IMAGE ENHANCEMENT FOR TUBERCULOSIS DETECTION USING DL

Guide:Prof.Sreerekha V.K

Submitted By,
Vineetha V
S4 MCA
Roll no:58
TVE20MCA-2058

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INTRODUCTION

- The latest WHO study on 2018 is showing that about 1.5 million people died and around 10 million people are infected with tuberculosis (TB) each year.
- Recently, DL techniques are applied to CXR images to detect and classify tuberculosis.
- DL requires a large number of high-quality training samples to yield better performance.
- The CNN model further improves and then classify the images.

LITERATURE REVIEW

1. **Comparative Study for Tuberculosis Detection by Using Deep Learning**
   - Authors: Busra Kubra Karaca, Selda Guney, Berna Dengiz and Muhtesem Agildere.
   - Publisher: IEEE,2021

- CAD system is used for TB detection process and SVM classifier is used for image classification.
- Dataset: Montgomery.
- VGG16,VGG19,DenseNet121,MobileNet are used to extract the features of CXR images.
- Compare the effect of data augmentation ,all analysis are performed with/without augmentation.
- An augmented process can achieve maximum accuracy than an unaugmented process.
- Accuracy:80.4%, 98.9%

2. **Reliable Tuberculosis Detection using Chest X-ray with Deep Learning, Segmentation and Visualization**
   - Authors:Tawsifur Rahman1 , Amith Khandakar , Muhammad Abdul Kadir1 , Khandaker R. Islam
   - Publisher:IEEE,2020

- Dataset: Kaggle lung x-ray & masks dataset
- In first method, CXR images were segmented using u-net and modified u-net model. Then it is classified into tuberculosis and non-tuberculosis using DenseNet model.
- Secondly, Images are classified using the ChexNet model without segmentation.
- A segmented process can achieve maximum accuracy than an unsegmented process.
- Accuracy: 96.88%, 97.07%
- Performance metrics: Precision, Sensitivity, F1-score, Accuracy, Specificity .

