# Classification of pneumonia status through X-ray images

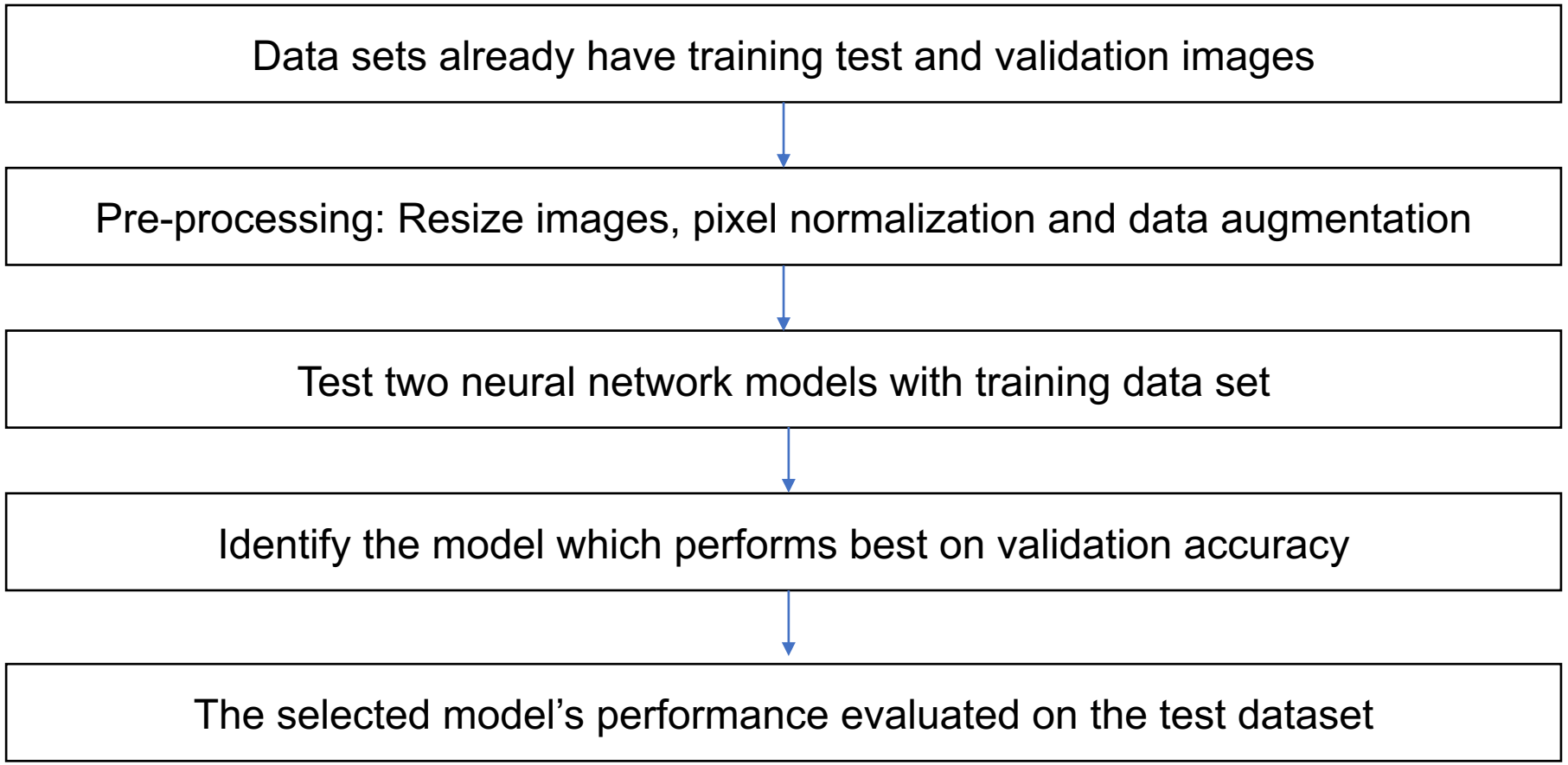
# Background information

**Aim: Development of method for automated detection of pneumonia in chest X ray images**

- Availability of 5,863 X-ray images from 1-3 year olds divided into training, test and validation images

