Pneumonia Prediction Using X-RAY Images

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Introduction

Pneumonia is an inflammatory condition of the lung primarily affecting the small air sacs known as alveoli.Symptoms typically include some combination of productive or dry cough, chest pain, fever and difficulty breathing.The severity of the condition is variable.Pneumonia is usually caused by infection with viruses or bacteria, and less commonly by other microorganisms.Identifying the responsible pathogen can be difficult.This is where we introduce deep learning to see if we can solve the problem.

Overview

We use the help of deep learning to train a model that can predict whether a given xray has pneumonia or not. For this problem we use one of the state of the art deep learning algorithms called Convolutional neural networks. After that we deploy the model using flask on a website. Where people can upload images and the model will predict whether the person is sick or not.

Purpose

The purpose of this project is to help decrease misdiagnosis of a scan. With the help of machine learning and deep learning we can add another layer to security to make sure no one is mis diagnosed. This will also help doctors to make more confident diagnosis.

Literature Survey

Existing Problem

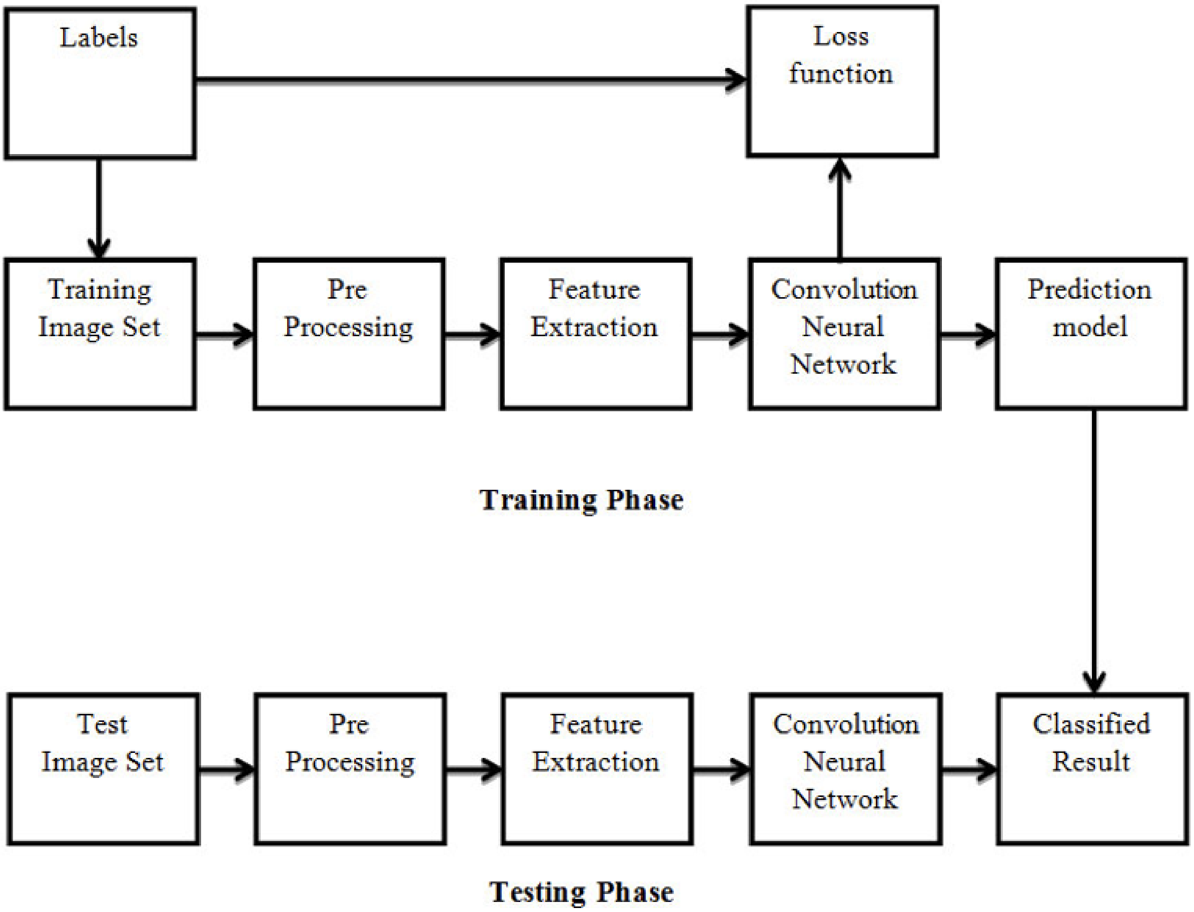
Each year, approximately 1.6 million children die from pneumonia [1]. The Pneumonia Etiology Research for Child Health (PERCH) study is the largest multisite study of childhood pneumonia since the Board of Science and Technology for International Development (BOSTID) studies were done in the 1980s [2]. The goal of PERCH is to identify the expected etiologies of pneumonia in 2015, a time when the burden of the major causes of bacterial pneumonia in the developing world, Streptococcus pneumoniae and Haemophilus influenzae type b (Hib), will likely be significantly reduced by widespread introduction and use of conjugate vaccines.

