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**COMSATS University, Islamabad Pakistan**

**Pneumonia Detection**

(Semester Project Report)

**BCS-5- (A)**

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**The candidate confirms that the work submitted is their own and appropriate  
 credit has been given where reference has been made to the work of others**.

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1. **Abstract**

Pneumonia is a dangerous infectious disease that is affecting one or both lungs mainly due to bacteria known as Streptococcus pneumoniae. Chest X-Rays that are used for diagnosis requires expert radiotherapists for evaluation. Thus, the development of an automated system for detection would be beneficial for the treatment especially in remote areas. The deep learning algorithms for analyzing medical images and features that are extracted from pre-trained Convolutional Neural Networks (CNNs) models on large-scale datasets are considered much useful in image classification tasks. In this project, we used tensorflow a python library to train model which is used for the classification of abnormal and normal chest X-Rays. We determined the optimal CNN model for this purpose.

# Introduction

Pneumonia is life taking disease and affects about 450 million people globally (7% of the population) and results in about 4 million deaths, each year. Pneumonia is an inflammatory condition of the lung primarily affecting the small air sacs known as alveoli. It is usually caused by infection with viruses or bacteria, and less commonly by other microorganisms.

If you may have pneumonia, an imaging test may be performed to confirm the diagnosis. One or more types of test may be taken in order to evaluate pneumonia.

People can’t understand their reports (X-ray) and have to consult their doctor in the world full of technology. In today’s world, the importance of technology can’t be denied.

This system will detect the pneumonia on report given by the patient and point out the infected area. The system requires some basic information regarding the disease and in return it provides you with most efficient information about disease along with some guideline and treatment. It uses the concepts of AI and deep learning (CNN).

# Proposed System

Nothing is more valuable than life and a person in good physical and mental health may appreciate the world to the fullest and meet life’s problems with ease and comfort. Health is riches implies that health is a priceless asset rather than money or ownership of material possessions. There is no point in having money if you don’t have good health. Simply we can say “Health is Wealth”

Early Detection of disease is lifesaving. Purpose of this system is to give you complete and efficient detail about pneumonia along with all detail in such a manner that any person can understand that easily.

# Explanation

**Convolutional Neural Network (CNN):**

It is a deep learning algorithm that takes image as an input, assign some learnable weights and biases to various aspects in that image and it is capable to differentiate one image from another. The pre-processing requirements in a ConvNet is much lower than other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, CNN is capable to learn these filters/characteristics.

**TensorFlow (a python library):**

TensorFlow is a free and open-source library used for machine learning and artificial intelligence. It could be used to perform variety of tasks but particularly, it focuses more on training and implication of deep neural networks.

Following are the parts of the tensorflow library that are used in our project.

***import tensorflow as tf***

***from keras.preprocessing.image import ImageDataGenerator***

***from keras.preprocessing import image***

Code:

train\_datagen = ImageDataGenerator(rescale = 1./255,shear\_range = 0.2,zoom\_range = 0.2,horizontal\_flip = True)

Explanation:

The purpose of ***from keras.preprocessing.image import ImageDataGenerator*** is that it is used for generating image and create different aspects of the same image (zoomed in version, from different sides, etc.).

***from tensorflow.keras.optimizers import Adam***

***from tensorflow.keras.utils import img\_to\_array***

***from keras.models import load\_model***

Code:

Training\_model = model.fit\_generator(train\_generator, epochs = 20, validation\_data = validation\_generator)

Explanation:

***from tensorflow.keras.optimizers import Adam*** is used for importing Adam optimizer for optimization though there are many other optimizers in this library but we have used Adam for this project. Its job is to check the data by assigning weights and organize it in a particular sequence. In other words, it makes and arrangement by extracting features.

The purpose of **importing img\_to\_array** is to convert the image into an array since the computer cannot study the normal picture that we do. An array consist of numbers.

**Load\_model** is used for making the model which is later used for classification. The code for the model is executed once to create it while it is used again and again for the detection of pneumonia on different x-rays.

**Convolutional Layer:**

It is the most important part of CNN used for image processing. Many parameters or filters are being used in this layer that keeps on extracting the features of an image and reduces it. Even if the image had a large dimension before entering this layer it is left with only one dimension in the end. After this process the image is checked if anything can be extracted from it or not. If not it is discarded.

# Advantages/Benefits of Proposed System

Following are some advantages of a System:

* Detection of pneumonia just by an X-ray image.
* Treatment and guideline to cure pneumonia
* User can view all previous reports
* User can contact the doctor for proper guidance.

# Conclusion

The aim of this system is to improve the medical aptitude in areas where the availability of expert doctors and radiotherapists are limited. It detects the early diagnosis of Pneumonia to prevent adversative consequences in backward areas. Not much work has been done to detect Pneumonia. The development of algorithms in this domain can be beneficial for providing better health-care services. With the series of tests directed, we plan to give the overwhelming pre-prepared CNN model and classifier for the future work in the comparative exploration space. Our system will probably prompt the improvement of better calculations for identifying Pneumonia soon.

# References

<https://en.wikipedia.org/wiki/Pneumonia>

<https://www.radiologyinfo.org/en/info/pneumonia#:~:text=If%20your%20doctor%20thinks%20you,determine%20if%20you%20have%20pneumonia>.

<https://www.hopkinsmedicine.org/health/conditions-and-diseases/pneumonia#:~:text=The%20main%20types%20of%20pneumonia%20are%20bacterial%2C%20viral%2C%20and%20mycoplasma,low%20energy%2C%20and%20extreme%20tiredness>