**Pneumonia-Classification**

About the Project:

[**Pneumonia**](https://en.wikipedia.org/wiki/Pneumonia) can be classified in several ways, most commonly by where it was acquired (hospital versus community), but may also by the area of lung affected or by the causative organism.[[1]](https://en.wikipedia.org/wiki/Classification_of_pneumonia#cite_note-pmid16013205-1) There is also a combined clinical classification, which combines factors such as age, risk factors for certain microorganisms, the presence of underlying lung disease or systemic disease, and whether the person has recently been hospitalized.

## Types of Pneumonia:

1. **Community Acquired Pneumonia(CAP)**: Is infectious pneumonia in a person who has not recently been hospitalized.

* **Cause** : Streptococcus pneumoniae, or pneumococcus, is a Gram-positive, alpha-haemolytic or beta-haemolytic, facultative anaerobic member of the genus Streptococcus. They are usually found in pairs (diplococci) and do not form spores and are nonmotile. As a significant human pathogenic bacterium S. pneumoniae was recognized as a major cause of pneumonia in the late 19th century, and is the subject of many humoral immunity studies.
* **Frequency**- Overall, Streptococcus pneumoniae is the most common cause of community-acquired pneumonia worldwide.
* **Spread-** CAP is the fourth most common cause of death in the United Kingdom and the sixth in the United States.
* **Severity:** The term "walking pneumonia" has been used to describe a type of community-acquired pneumonia of less severity (because the sufferer can continue to "walk" rather than require hospitalization).

1. **Hospital-acquired-** This kind of Pneumonia is acquired after hospitalization for another illness or Procedure. Hospitalized patients may have many risk factors including mechanical ventilation, prolonged malnutrition, underlying heart and lung diseases, decreases amounts of stomach acid, and immune system disturbances.

* **Cause:** Pneumonia acquired during or after hospitalization for another illness or procedure with onset at least 72 hrs after admission. The causes, microbiology, treatment and prognosis are different from those of community-acquired pneumonia. Up to 5% of patients admitted to a hospital for other causes subsequently develop pneumonia.
* **Frequency:** Up to 5% of patients admitted to a hospital for other causes subsequently develop pneumonia.
* **Spread:** Hospitalized patients may have many risk factors for pneumonia, including mechanical ventilation, prolonged malnutrition, underlying heart and lung diseases, decreased amounts of stomach acid, and immune disturbances. Additionally, the microorganisms a person is exposed to in a hospital are often different from those at home. Hospital-acquired microorganisms may include resistant bacteria such as MRSA, Pseudomonas, Enterobacter, and Serratia. Because individuals with hospital-acquired pneumonia usually have underlying illnesses and are exposed to more dangerous bacteria, it tends to be more deadly than community-acquired pneumonia.
* **Severity:** it tends to be more deadly than community-acquired pneumonia. Ventilator-associated pneumonia (VAP) is a subset of hospital-acquired pneumonia. VAP is pneumonia which occurs after at least 48 hours of intubation and mechanical ventilation.

Using Computer Vision, Deep Learning and CNN to Classify Images with 97% accuracy. #Pneumonia Diagnosis

Problem Statement: Automated defect detection in medical imaging has become the emergent field in several medical diagnostic applications. Automated detection of X-Ray is very crucial as it provides information about abnormal tissues which is necessary for planning treatment. The conventional method for defect detection in magnetic resonance brain images is human inspection. This method is impractical for large amount of data. So, automated X-Ray detection methods are developed as it would save Dermatologist time.

1. • Image Acquisition.
2. • Resizing the Image
3. • Denoising the Image
4. • Image Segmentation
5. • Deep Learning Methods

A Convolutional Neural Network that is able to detect whether a patient has pneumonia, both bacterial and viral, or not, based on an X-ray image of their chest. Implements transfer learning, using the first 16 layers of a pre-trained VGG19 Network, to identify the image classes. By completing the following steps, the following files are created:

1. • model.h5 - This stores a '.h5' version of the Convolutional Neural Network model trained.
2. • plot.jpg - This displays statistics regarding the training process of the model.

The final accuracy obtained by the model exceeds 90%.

Algorithm Used:

**What All was Done**

'1. • I also used VGG-16 is a convolutional neural network that is trained on more than a million images from the ImageNet database . The network is 16 layers deep and can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. Very Deep Convolutional Networks for Large-Scale Image Recognition 2. • In the context of artificial neural networks, the rectifier is an activation function defined as the positive part of its argument.

• I used the Following Optimizations:

1. loss = categorical\_crossentropy
2. optimizer = adam
3. Metrics = Accuracy

# Brief about Deep Learning:

Deep Learning is one most common technique for Image Classification. Although, Convolution Neural Network (**VGG**-16) Seems to Return Relatively Better Result. However, It’s Computationally Expensive and Time Consuming. I was Able to get 97.16 % of Accuracy and 88% Validation Accuracy. Which is Pretty Awesome.