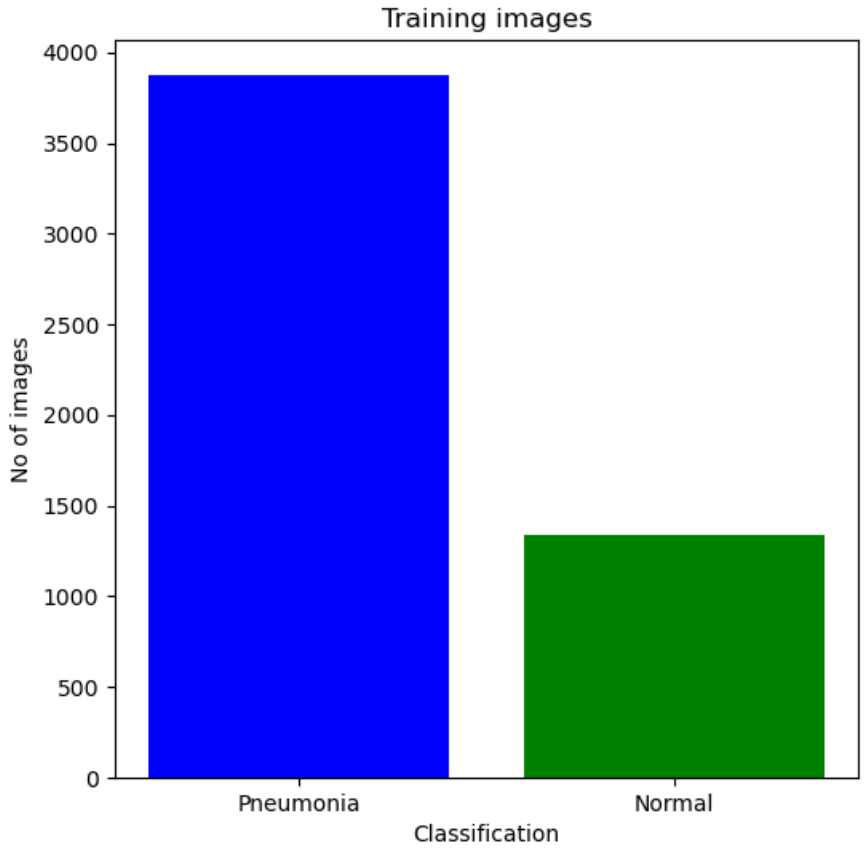
| | Pneumonia | Normal | Total |
|---|---|---|---|
| Training | 3875 | 1341 | 5216 (89%) |
| Validation | 8 | 8 | 16 (0.27%) |
| Test | 390 | 234 | 624 (10.6%) |

