Pneumonia Detection Using Chest X-Ray with Deep Learning Project Setup

1. **Hardware Requirements:**
   - Memory -4.0 GB
   - Processor Type -64 bit PROCESSOR
   - Operating system -windows 8/windows 10
2. **Software Requirements:**

Keras

Jupyter NoteBook

TensorFlow

Numpy

Pandas

OpenCV

Pickle

Tkinter

3. **Dataset:**
   - Download the dataset from Kaggle
4. **Execution:**
   - Move to project directory using change directory command.
     For Example: C:\Users\ELCOT\Desktop>cd pneumonia_detection
   - Now run the command **jupyter notebook <notebook name>**in command prompt.

     For Example: C:\Users\ELCOT\Desktop\pneumonia_detection>jupyter notebook Pneumonia_Detection_project.ipynb
5. **Program Code:**

LIBRARY FILES

```
import tensorflow as tf
import numpy as np
import os
import sys
import cv2
```

```
import matplotlib.pyplot as plt
import pickle
import random
import pandas as pd

import tensorflow as tf
from tensorflow.keras import Sequential
from tensorflow.keras.layers import Dense,Dropout,Activation,
Flatten,Conv2D,MaxPooling2D
import pickle

from sklearn.model_selection import train_test_split

import matplotlib.pyplot as plt
%matplotlib inline
```
PREPROCESSING
```
class MasterImage(object):

    def __init__(self,PATH='', IMAGE_SIZE = 50, CATEGORIES=[]):
        self.PATH = PATH
        self.IMAGE_SIZE = IMAGE_SIZE
        self.CATEGORIES = CATEGORIES
        self.image_data = []
        self.x_data = []
        self.y_data = []

    def Process_Image(self):

        """
        Return Numpy array of image
        :return: X_Data, Y_Data
        """

        for categories in self.CATEGORIES:                                  # Iterate
over categories

            train_folder_path = os.path.join(self.PATH, categories)                 #
Folder Path
            class_index = self.CATEGORIES.index(categories)                     # this
will get index for classification

            for img in os.listdir(train_folder_path):                           # This will
iterate in the Folder
                new_path = os.path.join(train_folder_path, img)                     # image
Path

                try:        # if any image is corrupted
```

```
                image_data_temp =
cv2.imread(new_path,cv2.IMREAD_GRAYSCALE)              # Read Image as
numbers
                image_temp_resize =
cv2.resize(image_data_temp,(self.IMAGE_SIZE,self.IMAGE_SIZE))
                self.image_data.append([image_temp_resize,class_index])
            except:
                pass

        data = np.asanyarray(self.image_data)

        # Iterate over the Data
        for x in data:
            self.x_data.append(x[0])       # Get the X_Data
            self.y_data.append(x[1])       # get the label

        X_Data = np.asarray(self.x_data) / (255.0)      # Normalize Data
        Y_Data = np.asarray(self.y_data)

        return X_Data,Y_Data

    def pickle_image(self):

        """
        :return: None Creates a Pickle Object of DataSet
        """

        X_Data,Y_Data = self.Process_Image()

        pickle_out = open('X_Data','wb')
        pickle.dump(X_Data, pickle_out)
        pickle_out.close()

        pickle_out = open('Y_Data', 'wb')
        pickle.dump(Y_Data, pickle_out)
        pickle_out.close()

        print("Pickled Image Successfully ")

        return X_Data,Y_Data

    def load_dataset(self):

        try:
            X_Temp = open('X_Data','rb')
            X_Data = pickle.load(X_Temp)

            Y_Temp = open('Y_Data','rb')
            Y_Data = pickle.load(Y_Temp)
```

```
            print('Reading Dataset from PIckle Object')

            return X_Data,Y_Data

        except:
            print('Could not Found Pickle File ')
            print('Loading File and Dataset  .....')
            X_Data,Y_Data = self.pickle_image()
            return X_Data,Y_Data
a=MasterImage(PATH='/Users/ELCOT/Desktop/prjct/chest_xray/chest_xray/train',
                    IMAGE_SIZE=80,
                    CATEGORIES=['NORMAL','PNEUMONIA'])
X_Data,Y_Data = a.load_dataset()
X_Data = X_Data.reshape(-1,80,80,1)
print(X_Data.shape)
```