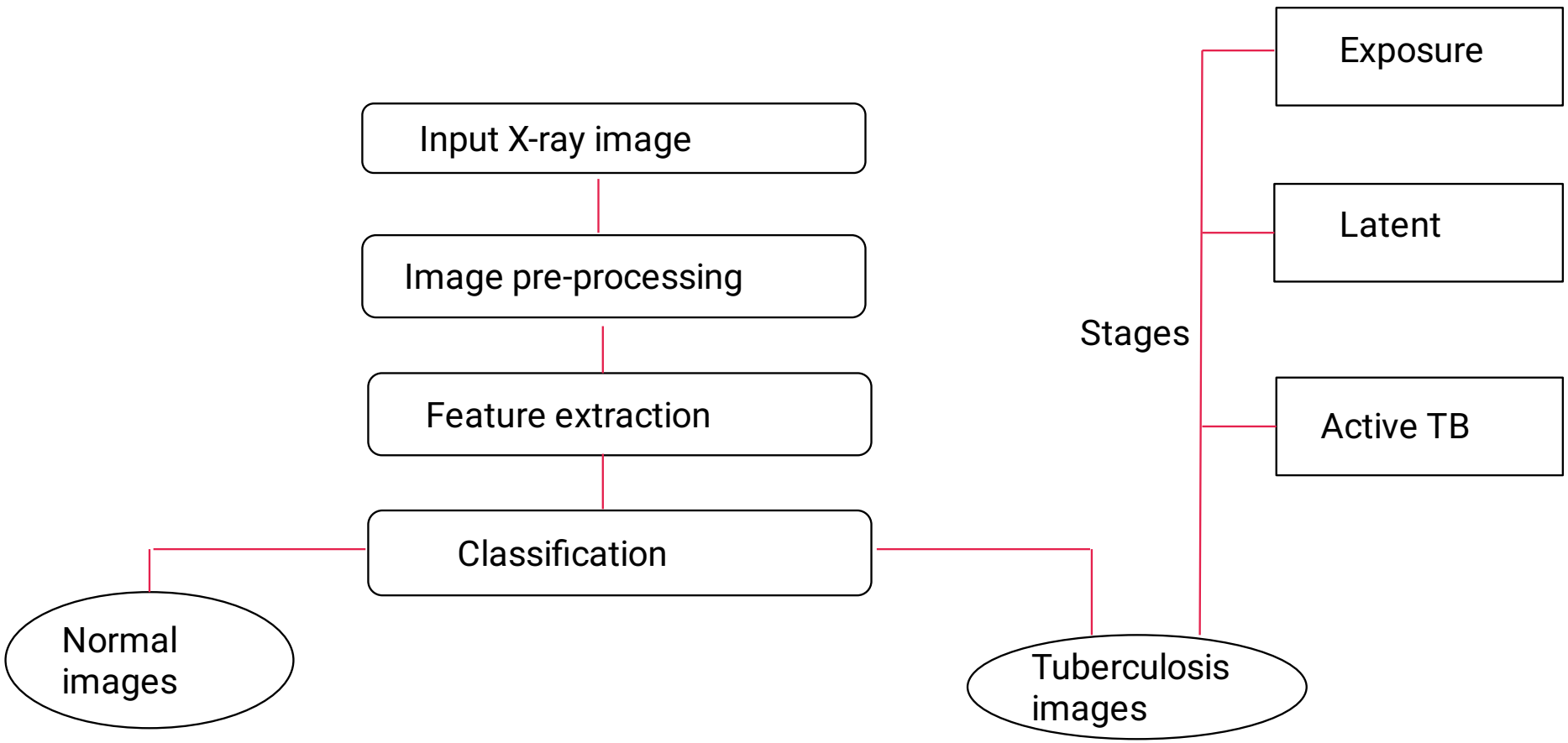
EXISTING SYSTEM

- Present system automatically detect Tuberculosis either as a tuber or no- tuber from the input images.
- In preprocess stage increase the quality of image by using DL techniques with two algorithm such as UM (unsharp masking) and HEF (High frequency Emphasis filtering).
- EfficientNet-B4, ResNet-50 and ResNet-18 in order to train the TB images and improve the detection accuracy.
- All the results are obtained using Shenzhen dataset.

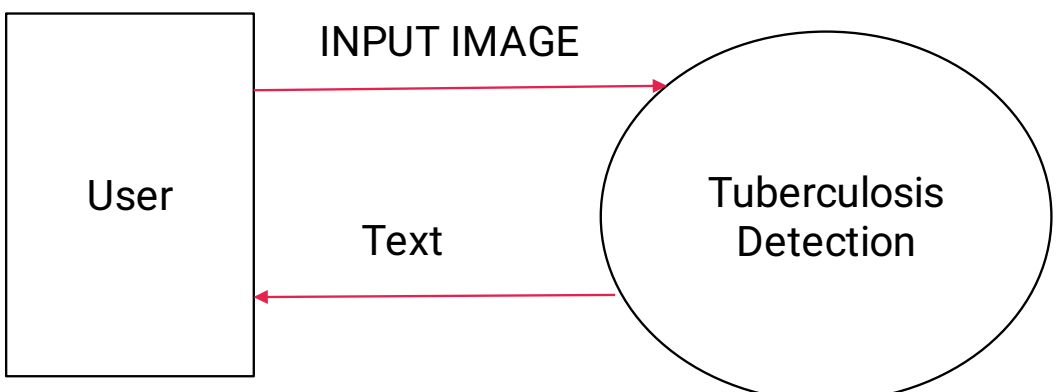
PROPOSED SYSTEM

- Inception V3 model is used for extract features and efficient classification of CXR images.
- The binary classification which results normal images and tuberculosis images.
- Tuberculosis images have 3 stages. They are exposure, latent and active disease.
- The three stages provide a suggestions.
- In exposure stage suggest short-term hospitalization.
- For latent TB: 6 to 12 month course of antibiotic called isoniazid will be given to kill off the TB organisms in the body.
- For active TB: Takes 3 or more antibiotics in combination for 6 to 9 months. Eg: isoniazid, rifampin, pyrazinamide, and ethambutol.

