Pneumonia Detection

1.Introduction :

1.1 Overview :

Pneumonia is an inflammatory condition of the lung affecting primarily the small air sacs known as alveoli.Symptoms typically include some combination of productive or dry cough, chest pain, fever and difficulty breathing.The risk of pneumonia is immense for many, especially in developing nations where billions face energy poverty and rely on polluting forms of energy. The WHO estimates that over 4 million premature deaths occur annually from household air pollution-related diseases including pneumonia.

1.2 Purpose :

The main aim of the project is to build an algorithm to automatically identify whether a patient is suffering from pneumonia or not by detecting the chest X-ray images. The algorithm had to be extremely accurate because lives of people is at stake.

2. Literature Survey :

2.1 Existing Problem :

Main Symptos of Pneumonia – cough or difficult breathing

The major problem is that the detection of pneumonia is time taking process where several tests like blood tests,Pulse oximetry,sputum test are conducted to detect whether the patient is suffering from pneumoia or not,by doing the tests helps your doctor diagnose pneumonia and determine the extent and location of the infection Detecting pnuemonia by conducting all the tests and finalizing by doctor whether the patient is suffering from pneumonia are very lengthy and time taking process.

2.2 Proposed Solution :

We have proposed a solution by using the Artifical Intelligence where we have used the convolution neural networks (CNN),a image processing tecnique for detecting the chest x-ray images and we have trained our machine with the chest x-ray scans of normal patient and patient suffering from pneuomia and using this solution by giving the image of chest x-ray to the machine it can predict the disease.By using this solution we can be able to detect the disease within a minutes so that the patient can take several measures for curing the disease.

3.Result :

Problem:

Patients suffering from Pneumonia goes to the hospital to take an X-ray image waits for the doctor and then the doctor will check the X-ray then he decides whether the person has pneumonia or not. The results are not only concluded based on just seeing X-ray images but furthermore,tests were conducted on the the patient to verify the results of the doctor. The process is time consuming and if the patient has severe pneumonia or not he has to wait several days for the results. But in recent developments of the artificial intelligence and the computational powers of the computers have increased it helps in predicting pneumonia by just passing the X-ray image as an input to our model.

Solution:

The main objective is not only to help the doctors to predict the pneumonia disease more accurately using a deep learning model. The objective is not only to help the doctors but also to the patients to verify whether they have pneumonia or not. By using this model we can precisely predict pneumonia. A convolutional neural network model is built from scratch to extract features from a given chest X-ray image and classify it to determine if a person is infected with pneumonia. A web is built where the user can upload the X-ray image and the result is shown.

4.Advantages and Disadvantages

Advantages :

1. remove noises.
2. Correct image density and contrast.
3. Helps to easily store and retrieve in computers
4. Image can be made available in any desired formats like black and white, negative image
5. Easy to use and accurate prediction.
6. It is time saving process

Disadvantages :

1. initial cost is high depending upon the system used.
2. once the system is damaged tha image will be lost.

5.Applications :

1.Computerized photography(e.g., Photoshop)

2.Space image processing (e.g., Hubble space telescope images, interplanetary probe images)

3.Medical/Biological image processing (e.g., interpretation of X-ray images, blood/cellular microscope images)

4.Automatic character recognition (zip code, license plate recognition)

