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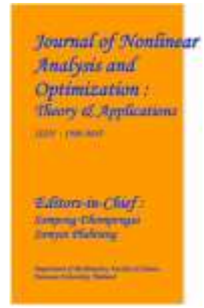

IDENTIFYING BONE TUMOR USING X-RAY IMAGES

K. JAYA KRISHNA [1], P.RAJIK[2]

[1]Associate Professor, Dept. of MCA, QIS College of Engineering and Technology, Ongole, Andhra Pradesh.

[2]PG Scholar, Dept. of MCA, QIS College of Engineering and Technology, Ongole, Andhra Pradesh.

ABSTRACT — Bone sarcoma, usually known as bone cancer, is a rare type of cancer that refers to an abnormal growth of tissue inside the bone, with high probability to spread to other parts of the body. It commonly affects children, teenagers and young adults. As for all other types of cancer (breast, lung, prostate, stomach, brain...), there are no identified causes for bone cancer. The association of medical imaging modalities (such as X-ray, MRI and CT imaging) with image processing techniques can provide more accuracy while detection eventual bone tumors. In this project, we introduced a new method for sarcoma diagnosis, using a Generalized Gaussian Density analysis (GGD). The process starts by generating sub-images of a given size from the processed bone MRI and conducting a GGD analysis on each of the sub-images. Then, a region of interest(ROI) corresponding to the sub-images with the highest value of the shape parameter α is selected from the original MRI.

Index Terms – X-ray images, pre-processing, U-net model, Watershed algorithm, SVM classifier.

I. INTRODUCTION

Bone cancer is an abnormal growth of tissue in the bone. It can be primary or secondary. Primary bone sarcoma starts growing from the bone cells, while secondary bone cancer starts from other organs of the body and then spread to the bone cells. Pain, bone loss and hyper calcemia are the most common symptoms of a bone cancer.

Early bone cancer detection may lead to more efficient treatment and reduce the risk of disabilities. However, bone cancer is usually misdiagnosed due to the difficulties encountered by radiologists while interpreting medical images. Image processing techniques can offer more accurate interpretation tools for medical imaging and assist radiologists in bone cancer diagnosis. In this paper, we first described the bone anatomy and how cancer cells are developed inside the bone texture. Then we illustrated examples of different bone cancer forms

II. LITERATURE SURVEY

A. *Bone-Cancer Assessment and Destruction Pattern Analysis in Long-Bone X-ray Image*

Bone cancer originates from bone and rapidly spreads to the rest of the body affecting the patient. A quick and preliminary diagnosis of bone cancer begins with the analysis of bone X-ray or MRI image. Compared to MRI, an X-ray image provides a low-cost diagnostic tool for diagnosis and visualization of bone cancer. In this paper, a novel technique for the assessment of cancer stage and grade in long bones based on X-ray image analysis has been proposed. Cancer-affected bone images usually appear with a variation in bone texture in the affected region. A fusion of different methodologies is used for the purpose of our analysis. In the proposed approach, we extract certain features from bone X-ray images and use support vector machine (SVM) to discriminate healthy and cancerous bones. A technique based on digital geometry is deployed for localizing cancer-affected regions. Characterization of the present stage and grade of the disease and identification of the underlying bone-destruction pattern are performed using a decision tree classifier. Furthermore, the method leads to the development of a computer-aided diagnostic tool that can readily be used by paramedics and doctors. Experimental results on a number of test cases reveal satisfactory diagnostic inferences when compared with ground truth known from clinical findings.

B. *Bone Cancer Detection Using Feature Extraction Based Machine Learning Model*

Bone cancer is considered a serious health problem, and, in many cases, it causes patient death. The X-ray, MRI, or CT-scan image is used by doctors to identify bone cancer. The manual process is time-consuming and required expertise in that field. Therefore, it is necessary to develop an automated system to classify and identify the cancerous bone and the healthy bone. The texture of a cancer bone is different compared to a healthy bone in the affected region. But in the dataset, several images of cancer and healthy bone are having similar morphological characteristics. This makes it difficult to categorize them. To tackle this problem, we first find the best suitable edge detection algorithm after that two feature sets one with hog and another without hog are prepared. To test the efficiency of these feature sets, two machine learning models, support vector machine (SVM) and the Random forest, are utilized. The features set with hog perform considerably better on these models.

C. *Automated Bone Cancer Detection Using Deep Learning on X-Ray Images*

In recent days, bone cancer is a life-threatening health issue that can lead to death. However, physicians use CT-scan, X-rays, or MRI images to recognize bone cancer, but still require techniques to increase precision and reduce human labor. These methods face challenges such as high costs, time consumption, and the risk of misdiagnosis due to the complexity of bone tumor appearances. Therefore, it is essential to establish an automated system to detect healthy bones from cancerous ones. In this regard, Artificial intelligence, particularly deep learning, shows increased attention in the medical image analysis process. This research presents a new Golden Search Optimization along with Deep Learning Enabled Computer Aided Diagnosis for Bone Cancer Classification (GSODL-CADBCC) on X-ray images. The aim of the GSODL-CADBCC approach is to accurately distinguish the input X-ray images into healthy and cancerous. This research presents the GSODL-CADBCC technique that leverages the bilateral filtering technique to remove the noise. This method uses the SqueezeNet model to generate feature vectors, and the GSO algorithm efficiently selects the hyperparameters. Finally, the extracted features can be classified by improved cuckoo search with a long short-term memory model.