Proposed Solution

The proposed solution is to build a convolutional neural network which is trained with a dataset of chest x rays to get the most optimum output. The convolutional neural network is a great neural network for the classification of images. With the Convolutional layers it is possible to build a model with very high accuracy. Since the accuracy is very high the model is very reliable in terms of prediction of the result. The solution will be a huge game changer for both the patient and the doctor. The patient won't necessarily have to pay high free to a ger a diagnosis from a doctor. And the doctor can always help with the machine learning model to make sure that the diagnosis is correct.

Theoretical Analysis

Block Diagram



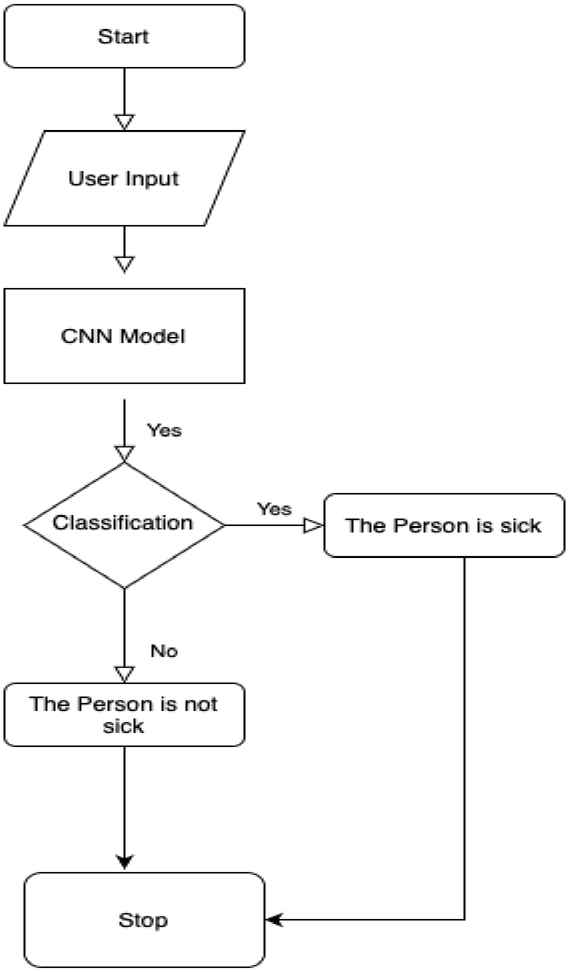
Hardware And Software Designing

Since we are building a web application it is not highly reliant on hardware. As long as the person has some sort of computer which can be either a PC or a smartphone. The only requirement is the it can access a browser and have the internet. But the prediction does require a chest x-ray. Since an x ray machine is not for the typical consumer they are advised to go to the nearest hospital for getting the x ray

Experimental Investigation

The dataset is organized into 3 folders (train, test, val) and contains subfolders for each image category (Pneumonia/Normal). There are 5,863 X-Ray images (JPEG) and 2 categories (Pneumonia/Normal). Chest X-ray images (anterior-posterior) were selected from retrospective cohorts of pediatric patients of one to five years old from Guangzhou Women and Children's Medical Center, Guangzhou. All chest X-ray imaging was performed as part of patients' routine clinical care. For the analysis of chest x-ray images, all chest radiographs were initially screened for quality control by removing all low quality or unreadable scans. The diagnoses for the images were then graded by two expert physicians before being cleared for training the AI system. In order to account for any grading errors, the evaluation set was also checked by a third expert.