FLOW OF THE SYSTEM



DATA FLOW DIAGRAM



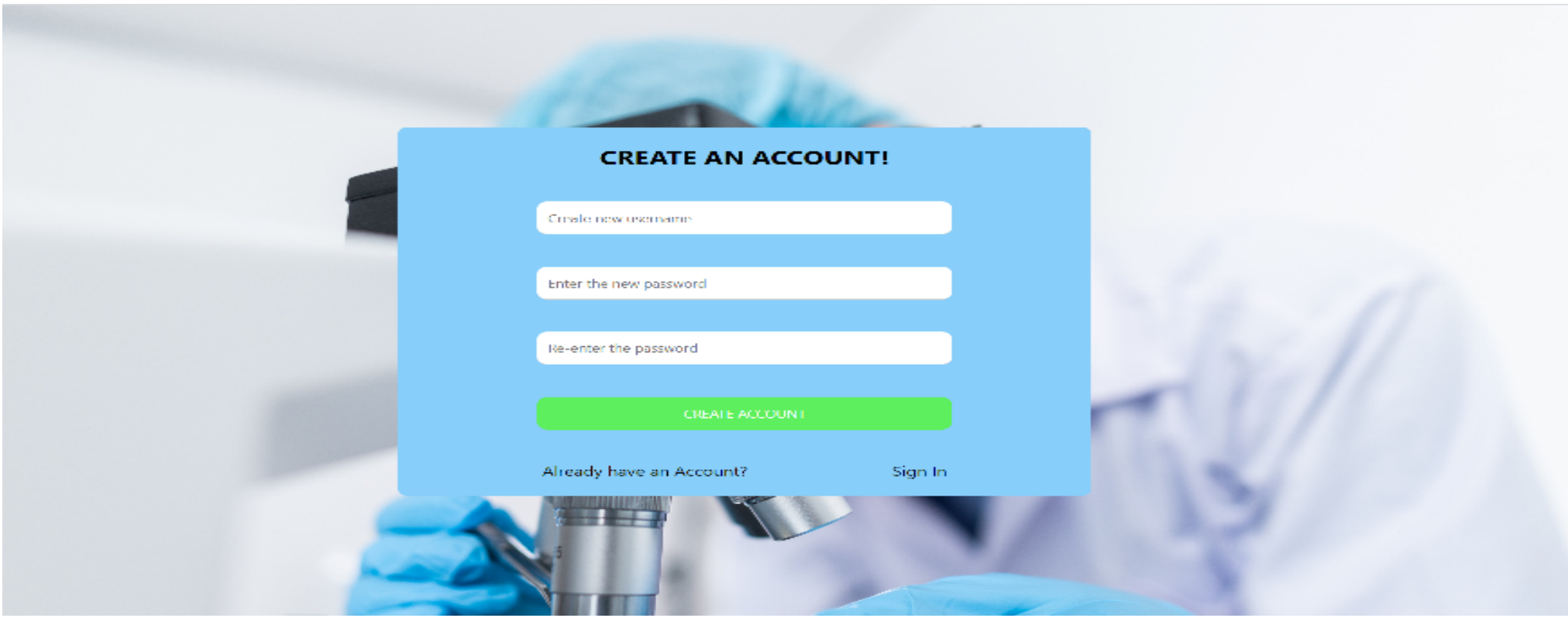
TECHNOLOGIES USED

