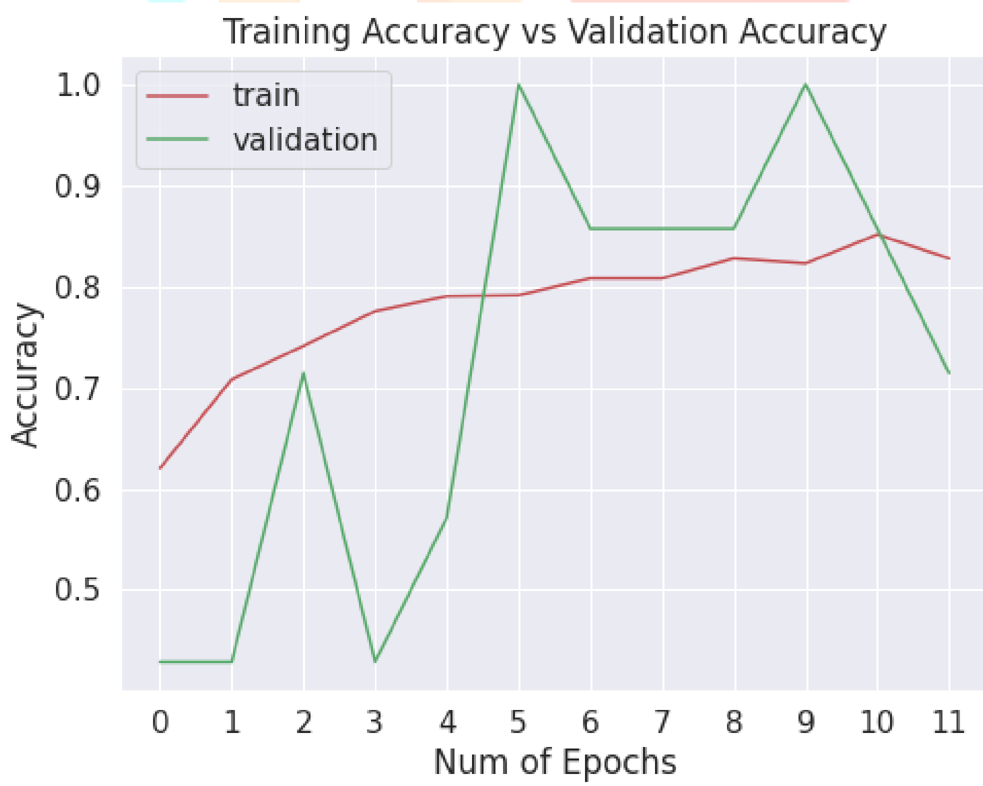


Fig.2 Shows the Accuracy Graph of the proposed system

IV. CONCLUSION AND FUTURE WORK

The use of computer-based techniques for fault identification, particularly in the field of healthcare, is becoming increasingly common. In the case of bone fractures, X-ray is the primary tool used for detection. However, traditional edge identification techniques may lack the ability to identify minor details during the analysis, leading to inaccuracies.

To overcome this challenge, the use of Convolutional neural network (CNN) algorithm is being explored to improve accuracy in detecting fractures in bones. The CNN algorithm is a powerful tool for image recognition and analysis and is particularly well-suited for image classification tasks. By utilizing CNN, healthcare professionals can more accurately and quickly identify the specific location of fractures in bones, ultimately improving patient outcomes.

REFERENCES

[1] I. Khatik, “A Study of Various Bone Fracture Detection Techniques,” Int. J. Eng. Comput. Sci., vol. 6, no. 5, pp. 6–11, 2017.

[2] S. K. Mahendran and S. S. Baboo, “Automatic Fracture Detection Using Classifiers- A Review,” vol. 8, no. 6, pp. 340–345, 2011.

[3] N. Johari and N. Singh, “Bone fracture detection using edge detection technique,” Adv. Intell. Syst. Comput., vol. 584, pp. 11–19, 2018.

[4] F. Paulano, J. J. Jiménez, and R. Pulido, “3D segmentation and labeling of fractured bone from CT images,” Vis. Comput., vol. 30, no. 6–8, pp. 939–948, 2014.

[5] K. Dimililer, “IBFDS: Intelligent bone fracture detection system,” Procedia Comput. Sci., vol. 120, pp. 260–267, 2017.

[6] R. Aishwariya, M. Kalaiselvi Geetha, and M.Archana, “Computer-Aided Fracture Detection Of X-Ray Images,” IOSR J. Comput. Eng., pp. 2278–661.

[7] E.Jacob and M. V. Wyawahare, “Survey of Bone Fracture Detection Techniques,” Int. J. Comput. Appl., vol. 71, no. 17, pp. 31–34, 2013.

[8] H. Kaur and A. Jain, “Detection of Fractures in Orthopedic X-Ray Images,” vol. 8, no. 3, pp. 545– 551, 2017.

[9] S. Bhardwaj and A. Mittal, “A Survey on Various Edge Detector Techniques,” Procedia Technol., vol. 4, pp. 220–226, 2012.

[10]Edward V, Cephas Paul. and Hepzibah S, Hilda. (2015) , ―A Robust Approach For Detection of the type of Fracture from X-Ray Images, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue No. 3, pp.479-482.

[11] Deshmukh, Snehal., Zalte, Shivani., Vaidya, Shantanu. and Tangade, Parag. (2015), ―Bone Fracture Detection Using Image Processing in Matlab, International Journal of Advent Research in Computer and Electronics (IJARCE), pp. 15-19.

[12] Basha, C. Z., Simha, G. K. J., & Krishna, Y. V. (2019). An efficient and robust fracture detection in femur bones. International Journal of Innovative Technology and Exploring Engineering, 9(1), 1954–1957.

[13] Basha, C. Z., Sricharan, K. M., Dheeraj, C. K., & Ramya Sri, R. (2018). A study on wavelet transform using image analysis. International Journal of Engineering and Technology(UAE), 7(2), 94–96.

[14] Rafeal. C. Gonzalez & Woods, “Chapter 10: Image segmentation”, Digital image processing, Pearson Education, Inc., 2005, pp. 392–439.

[15] Othman, M. F. B., Abdullah, N. B., & Kamal, N. F. B. (2011). MRI brain classification using support vector machine. 2011 Fourth International Conference on Modeling, Simulation and Applied Optimization. doi:10.1109/icmsao.2011.5775605

[16] Zeelan Basha, C. M. A. K., Maruthi Padmaja, T., & Balaji, G. N. (2018). Automatic X-ray image classification system. In Smart Innovation, Systems and Technologies (Vol. 78, pp. 43–52). Springer Science and Business Media Deutschland GmbH.

[17] C. Z. Basha, M. R. K. Reddy, K. H. S. Nikhil, P. S. M. Venkatesh and A. V. Asish, "Enhanced Computer Aided Bone Fracture Detection Employing X-Ray Images by Harris Corner Technique," 2020 Fourth International Conference on Computing Methodologies and Communicati on (ICCMC), Erode, India, 2020, pp. 991-995.

[18] Basha, C. Z., Krishna, A., & Kumar, S. S. (2019). Automatic article detection in a jumbled scene using point feature matching. In Examining Fractal Image Processing and Analysis (pp. 188–195). IGI Global.