SPLITTING THE TRAINING AND TESTING DATA

```
X_Train, X_Test, Y_Train, Y_Test = train_test_split(X_Data, Y_Data,
test_size=0.3,random_state=101)
```

TRAINING THE MODEL

```
model = Sequential()
model.add(Conv2D(200, (3, 3), input_shape=X_Data.shape[1:]))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Conv2D(100, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())
model.add(Dense(80))
model.add(Dense(1))
model.add(Activation('sigmoid'))
model.compile(loss='binary_crossentropy',
            optimizer='adam',
            metrics=['accuracy'])
model.fit(X_Data, Y_Data, batch_size=40, epochs=5, validation_split=0.3)
model.save('model.h5')
```

EVALUATING THE MODEL

```
model.evaluate(X_Test,Y_Test,batch_size=40)
```

LOADING THE MODEL

```
model = tf.keras.models.load_model('model.h5')
```

USER INTERFACE

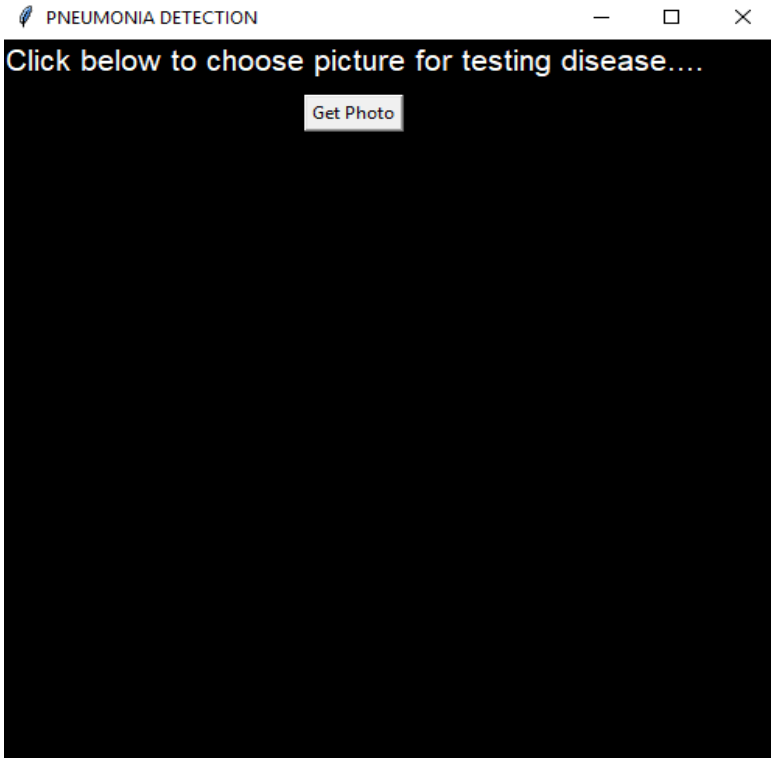
```
import tkinter as tk
from tkinter.filedialog import askopenfilename
import shutil
import os
import sys
from PIL import Image, ImageTk

window = tk.Tk()
```

```
window.title("PNEUMONIA DETECTION")

window.geometry("500x510")
window.configure(background ="black")

title = tk.Label(text="Click below to choose picture for testing disease....",
background = "black", fg="white", font=("", 15))
title.grid()
def exit():
   window1.destroy()

def prepare(filepath):
   training_date = []

   img_array = cv2.imread(filepath,cv2.IMREAD_GRAYSCALE)
   new_array = cv2.resize(img_array,(80,80))
   new_image =  new_array.reshape(-1,80,80,1)
   return new_image

def analysis():

   #model = tf.keras.models.load_model('model.h5')
   test = model.predict([prepare(filepath=filepath)])
   CATEGORIES=['NORMAL','PNEUMONIA']
   print(CATEGORIES[int(test[0][0])])
      #model_out = model.predict([data])[0]
   message = tk.Label(text='Status: '+CATEGORIES[int(test[0][0])],
background="black",
                      fg="white", font=("", 15))
   message.grid(column=0, row=3, padx=10, pady=10)
   button = tk.Button(text="Exit", command=exit)
   button.grid(column=0, row=9, padx=20, pady=20)

def openphoto():
   global filepath
   global window1
   window.destroy()
   window1 = tk.Tk()

   window1.title("PNEUMONIA DTECTION")

   window1.geometry("500x520")
   window1.configure(background="black")

   # C:/Users/sagpa/Downloads/images is the location of the image which you want
to test..... you can change it according to the image location you have
```

