



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: V Month of publication: May 2023

DOI: <https://doi.org/10.22214/ijraset.2023.52166>

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Pneumonia Detection Using X-Rays by Deep Learning

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Abstract: Pneumonia is one of the serious diseases that is caused by a bacterial or viral infection of the lungs and has the potential to result in severe consequences within a short period. Therefore, early diagnosis is a key factor in terms of the successful treatment process. Thus, there is a need for an intelligent and automatic system that has the capability of diagnosing chest X-rays and to simplify the pneumonia detection process for experts as well as for novices. This study aims to develop a model that will help with the classification of chest x-ray medical images into normal(healthy) vs abnormal(sick).

Keyword: web application, Pneumonia Detection

I. INTRODUCTION

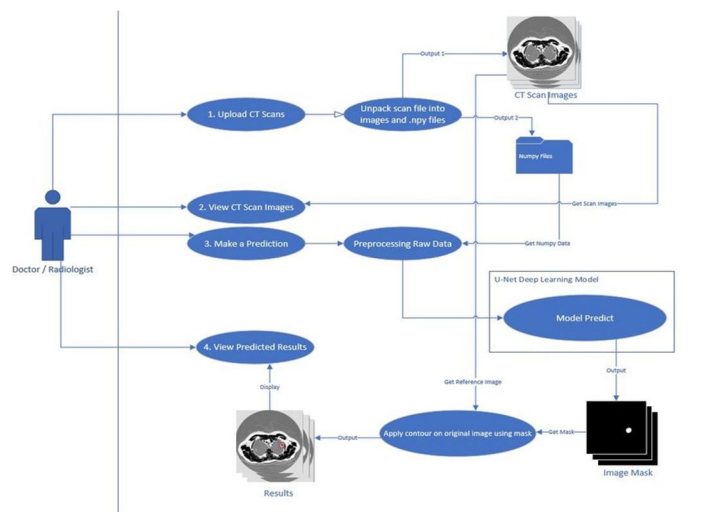
According to the World Health Organization (WHO), pneumonia is one of the most infectious causes of death worldwide, it affects children and families everywhere and causes 50 thousand deaths each year. Recently, the Situation Report - 150 from WHO about COVID-19 presented the number of infected active cases is up to 8, 2 million, the number of deaths is 445, 535. The patients can get pneumonia as a complication of viral infections such as COVID-19 or the common flu. Besides, the bacteria, fungi, and other microorganisms can also be the primary infectious agents of pneumonia, causing cough with phlegm or pus, fever, chills, and difficulty breathing. Pneumonia is the infection of one or both lungs and filled up with fluid and pus. Based on , up to 60% of the cases are related to respiratory virus infections. The study in indicated the difference between viral and bacterial pneumonia in children is based on the serum C reactive protein (CRP) but the sensitivity is not enough for use in clinical practice.

A. Working Principle

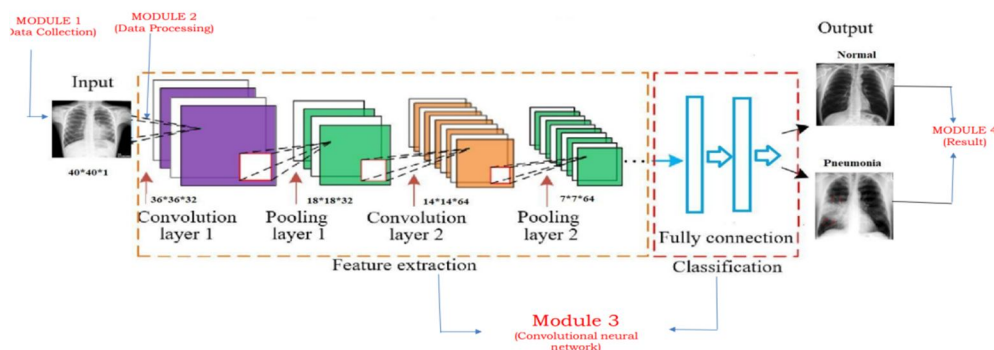
Detecting the traces of pneumonia through the X-ray Images using Deep Learning Techniques. X-ray Images are extracted using the dicomutils.py with patient information from DICOM(Digital Imaging and Communications in Medicine). End-to-End Machine learning is done in the Jupyter Notebook with relevant Markdown in the notebook itself and the pipeline code is executed in Spyder application