# Strategy for development of automated detection method



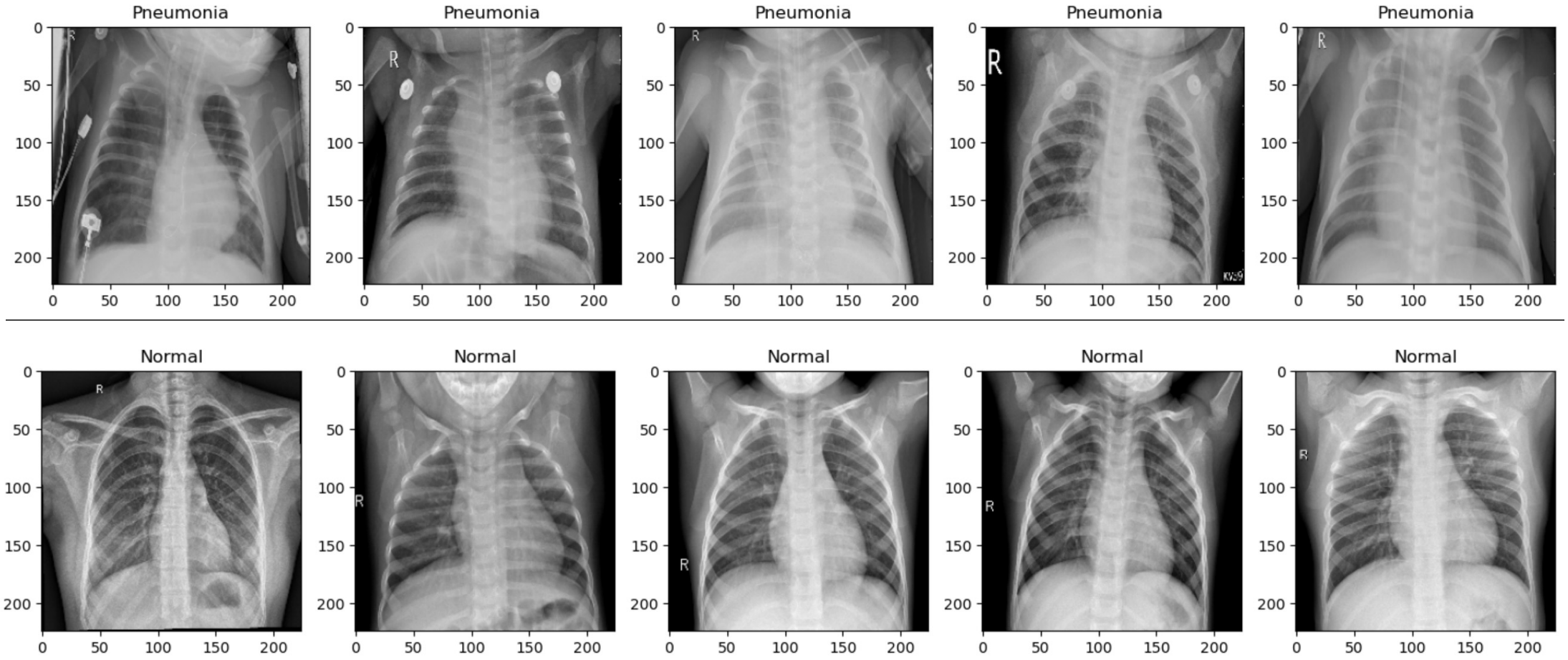
# Exploratory data analysis

- Looking at the training dataset, we can see that there is a class imbalance with the number of images in the pneumonia class 3 times that of normal.



# Chest X ray images

- Visualizing a few images after resizing (224x224) in the training dataset



# Building neural network models for classification

- We will be testing two convolutional neural network models:

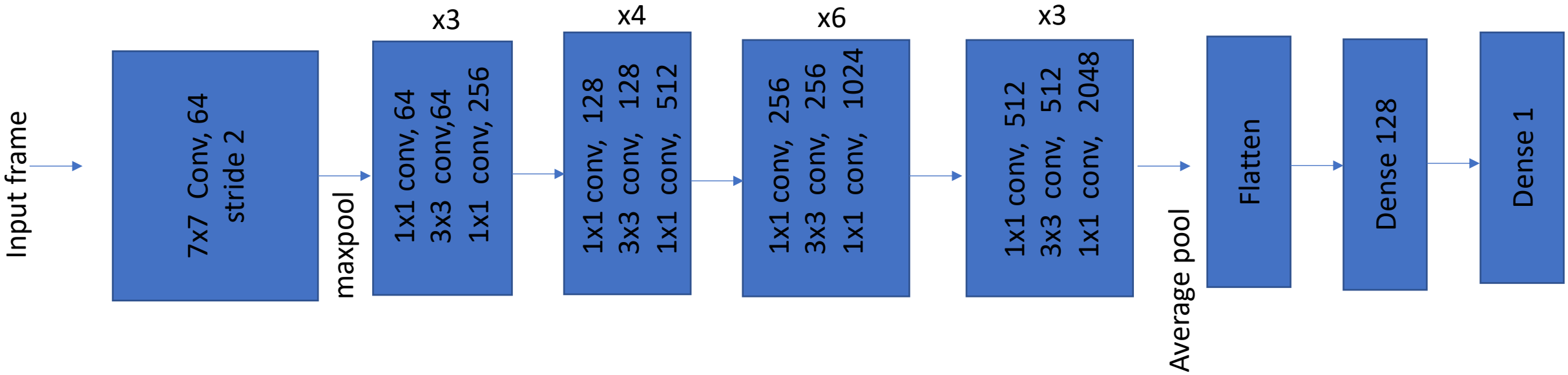
-Resnet50 model

-Custom Conventional neural network

To counter the imbalance and any overfitting:
- Used data augmentation to increase the diversity of images to be trained
-Used class weights balancing in the training which were dependent on the number of images in each class
-Binary cross entropy was the loss function used to evaluate how well the network fits the data

