Swanirman Sunirmit Publications of Research-Special Issue of ICRTTEAS July 2024 | [2024-25]
ISSN [Online]: 2583-2654

Pancreatic Cancer Detection Using Deep Learning

Supriya S, Vamsi M,Gangothri N V
Mohamed Kareemulla N R, Kharmega Sundararaj G
Department of CSE, Dr. T. Thimmaiah Institute of Technology
KGF, Karnataka - 563120

Abstract: An improved Deep learning technique called Pancreatic Cancer Detection Using Deep Learning. The proposed (PCD-DL) system automatically aims to identify cancerous using Deep Learning technique. The proposed system contains 2 phases namely training phase and testing phase, in the first stage of training phase, the historical pancreatic images are collected from the medical related system as a image dataset. In second stage, the system preprocesses the pancreatic CT images to improve the quality and optimize size of the image using improved arithmetic operation. In third stage feature extraction involves identifying unique pancreatic characteristics like edges and texture using Convolution neural network (CNN) algorithm. Following the previous stage the fourth stage is about classifying the data. The final stage is about testing the model, fine tuning and deploying our system for betterment in health care.

Keywords: Pancreatic Cancer, Convolution Neural Network (CNN), CT Images, Deep Learning

I. INTRODUCTION

The objective of the initiative titled "Utilizing Deep Learning for Detecting Pancreatic Cancer" is to leverage advanced deep learning techniques to enhance the timely identification of pancreatic cancer. Through the examination of diverse medical imaging technologies like computed tomography (CT) scans, this endeavor endeavors to furnish a non-intrusive and remarkably precise approach for promptly detecting pancreatic tumors.

Creating an effective and dependable deep learning algorithm for pancreatic cancer identification carries the potential for swifter intervention, enhanced treatment outcomes, and ultimately, heightened survival rates among afflicted individuals, the urgency of this challenge is reflected in the very serious and often fatal nature of pancreatic cancer. Early and accurate detection methods play an important role in improving the prognosis of affected individuals. In recent years, the integration of deep learning, especially convolutional neural networks (CNN), has become an effective method to support the early diagnosis of pancreatic cancer. This guide

provides an overview of the application of deep learning data and provides conflicting information about different studies on the detection of porcelain cancer. An effort is being made to identify pancreatic cancer using CT images.Detecting cancer is achieved through the application of image processing methods and a CNN model architecture.

Pancreatic cancer, referred to as PC, poses a significant threat as it frequently eludes detection due to its complex diagnostic procedures. Regrettably, despite considerable research efforts, no effective treatment has yet been found for this lethal condition. Currently, the 5-year survival rate in the United States stands at a mere 11%. Early detection of PC is imperative. The fusion of technology and medical investigation presents a glimmer of hope for the early identification and improved management of this illness.

II. SCOPE OF THE WORK

It sounds like you have a comprehensive plan for

ISSN [Online]: 2583-2654

utilizing deep learning, specifically Convolutional Neural Networks (CNNs), to detect pancreatic cancer early. The primary goal is to detect pancreatic cancer early using deep learning techniques, particularly CNNs. Deep learning algorithms allow the system to learn intricate patterns and correlations in the data, enhancing sensitivity and specificity compared to traditional diagnostic methods.

Early detection is crucial in pancreatic cancer as it can lead to timely interventions and improved patient outcomes.The work involves collaboration between medical professionals, data scientists, and technology experts, emphasizing the interdisciplinary nature of the work.

The developed model aims to serve as a valuable tool for healthcare practitioners, providing them with a reliable and efficient means of diagnosing pancreatic cancer.This work exemplifies the convergence of healthcare and artificial intelligence, demonstrating the potential for technology to positively impact cancer diagnostics and patient care.

Each of these points highlights the significance and potential impact of your project in the field of early pancreatic cancer detection.