II. SYSTEM DESIGN

A. Usecase Diagram



B. System Architecture



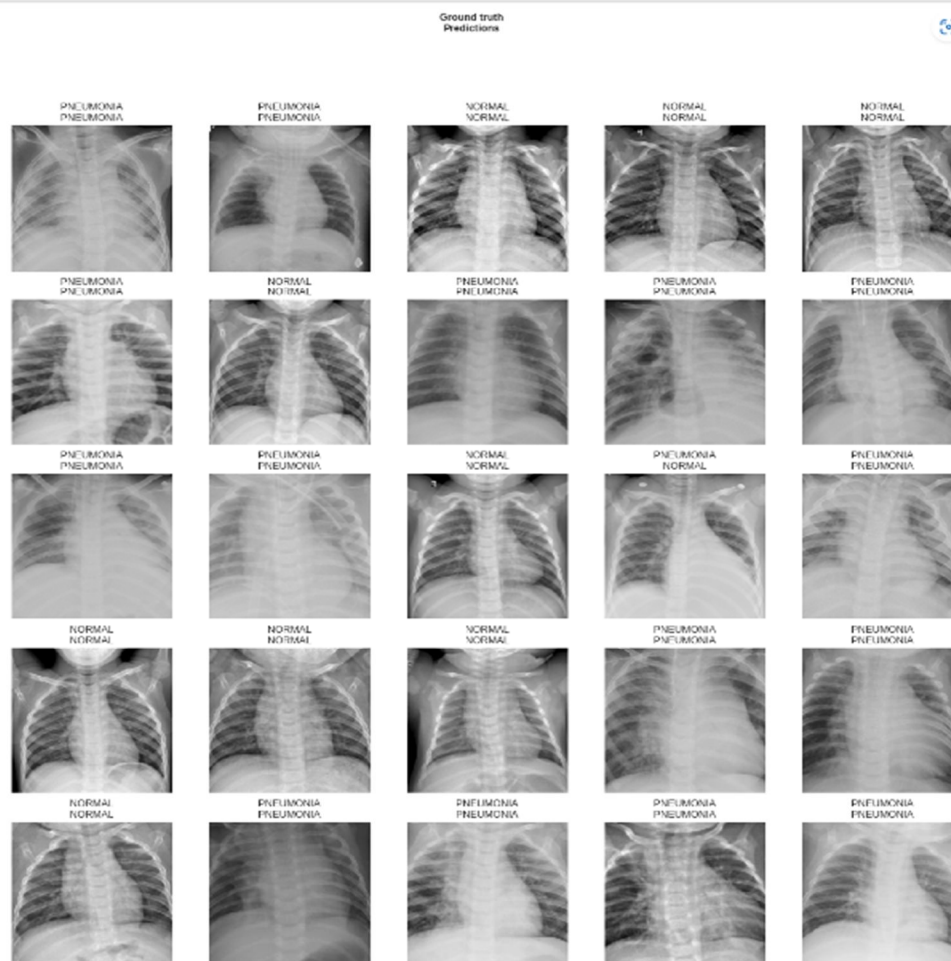
III. PROPOSED SYSTEM

We have analyzed the various work done on medical image detection in the previous section. The experiments were performed based on available datasets. It has been observed that the machine learning models effectively detects medical images when the model is fed with a larger quantity of data. The use of ML algorithms has been proven effective in detection while compared to the traditional procedures mentioned in the literature review.

ML models need a higher volume of data for effective training capable of achieving higher accuracy in detection

```
Out[22]: [(('PNEUMONIA', 'NORMAL', 47), ('NORMAL', 'PNEUMONIA', 14))]
```

```
In [23]: learn.show_results()
```



IV. SYSTEM IMPLEMENTATION

A. Data Collection

The chest x-ray image dataset is available at . It was the Chest X-Ray images which include normal chest X-Ray and Pneumonia chest X-Ray. Here, we have taken 5,856 sample images of the dataset to use later on for recognition and classification of pneumonia. 1,583 of which are normal X-Ray lung images, and 4,273 of which are X-Ray lung images with Pneumonia from patients.

B. Data processing

The most important part of machine learning is data and data must be clean for models to process it.

When it comes to image data, there are some preparation methods. Various types of pre-processing tasks such as dimension reduction, image resize, and image cropping is applied.

C. Image Convolution

Image classifications is CNN nowadays because it's able to extract image features efficiently with the utilization of Image convolution. As that an image's features can be extracted by an image filter with image convolution. Different image filters can extract different image features.

D. Image Pooling

Image Pooling is a popular approach in CNN for data dimension reduction. It is responsible for reducing processing time by down sampling the data it receives from the preceding convolutional layers to decrease the feature map's dimensionality and sharpen the identified features.

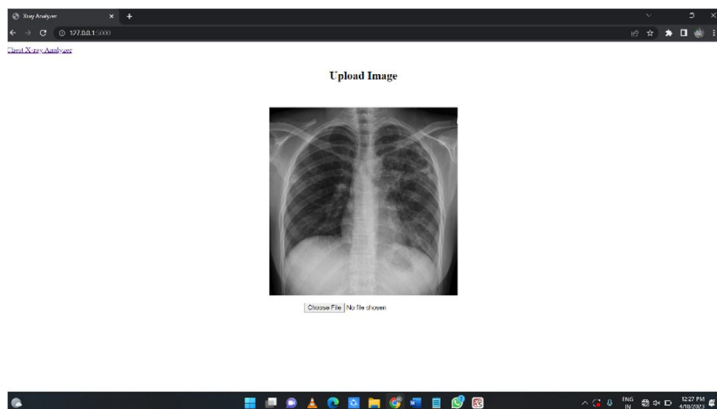
V. SYSTEM IMPLEMENTATION

A. Running The Code

```

Console 1/A X
dense (Dense)          (None, 256)          1179904
dropout_3 (Dropout)    (None, 256)          0
dense_1 (Dense)        (None, 2)             514
=====
Total params: 1,661,186
Trainable params: 1,661,186
Non-trainable params: 0
None
* Serving Flask app "app" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production
  Use a production WSGI server instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
  
```

B. Browse The Local Host



VI. CONCLUSION

In this paper, we offered a model for detecting and classifying pneumonia from chest X-ray images using machine learning methods based on Convolutional Neural Networks (CNN). In particular, comparing all seven models based on test accuracy score, F-score and ROC curve, it appears that CNN outperforms all other models by a small margin with test accuracy score 98.46%. Random forest performs surprisingly well with test its long running and waiting time.

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45.98



IMPACT FACTOR:
7.129



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