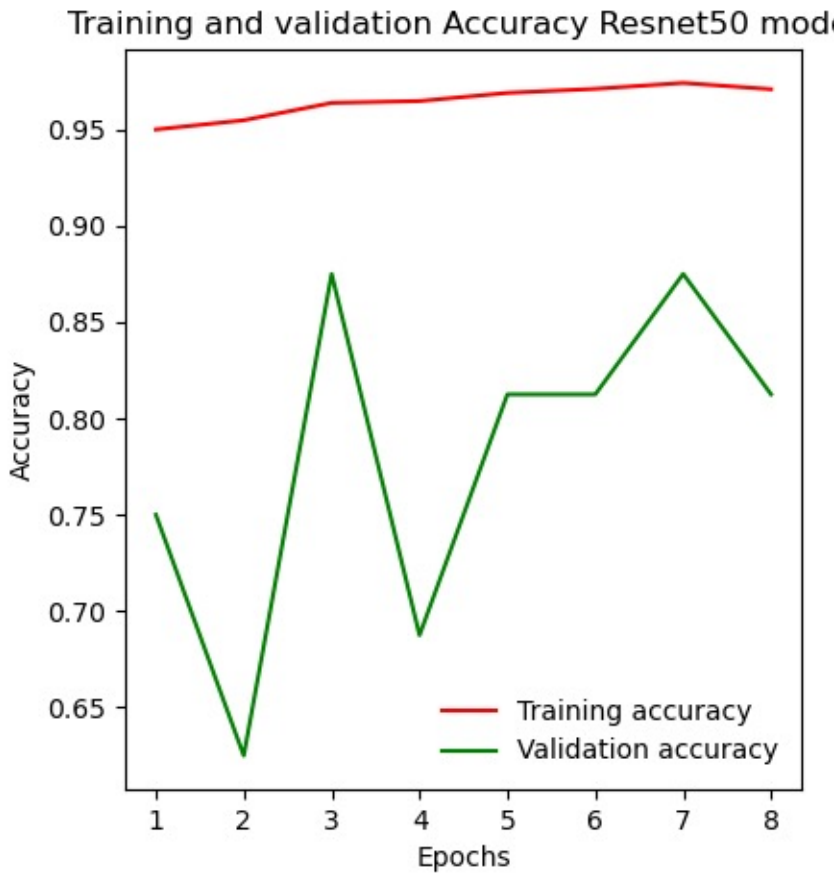
# Resnet50

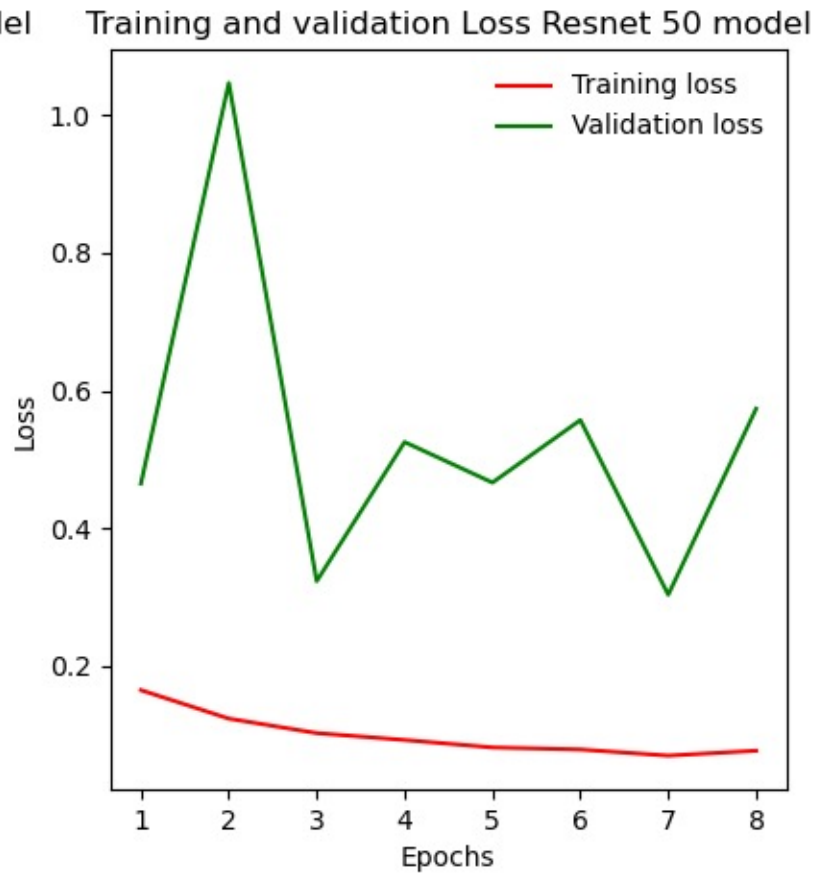
- Resnet50 is a 50 layer deep model with weights for lower layers trained from Imagenet.
- Top layer was adjusted as this is a binary classification.
- Let us look at the performance based on training and validation data sets  