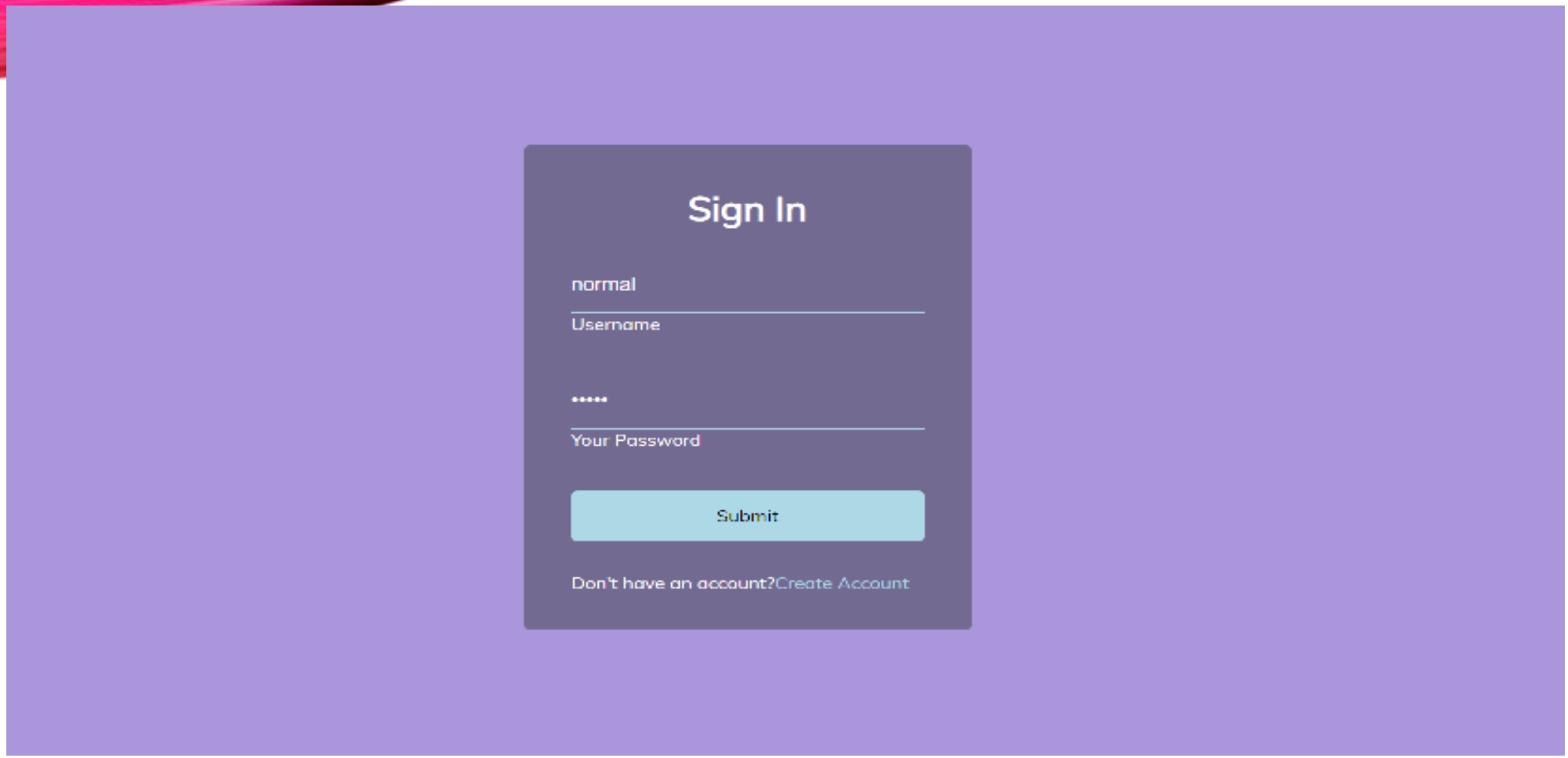
- Language: Python
- IDE: Visual Studio Code
- Front end: Python flask
- Backend: Google colab