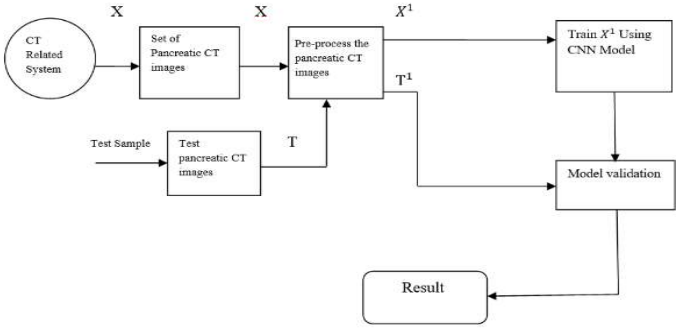

Fig 1: System Architecture

III. METHODOLOGY

3.1 Data collection

The historical Pancreatic CT images are collected from the medical related system as a image dataset. A total of 1239 images were collected from a Kaggleplat form, comprising 701 cancerous images and 538 non-cancerous images. A set of CT images deployed in an PCD- DL system, represented as X = $\mathbf{X_i}$for, $\mathbf{X_i}$=$\mathbf{X_{ijr}}$, j= 1,2,…….,h, r = 1,2,…….,w, where Xi indicates the ith reference CT from the image deposit X with n image, $\mathbf{X_{ijr}}$ is the jth height and rth width in the ith CT image $\mathbf{X_{ijr}}$ as $X=\{\boldsymbol{X_1},\boldsymbol{X_2},....,\boldsymbol{X_n}\}$where i=1,2,3…,n and $\mathbf{X_i}$=$\mathbf{X_{ijr}}$ where j=1, 2, 3,…..,h ; r=1 ,2, 3,…..,w, $\mathbf{X_i}$ represents an individual pancreatic CT image in the collection, n is the total number ofCT images in the dataset and X represents a set containing all the Pancreatic CT images

3.2 Data processing stage

Pancreatic CT images preprocessing involves several steps to enhance the quality of the images. Resizing ensures that you adjust the dimensions of the image while keeping the aspect ratio constant. This helps prevent distortion and ensures that structures in the Pancreatic are accurately represented

The CT images undergo resizing using the aspect ratio preservation technique, ensuring that the original proportions of the images are maintained throughout the process. Aspect ratio preservation maintains the original proportions of the CT image. Resizing ensures uniformity in image dimensions.

To represent the resizing process with aspect ratio preservation mathematically, let's denote the original dimensions of each Pancreatic CT image(width) and h_i(height) in the set by X The aspect ratio ($AR_{wi,hi}$) of width and height is given

$$ARwi=wtarget/wi \quad (1)$$
$$ARhi=htarget/hi \quad (2)$$
$$w_{ri}=w_i*AR_{wi} \quad (3)$$
$$h_{ri}=h_i*AR_{hi} \quad (4)$$

Training CNN The ambition of CNN is to classify new data into proper classes with a high score or high probability. As a result, a strong accurate

ISSN [Online]: 2583-2654

model is vital, which is able to identify all the training datasets with a low error rate. Intuitively, minimizing the differences between output result and given true label would be one of the options, which consists of minimizing the mean square error loss function between the predicted results.

