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| **Pneumonia Detection Challenge** |
| **Interim Report** |

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# Overview

# Pneumonia is a form of acute respiratory infection that affects the lungs. The lungs are made up of small sacs called alveoli, which fill with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake.

# Following are some of the key facts about Pnuemonia which needs at most attention to address the problem proactively.

* Pneumonia accounts for 15% of all deaths of children under 5 years old, killing 808 694 children in 2017.
* Pneumonia can be caused by viruses, bacteria, or fungi.
* Pneumonia can be prevented by immunization, adequate nutrition, and by addressing environmental factors.
* Pneumonia caused by bacteria can be treated with antibiotics, but only one third of children with pneumonia receive the antibiotics they need.

# Per WHO, Pneumonia is the single largest infectious cause of death in children worldwide. Pneumonia killed 808 694 children under the age of 5 in 2017, accounting for 15% of all deaths of children under five years old. Pneumonia affects children and families everywhere, but is most prevalent in South Asia and sub-Saharan Africa. Children can be protected from pneumonia, it can be prevented with simple interventions, and treated with low-cost, low-tech medication and care.

# The WHO and UNICEF integrated Global action plan for pneumonia and diarrhoea (GAPPD) aims to accelerate pneumonia control with a combination of interventions to protect, prevent, and treat pneumonia in children with actions to:

* protect children from pneumonia including promoting exclusive breastfeeding and adequate complementary feeding;
* prevent pneumonia with vaccinations, hand washing with soap, reducing household air pollution, HIV prevention and cotrimoxazole prophylaxis for HIV-infected and exposed children;
* treat pneumonia focusing on making sure that every sick child has access to the right kind of care -- either from a community-based health worker, or in a health facility if the disease is severe -- and can get the antibiotics and oxygen they need to get well;

# Based on research we have made an attempt to look at the Chest Radiography to identify the Lung Opacity and quickly help Clinical specialists to take right decisions to drive proactive measure to cure and help avoid the spread of this decease to larger extent.

# Abstract

This project is aimed at detecting Pneumonia by locating the lung opacities on the Chest radiographs. This process can help identify the problem at an early stage as well as helps the Clinical analysis much faster and drives better decision making. This process of Pneumonia detection will be done by looking at several thousand images of Chest radiographs taken from past wherein the analysis and desired results were identified by the specialists. These past datapoints will become the indicators and these images will be processed through the Computer Vision Technology of deep learning to capture every details by which a Deep Learning Algorithm will be built.

The new patients data will be fed to this model which detects the Lung Opacity indication along with its location such that Clinical specialists will be able to confirm diagnosis quickly and can help in taking respective decisions quickly to move forward with the next steps of the treatment.

Deep neural networks models have conventionally been designed and experiments were performed upon them by human experts in a continuing trial and error method. This process demands enormous time, knowhow and resources. To overcome this problem, a novel but simple model is introduced to automatically perform optimal classification tasks with deep neural network architecture .

The Neural network architecture was specifically designed for Pneumonia image classification tasks. The proposed technique is based on the CNN algorithm, utilizing set of neurons to convolve on a given sample images to extract relevant features from them. This is demonstrated through validating the accuracy of the detection along with the objective to reduce the loss while the network is learning the details.

As part of this project, we will be demonstrating the outcome with 4 different model architecture along with their outcome in each of the model and provide the commentary for each of the models developed.

# Project Objective

The objective of this capstone project is to build a Pneumonia detection system to locate the position of the inflammation in a Chest Radiography.

Based on the dataset provided, we will have to do the following steps to work towards building the final model and validate and results.

* Merge the csv files to arrive at the sample dataset to completion and along the line build the merged CSV files along with the right x,y, width and height bounding box coordinates along with the patient ID.
* Validate the images and respective bounding box coordinates.
* Extract all the features from the images and build the csv file for processing further.
* Perform Exploratory Data Analysis to validate all the data points and build insights
* Based on the project objective – isolate the dataset and accordingly images as well which are fully unique by removing the duplicate records in the dataset based on target variable.
* Build the model with different architectures and showcase the accuracy and showcase the right model to approach the problem description

# EDA Inference and Data pre-processing

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# Current Approach on Model building

Deep neural networks models have conventionally been designed and experiments were performed upon them by human experts in a continuing trial and error method. This process demands enormous time, knowhow and resources. To overcome this problem, a novel but simple model is introduced to automatically

YOLO

MobileNet

SSD

Mask R-CNN

# Approach to improve model performance