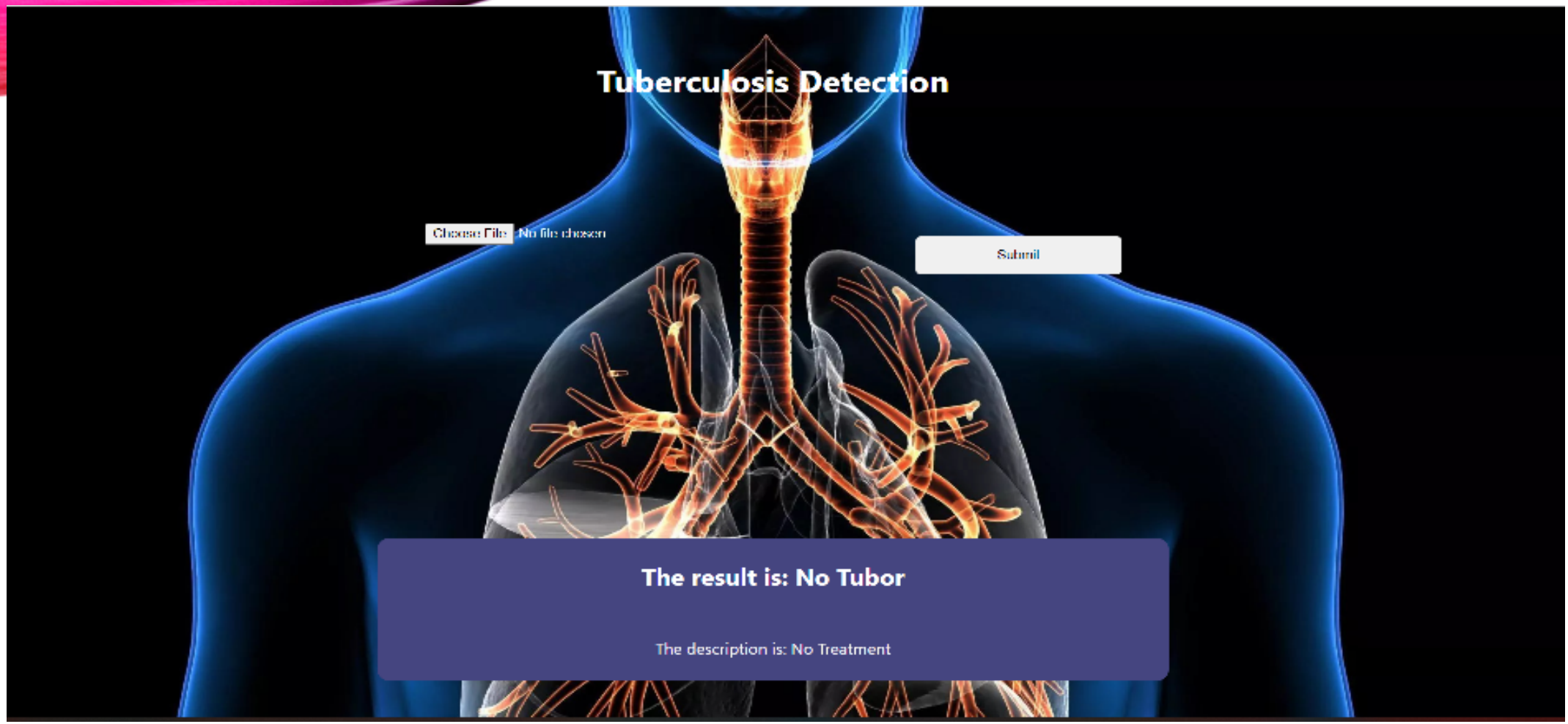
WORKING

- The system is in the form of a website.
- In user interface people can create account for the first time use and if once created , do login using username and password.
- This data is stored in database.
- In the next page upload CXR image and the system will predict whether tuberculosis is present or not, then provide a solution.