III. PROPOSED SYSTEM

The overview of our proposed system is shown in the below figure.

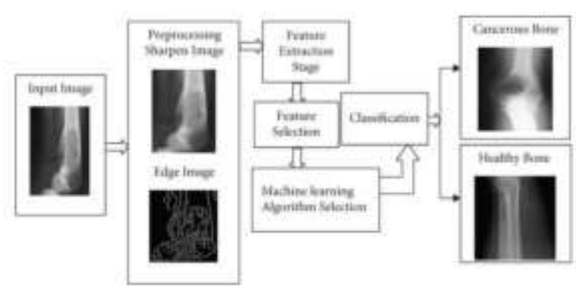

Fig. 1: System Overview

Implementation Modules

User Module

- In this module, user start the web cam to capture the video, once capture the video he can check the liveness of the video, and detect the any spoof attack.

Open Camera Module

- In this module, we are enable the system camera module using the Opencv library in python. This library is used to handling the image or video data effectively. Using the module we capture the live video data for further verification process.

Check liveness

- In this module, we are check the liveness of the video. In the recent time it is very common attack system different type of attacks in which spoofing the biometrics data. This attack was performing by using the photostat copies of images or pre record data. So we need check the liveness of the data is important to detect and mitigate the spoofing attack effectively.

Detect Spoof

- In this module, we collect liveness data from the above module and then classify whether the data spoofed or not.

IV. RESULTS

Fig. 2: Upload tumor image dataset

In above screen all images are processed and to check images are loaded properly so I am displaying one sample processed image and now close that image to get below output.

Fig. 3: Classify label

In above screen we can see dataset contains 253 images with and without tumor class label and now click on 'Trained CNN Bone Tumor Detection Model' button to train CNN with above extracted features and get below output.

Fig. 4: Train CNN Model

In above screen CNN training completed and we got it accuracy as 96% and now click on 'Bone Tumor Segmentation & Classification' button to upload test image and get below output.

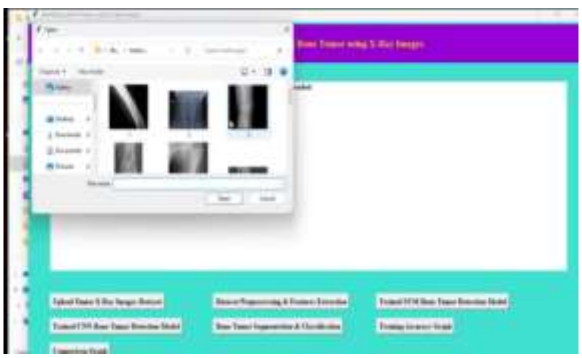

Fig. 5: Upload Image

In above screen selecting and uploading 5.jpg file and then click on 'Open' button to get below output.

Fig. 5: Classification Result

In above image 'No Tumor Detected' and now try another image.

V. CONCLUSION

In conclusion, the AI-based medical tumor detection system proves to be a highly effective solution for improving the accuracy and efficiency of cancer diagnosis. By utilizing deep learning algorithms and advanced image analysis techniques, it assists doctors in detecting tumors at an early stage, which is crucial for timely treatment and better patient outcomes. The system reduces human error, speeds up diagnostic processes, and provides valuable decision support to healthcare professionals. Although challenges such as data quality, privacy, and integration with existing medical infrastructure still exist, the overall benefits highlight its potential as a reliable and innovative tool in modern healthcare.

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AUTHORS Profile

Mr. K. Jaya Krishna is an Associate Professor in the Department of Master of Computer Applications at

QIS College of Engineering and Technology, Ongole, Andhra Pradesh. He earned his Master of Computer Applications (MCA) from Anna University, Chennai, and his M.Tech in Computer Science and Engineering (CSE) from Jawaharlal Nehru Technological University, Kakinada (JNTUK). With a strong research background, he has authored and co-authored over 90 research papers published in reputed peer-reviewed Scopus-indexed journals. He has also actively presented his work at various national and international conferences, with several of his publications appearing in IEEE-indexed proceedings. His research interests include Machine Learning, Artificial Intelligence, Cloud Computing, and Programming Languages. He is committed to advancing research and fostering innovation while mentoring students to excel in both academic and professional pursuits.

Mr. P.Rajik has revived has received her BCA And Degree From ANU 2023 pursuing MCA QIS college of Engineering And Technology Affiliated to JNTUK 2023-2025