with no of epochs determined by when the validation accuracy does not further improve



# Resnet50 model evaluation

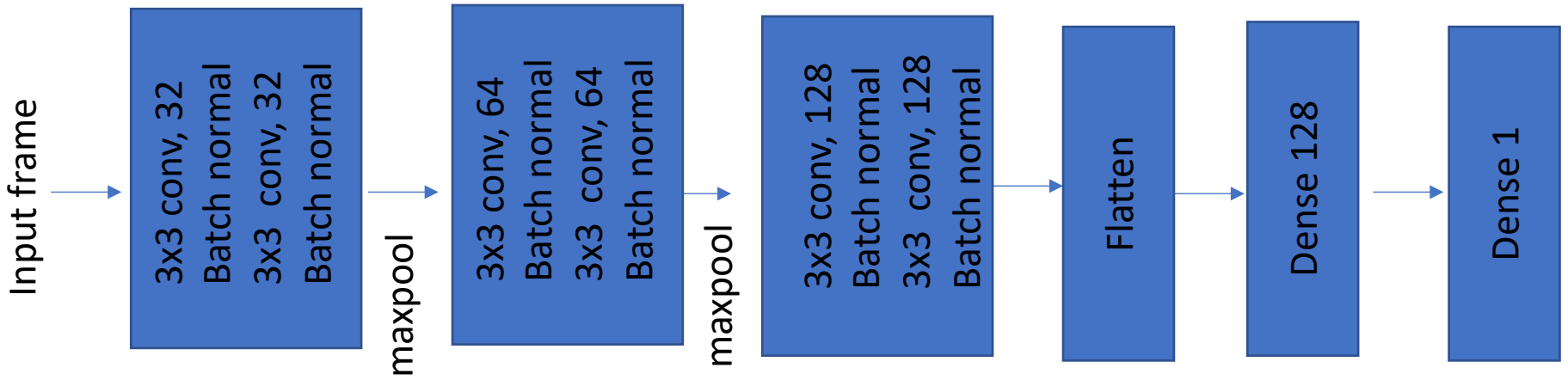
- Let us look at the performance based on training and validation data sets with no of epochs determined by when the validation accuracy does not further improve