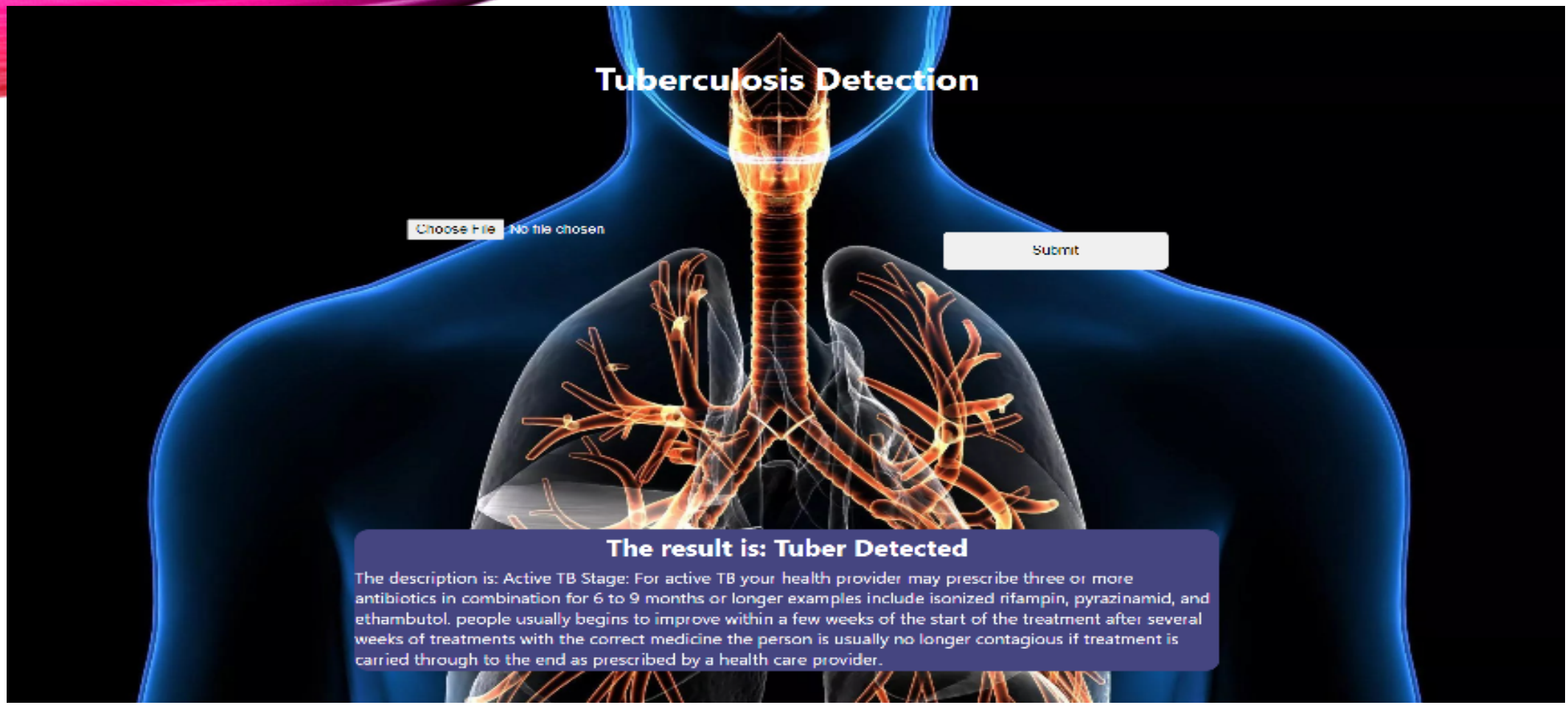
Implementation




Sign In
normal
Username
•••••
Your Password
Submit
Don't have an account?Create Account


Tuberculosis Detection
Choose File
No file chosen
Submit
The result is: No Tubor
The description is: No Treatment


Tuberculosis Detection
The result is: Tuber Detected


Tuberculosis Detection
Choose File
No file chosen
Submit
The result is: Tuber Detected
The description is: Active TB Stage: For active TB your health provider may prescribe three or more antibiotics in combination for 6 to 9 months or longer examples include isonized rifampin, pyrazinamid, and ethambutol. people usually begins to improve within a few weeks of the start of the treatment after several weeks of treatments with the correct medicine the person is usually no longer contagious if treatment is carried through to the end as prescribed by a health care provider.

RESULT

- In existing system Resent and EfficientNet models is used for classifying images.
  Accuracy: 94.8%

- Using InceptionV3 model for image classification process.
  Accuracy:99.76%.

- In this detection process avoid complicated preprocessing and directly performs end-to-end diagnosis.

CONCLUSION

- Now a days, public awareness about Tuberculosis has been improved.
- So earlier diagnosis and prognosis help to receive better treatment and thus can increase the survival rate of the patients.
- There are many innovative research directions that this method can offer.

FUTURE WORK

- Future works will evaluate more images enhancement techniques in order to show a more significant effect of enhancement on DL models.
- A comprehensive subjective judgment and preference from the medical expert will also be analyzed.
- Tuberculosis will bring more stages to the images. It will help with subsequent treatment.