IV. IMPLEMENTATION AND DISCUSSION

Fig 2: UserLoginPage

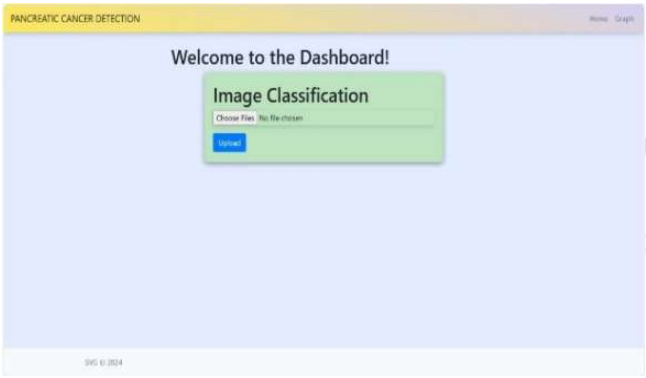

Fig 3: DashboardtoUploadImage

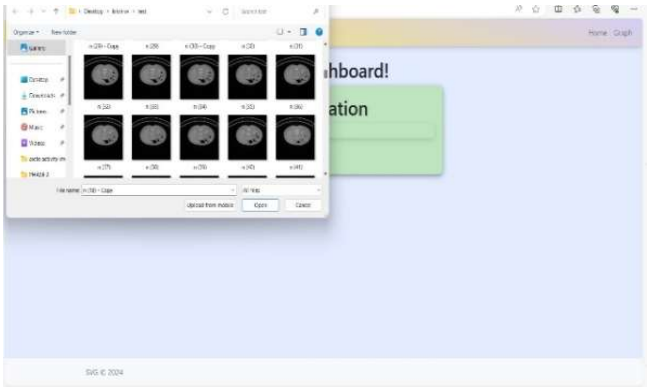

Fig 4:UserInputPanel

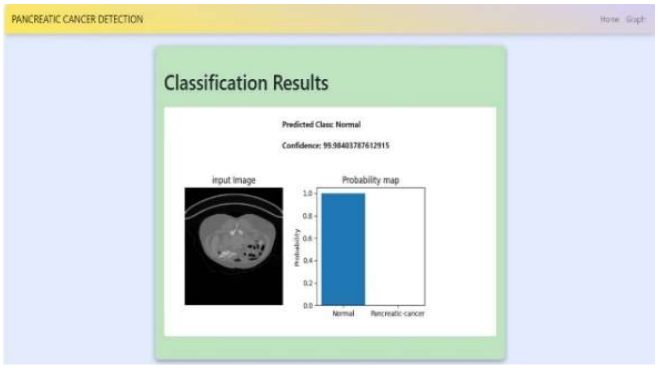

Fig 5:PredictionClassasNormal

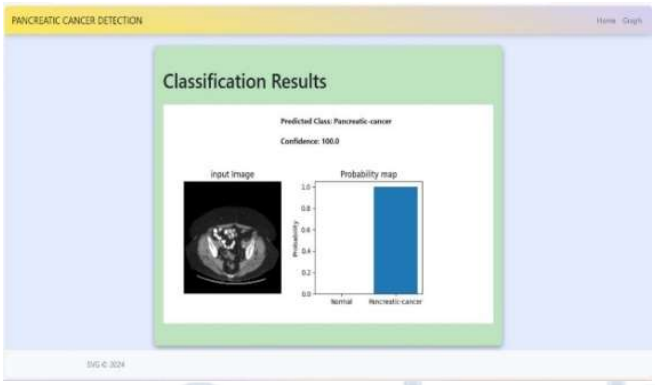

Fig 6:PredictionClassasPancreaticCancer

V. CONCLUSION

This work is developed a deep learning model to predict pancreatic cancer presence using image data of clinical features. After thorough data preprocessing and splitting into training and testing sets, a Convolutional Neural Network (CNN) was trained and evaluated.

The CNN achieved a remarkable validation accuracy of 98%, with precision scores of 0.98 for both presence and absence predictions of pancreatic cancer. This success underscores the model's robustness in accurately predicting cancer occurrence from clinical image features.

The developed CNN serves as a valuable tool for healthcare professionals, aiding in clinical decision-making and early pancreatic cancer detection from medical images. However, it's important to acknowledge that model performance can vary based on dataset quality, image diversity, and problem specificity.

ISSN [Online]: 2583-2654

Future enhancements could involve further model tuning, testing on larger and more diverse datasets, and collaboration with domain experts to refine the model's performance and applicability in real-world scenarios.In conclusion, this wok highlights the potential of deep learning in leveraging image data for early cancer detection, ultimately contributing to improved patient outcomes and healthcare resource allocation.

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