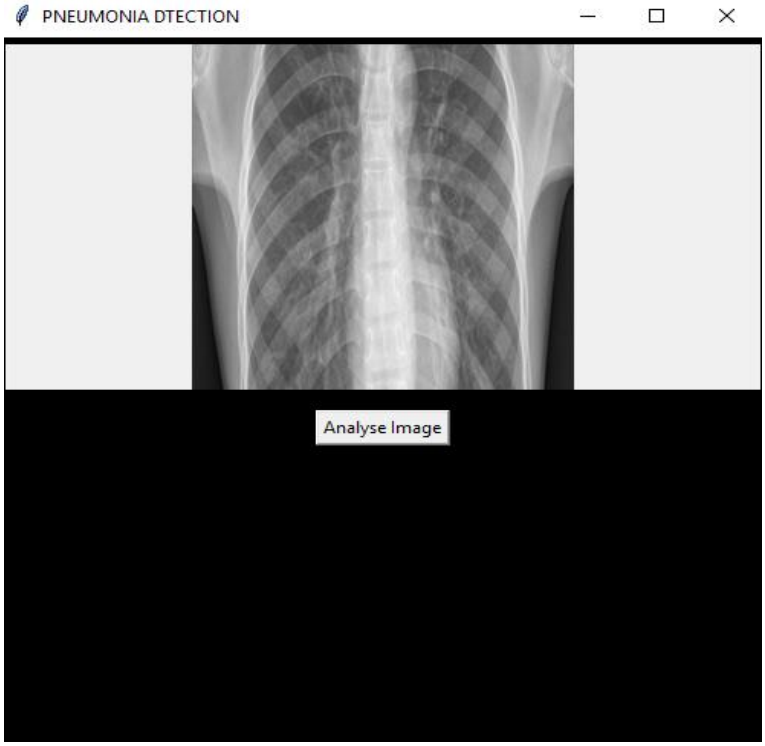
```
    filepath =
askopenfilename(initialdir='C:/Users/ELCOT/Desktop/prjct/chest_xray', title='Select
image for analysis ',
                        filetypes=[('image files', '.jpeg')])
    load = Image.open(filepath)
    load= load.resize((250,490),Image.ANTIALIAS)
    render = ImageTk.PhotoImage(load)
    img = tk.Label(image=render, height="250", width="490")
    img.image = render
    img.place(x=0, y=0)
    img.grid(column=0, row=0, padx=5, pady = 5)
    button2 = tk.Button(text="Analyse Image", command=analysis)
    button2.grid(column=0, row=2, padx=10, pady = 10)
    window1.mainloop()
button1 = tk.Button(text="Get Photo", command = openphoto)
button1.grid(column=0, row=1, padx=10, pady = 10)
window.mainloop()
```

6. **Result:**

- **Home Page**



- **Output For Normal CXR:**



- **Output For Pneumonia CXR**