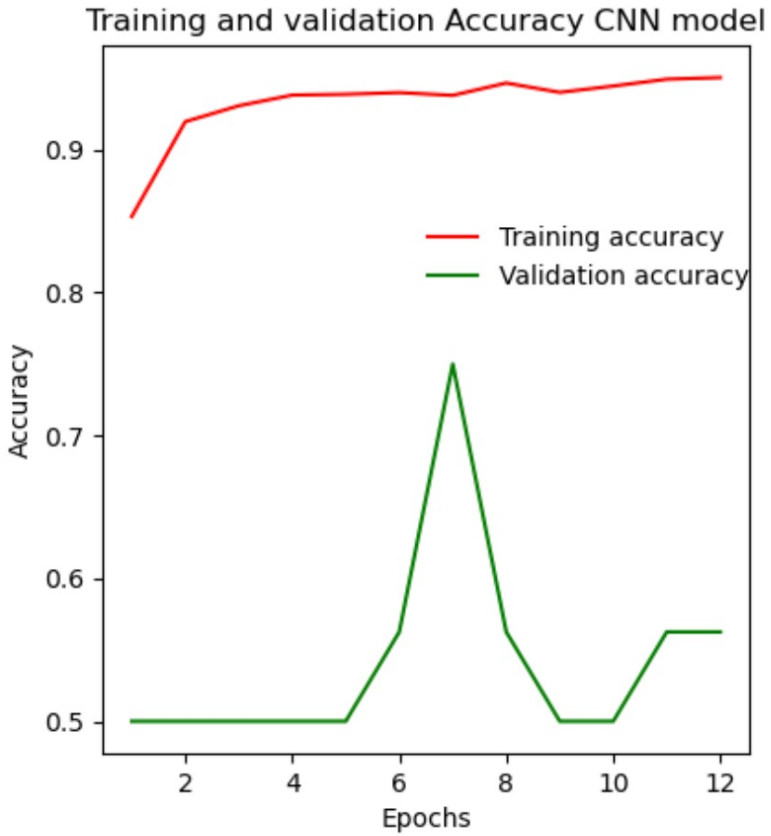
# Convolutional neural network

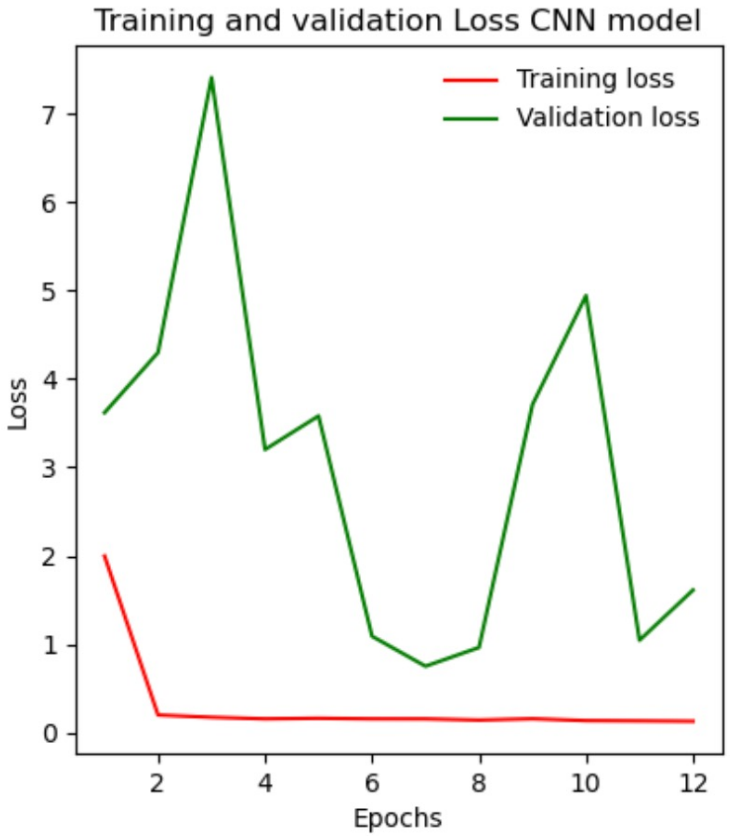
- We used a traditional convolutional network using the following architecture



# CNN model evaluation

- Let us look at the performance based on training and validation data sets with no of epochs determined by when the validation accuracy does not further improve




**Lower accuracy on the validation compared to Resnet50 model**

# Test  performance and conclusion

- Based on the performances for validation accuracy, Resnet50 was the better model and was evaluated in the test data set.

| | Accuracy | Precision | Recall |
|---|---|---|---|
| Test | 93.6% | 0.94 | 0.94 |