Flowchart


Start
User Input
CNN Model
Yes
Classification
Yes
The Person is sick
No
The Person is not sick
Stop

Result

The Trained Model was able to get an accuracy of 84%.

Advantages & Disadvantages

- Great help for patients but they do need to get a chest xray which can be expensive.
- The doctors might have less job to do
- Internet is required to use the service
- Not very reliable because only 84% accuracy.
- Not completely independent of hospitals

Application

This can be used by both doctors and patients as a web applications

Conclusion

From this we can conclude that we cant be completely reliant on machine learning models as of now. There is still a lot of room for improvement. But the future looks bright considering the fact that the revolution of artificial intelligence has just begun. In just a few years we will get better algorithms to make more accurate predictions. The machine learning model can get very high accuracy but that might be because it may be biased or be over fitted.

Future Scope

The Future scope of artificial intelligence in medicine is very high. Let it be genetic mutation or cancer detection , machine learning will have an impact on everything in the future.

Bibliography

https://www.kaggle.com

https://stackoverflow.com

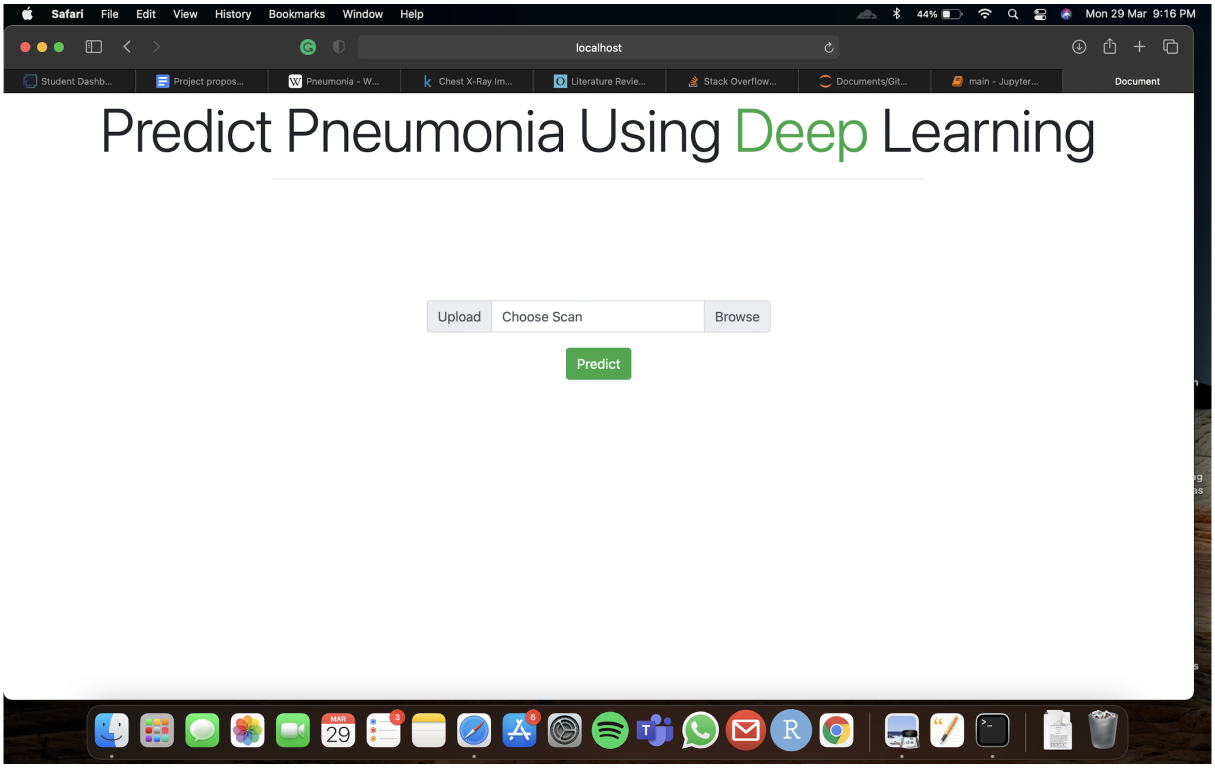
Appendix

Source Code:-

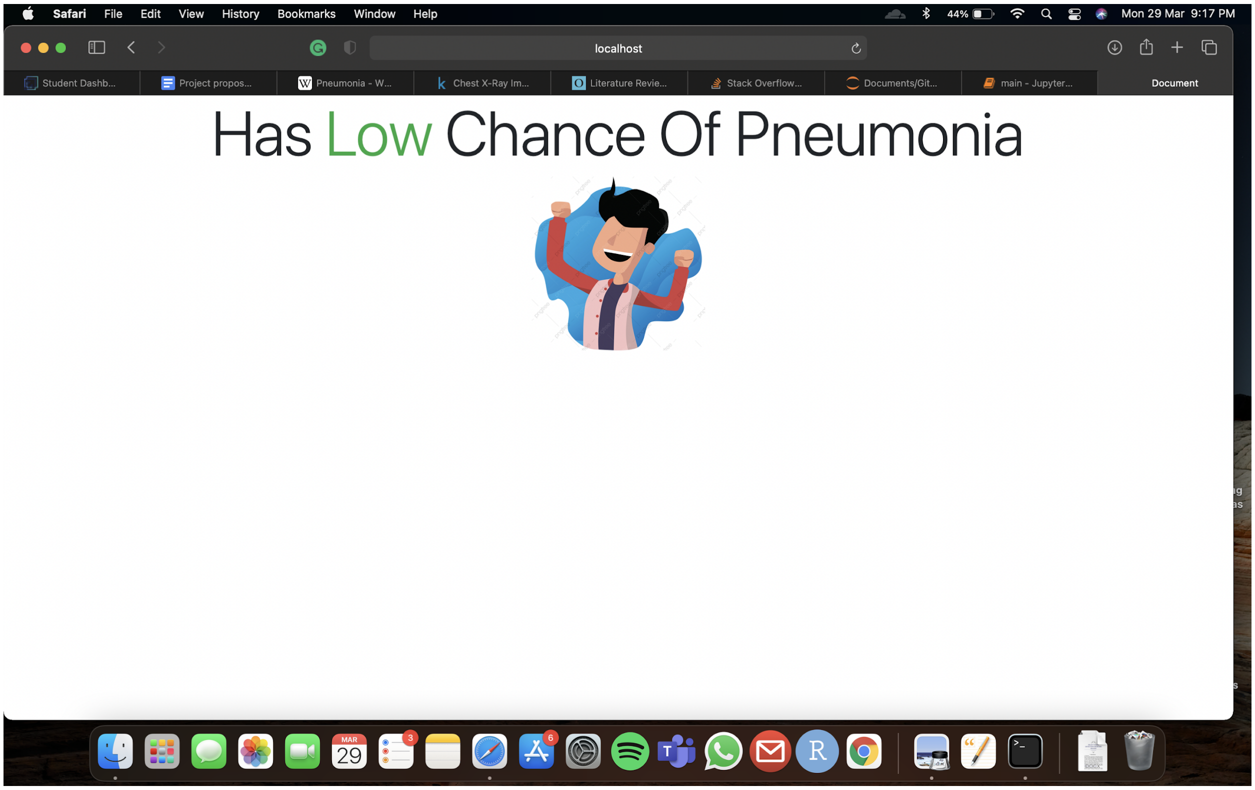
```
from werkzeug.wrappers import Request, Response

from flask import *

import tensorflow as tf

from tensorflow.keras.models import load_model
```

```
import numpy as np
from tensorflow.keras.preprocessing import image
app.secret_key='some'
model = load_model('mymodel.h5')

app = Flask(__name__)

@app.route("/")
def hello():
    return render_template('index.html')
@app.route('/success', methods = ['POST'])
def success():
    if request.method == 'POST':
        f = request.files['file']
        f.save(f.filename)
        test_image = image.load_img(f.filename, target_size=(64,64))
        test_image = image.img_to_array(test_image)
        test_image = np.expand_dims(test_image,axis=0)
        result = model.predict(test_image)
        if (result[0][0]>.5):
            va= 1
        else:
            va = 0
        return render_template("success.html", val = va)
if __name__ == '__main__':
    from werkzeug.serving import run_simple
    run_simple('localhost', 9000, app)
```