5.Finger print/face/iris recognition

6.Remote sensing: aerial and satellite image interpretations

7.Reconnaissance

8.Industrial applications

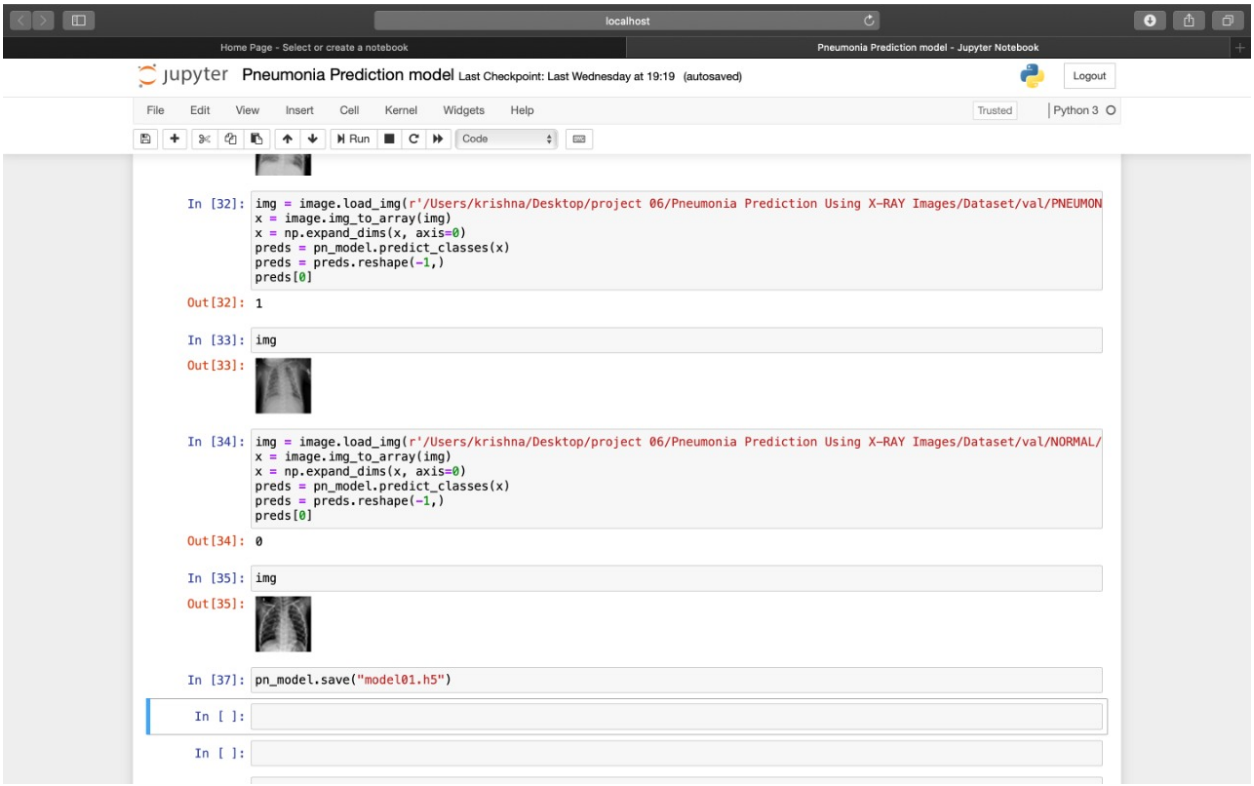
6.Conclusion :

Although this project is far from complete but it is remarkable to see the success of deep learning in such varied real world problems. we have demonstrated how to classify positive and negative pneumonia data from a collection of X-ray images. The model was made from scratch, which separates it from other methods that rely heavily on transfer learning approach.

7.Future Scope :

In the future this work could be extended to detect and classify X-ray images consisting of lung cancer and pneumonia. Distinguishing X-ray images that contain lung cancer and pneumonia has been a big issue in recent times, and our next approach should be to tackle this problem.

SCREENSHOTS OF OUR NOTEBOOKS



Training and Testing the Model

In [*]:
```
pn_model.fit_generator(x_train, steps_per_epoch=163, epochs=35, validation_data=x_test, validation_steps=40)
```

```
WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:986: The name tf.assign_add is deprecated. Please use tf.compat.v1.assign_add instead.

Epoch 1/35
163/163 [==============================] - 90s 553ms/step - loss: 0.5890 - acc: 0.7395 - val_loss: 0.6470 - val_acc
: 0.6250
Epoch 2/35
163/163 [==============================] - 100s 611ms/step - loss: 0.4269 - acc: 0.7759 - val_loss: 0.4373 - val_ac
c: 0.8413
Epoch 3/35
163/163 [==============================] - 89s 548ms/step - loss: 0.3249 - acc: 0.8677 - val_loss: 0.4302 - val_acc
: 0.7917
Epoch 4/35
163/163 [==============================] - 90s 549ms/step - loss: 0.3077 - acc: 0.8786 - val_loss: 0.3897 - val_acc
: 0.8349
Epoch 5/35
163/163 [==============================] - 89s 545ms/step - loss: 0.2720 - acc: 0.8842 - val_loss: 0.5215 - val_acc
: 0.7708
Epoch 6/35
163/163 [==============================] - 88s 542ms/step - loss: 0.2708 - acc: 0.8913 - val_loss: 0.3844 - val_acc
: 0.8365
Epoch 7/35
163/163 [==============================] - 88s 542ms/step - loss: 0.2644 - acc: 0.8938 - val_loss: 0.3386 - val_acc
: 0.8429
Epoch 8/35
163/163 [==============================] - 94s 577ms/step - loss: 0.2359 - acc: 0.8972 - val_loss: 0.4210 - val_acc
: 0.8157
Epoch 9/35
 53/163 [========>.....................] - ETA: 48s - loss: 0.3580 - acc: 0.8414
```

In [10]:
```
pn_model.add(Flatten())
```

In [11]:
```
pn_model.add(Dense(units = 30, init='uniform', activation='relu'))
```

```
/Users/krishna/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:1: UserWarning: Update your `Dense`
call to the Keras 2 API: `Dense(units=30, activation="relu", kernel_initializer="uniform")`
  """Entry point for launching an IPython kernel.
```