PAPER PUBLICATION

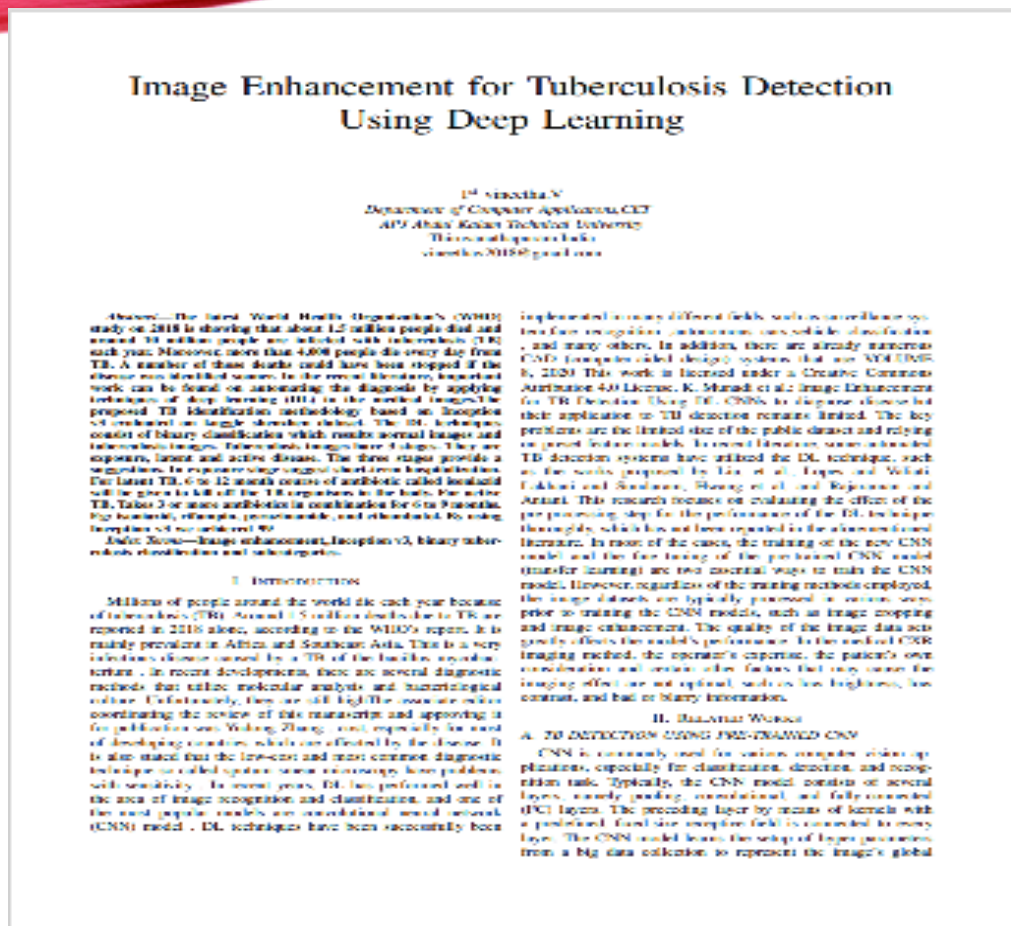


Image Enhancement for Tuberculosis Detection Using Deep Learning

1st vineetha V
Department of Computer Applications, CET
APJ Abdul Kalam Technical University
Thiruvananthapuram, India
vineetha2018@gmail.com

Abstract—The latest World Health Organization's (WHO) study on 2018 is showing that about 1.5 million people died and around 10 million people are infected with tuberculosis (TB) each year. Moreover, more than 4,000 people die every day from TB. A number of these deaths could have been stopped if the disease was identified sooner. In the recent literature, important work can be found on automating the diagnosis by applying techniques of deep learning (DL) to chest medical images. The proposed TB identification methodology based on Inception v3 (enhanced as height shoulder chest). The DL techniques consist of binary classification which results normal images and tuberculosis images. Tuberculosis images have 4 stages. They are exposure, latent and active disease. The three stages provide a range of doses. In exposure stage, people show no bacteria doses. For latent TB, 6 to 12 month course of antibiotic called Isoniazid will be given to kill off the TB organisms in the body. For active TB, Takes 3 or more antibiotics in combination for 6 to 9 months. Eg: Isoniazid, rifampin, pyrazinamide, and ethambutol. By using Inception v3 we achieved 89

Index Terms—Image enhancement, Inception v3, binary tuberculosis classification and tuberculography.