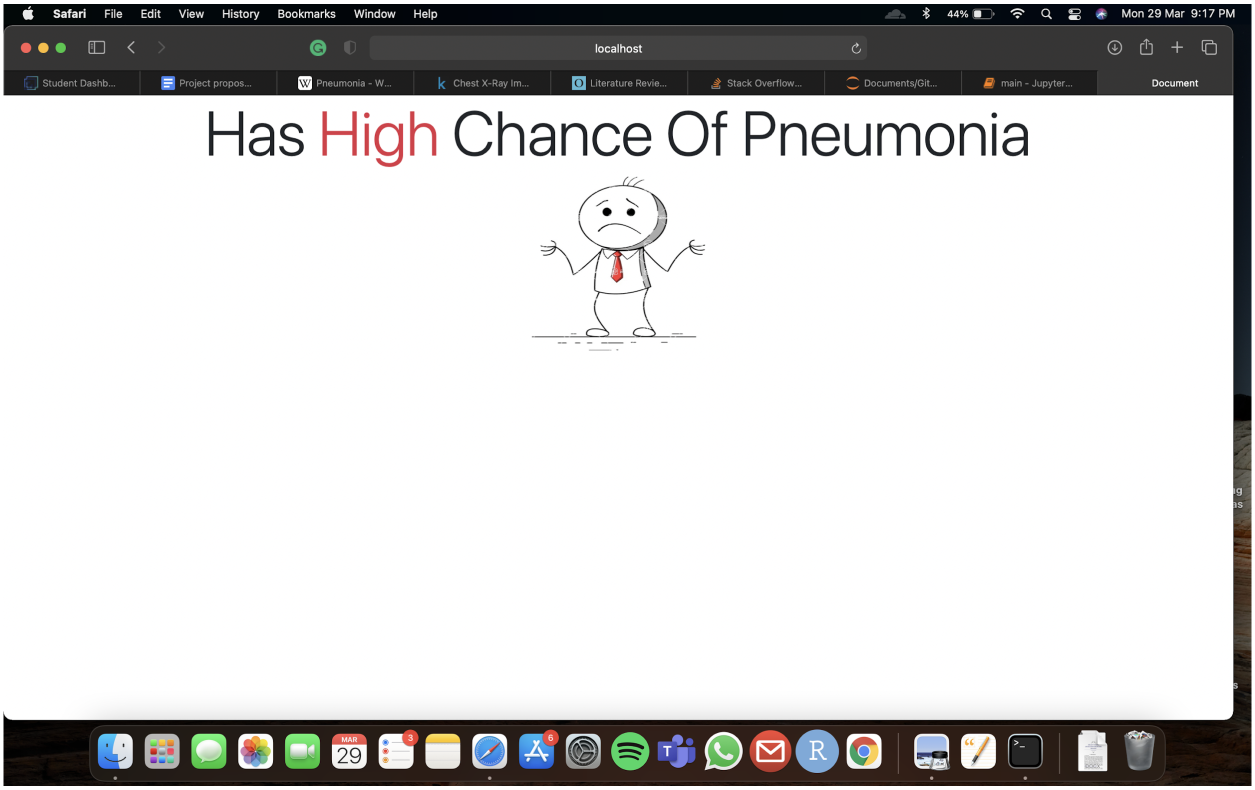
User Interface:-



Predict Pneumonia Using Deep Learning



Has Low Chance Of Pneumonia



Has High Chance Of Pneumonia