In [12]:
```
pn_model.add(Dense(units = 10, init='uniform', activation='relu'))
```

```
/Users/krishna/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:1: UserWarning: Update your `Dense`
call to the Keras 2 API: `Dense(units=10, activation="relu", kernel_initializer="uniform")`
  """Entry point for launching an IPython kernel.
```

In [13]:
```
pn_model.add(Dense(units = 20, init='uniform', activation='relu'))
```

```
/Users/krishna/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:1: UserWarning: Update your `Dense`
call to the Keras 2 API: `Dense(units=20, activation="relu", kernel_initializer="uniform")`
  """Entry point for launching an IPython kernel.
```

In [14]:
```
pn_model.add(Dense(units = 1, init='uniform', activation='sigmoid'))
```

```
/Users/krishna/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:1: UserWarning: Update your `Dense`
call to the Keras 2 API: `Dense(units=1, activation="sigmoid", kernel_initializer="uniform")`
  """Entry point for launching an IPython kernel.
```

In [15]:
```
pn_model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
```

```
WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/optimizers.py:790: The name
tf.train.Optimizer is deprecated. Please use tf.compat.v1.train.Optimizer instead.

WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:3376: The name tf.log is deprecated. Please use tf.math.log instead.

WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/tensorflow/python/ops/nn_impl.py:1
80: add_dispatch_support.<locals>.wrapper (from tensorflow.python.ops.array_ops) is deprecated and will be removed
in a future version.
Instructions for updating:
Use tf.where in 2.0, which has the same broadcast rule as np.where
```

localhost

Home Page - Select or create a notebook | Pneumonia Prediction model - Jupyter Notebook

jupyter **Pneumonia Prediction model** Last Checkpoint: Last Wednesday at 19:19 (autosaved)

Logout

File Edit View Insert Cell Kernel Widgets Help | Trusted | Python 3

Run | Code

Out[20]:

In [21]:
```
x.shape
```
Out[21]: (64, 64, 3)

In [22]:
```
x = np.expand_dims(x, axis=0)
```

In [23]:
```
x.shape
```
Out[23]: (1, 64, 64, 3)

In [25]:
```
preds = pn_model.predict_classes(x)
```

In [26]:
```
preds = preds.reshape(-1,)
```

In [27]:
```
preds[0]
```
Out[27]: 1

######

In [28]:
```
img = image.load_img(r'/Users/krishna/Desktop/project 06/Pneumonia Prediction Using X-RAY Images/Dataset/val/PNEUMON
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = pn_model.predict_classes(x)
preds = preds.reshape(-1,)
preds[0]
```
Out[28]: 1

In [29]:
```
img
```
Out[29]:

localhost

Home Page - Select or create a notebook | Pneumonia Prediction model - Jupyter Notebook

jupyter **Pneumonia Prediction model** Last Checkpoint: Last Wednesday at 19:19 (autosaved)

Logout

File Edit View Insert Cell Kernel Widgets Help | Trusted | Python 3

Run | Code

######

In [28]:
```
img = image.load_img(r'/Users/krishna/Desktop/project 06/Pneumonia Prediction Using X-RAY Images/Dataset/val/PNEUMON
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = pn_model.predict_classes(x)
preds = preds.reshape(-1,)
preds[0]
```
Out[28]: 1

In [29]:
```
img
```
Out[29]:

In [30]:
```
img = image.load_img(r'/Users/krishna/Desktop/project 06/Pneumonia Prediction Using X-RAY Images/Dataset/val/PNEUMON
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = pn_model.predict_classes(x)
preds = preds.reshape(-1,)
preds[0]
```
Out[30]: 1

In [31]:
```
img
```
Out[31]:

In [32]:
```
img = image.load_img(r'/Users/krishna/Desktop/project 06/Pneumonia Prediction Using X-RAY Images/Dataset/val/PNEUMON
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = pn_model.predict_classes(x)
preds = preds.reshape(-1,)
preds[0]
```

Initializing the Model / adding layers

In [7]:
```
pn_model = Sequential()
```

```
WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:74: The name tf.get_default_graph is deprecated. Please use tf.compat.v1.get_default_graph instead.
```

In [8]:
```
pn_model.add(Convolution2D(32, (3,3), input_shape=(64,64,3), activation = 'relu'))
```

```
WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:517: The name tf.placeholder is deprecated. Please use tf.compat.v1.placeholder instead.

WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:4138: The name tf.random_uniform is deprecated. Please use tf.random.uniform instead.
```

In [9]:
```
pn_model.add(MaxPooling2D(pool_size = (2,2)))
```

```
WARNING:tensorflow:From /Users/krishna/opt/anaconda3/lib/python3.7/site-packages/keras/backend/tensorflow_backend.p
y:3976: The name tf.nn.max_pool is deprecated. Please use tf.nn.max_pool2d instead.
```

In [10]:
```
pn_model.add(Flatten())
```