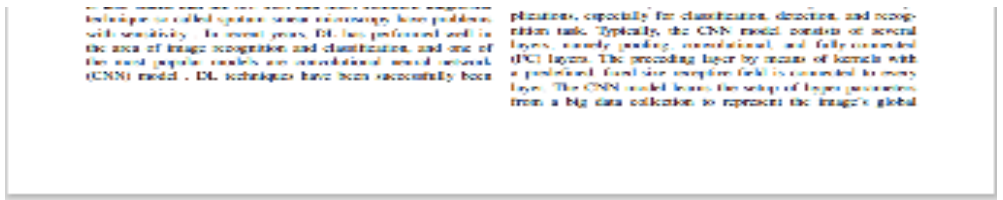
I. Introduction

Millions of people around the world die each year because of tuberculosis (TB). Around 1.5 million deaths due to TB are reported in 2018 alone, according to the WHO's report. It is mainly prevalent in Africa and Southeast Asia. This is a very infectious disease caused by a TB of the bacillus mycobacterium . In recent developments, there are several diagnostic methods that utilize molecular analysis and histopathological culture. Unfortunately, there are still high The researcher extends coordinating the review of this manuscript and supporting it for publication was Weiping Zhang. and especially for case of developing countries, which are affected by the disease. It is also stated that the low-cost and most common diagnostic technique is called sputum smear microscopy, have problems with sensitivity . In recent years, DL has performed well in the area of image recognition and classification, and one of the most popular models are convolutional neural network (CNN) model . DL techniques have been successfully been implemented in many different fields, such as surveillance systems, face recognition , pedestrian, cars vehicle classification , and many others. In addition, there are already numerous CAD (computer aided design) systems that are. 978 IMPS, b. 2020 This work is licensed under a Creative Commons Attribution 4.0 License. K. Munadi et al. Image Enhancement for TB Detection Using DL CNNs to diagnose disease led their application to TB detection remains limited. The key problems are the limited size of the public dataset and relying on pre-set feature models. In recent literature, some advanced TB detection systems have utilized the DL technique, such as the models proposed by Lin et al., Lopes and Valiati, Lakhani and Sundaram, Hwang et al. and Rajaraman and Antani. This research focuses on evaluating the effect of the pre-processing step for the performance of the DL technique thoroughly, which has not been reported in the aforementioned literature. In most of the cases, the training of the new CNN model and the fine tuning of the pre-trained CNN model (transfer learning) are two essential ways to train the CNN model. However, regardless of the training methods employed, the image datasets are typically processed in various ways prior to training the CNN models, such as image cropping and image enhancement. The quality of the image data can greatly affects the model's performance. In the medical CXR imaging method, the operator's expertise, the patient's own considerations and certain other factors that may cause the imaging effect are not optimal, such as low brightness, low contrast, and hazy or blurry information.

II. Related Works

A. TB DETECTION USING PRE-TRAINED CNN

CNN is commonly used for various computer vision applications, especially for classification, detection, and recognition task. Typically, the CNN model consists of several layers, namely pooling, convolutional, and fully connected (FC) layers. The preceding layer by means of kernels with a predefined fixed size complete field is connected to every layer. The CNN model learns the weight of layer parameters from a big data collection to represent the image's global



plications, especially for classification, detection, and recognition task. Typically, the CNN model consists of several layers, namely pooling, convolutional, and fully connected (FC) layers. The preceding layer by means of kernels with a predefined fixed size complete field is connected to every layer. The CNN model learns the weight of layer parameters from a big data collection to represent the image's global

or local characteristics. That model architecture has different layer types and activation functions to display better representational features than human engineered software. In recent literature pre-trained CNN (where as ImageNet-trained network is used) shows good performance in the medical domain. For efficiency purposes, the researchers used a model more than a million images, which also requires a large amount of memory and computation. This is a method called transfer learning. Transfer learning stores storing information gained from one domain and applying it to another, still similar domain. It usually takes a lot of time when training from scratch, as the random Gaussian distribution is utilized to initialize all model parameters. Typically, the convergence is achieved with a batch size of 32 images and after at least 40 epochs. Recent studies have shown that fine tuning of a more complex dataset results in excellent classification and detection performance using a pre-trained ImageNet dataset model. The reason for this training procedure is that CNN receives a general representation of natural images from pretraining. The model adjusts the parameters after the fine-tuning to show the specific features of the individual images, while retaining the ability to display the general image. This training strategy is explicitly implemented, coupled with a sampling of shuffles and cross-validation.

A. IMAGE ENHANCEMENT EFFECT FOR PRE-TRAINED CNN

Throughout this study, we evaluated the impact of image enhancement on a pre-trained CNN model. This influence has been studied in the literature in various fields. In, Tan et al. reported that using image enhancement functions with Laplace operators can improve the performance of fast R-CNN and R-CNN in the pedestrian detection task. They compared the enhanced image dataset, with the Laplace operator and the original image. The enhanced approach could increase the detection rate by 2models, respectively. The papers, presented used the transfer learning by fine tuning of the pre-trained R-CNN model. Xiang et al. proposed a night-time vehicle detection approach that has three key technologies: night-time image enhancement, focused on ROI extraction and expanding light detection for the vehicle. In China provided a comprehensive evaluation of image enhancement on RGB and grayed CXR images. In addition, the recent detection of retinal blood vessels via deep learning and image enhancement is discussed in a recent paper by Soomro, et al. While several works have been proposed, none of the work thoroughly investigates the effect of image enhancement through pre-

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THANK YOU