Detection of Pneumonia from Chest X-Ray Images

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Objectives

This project uses a deep convolutional neural network model trained from scratch to classify and detect the presence of pneumonia from a collection of chest X-ray image samples.
The model extracts features from a given chest X-ray image and classify it to determine if a person is infected or not.
This model could help mitigate the reliability and interpretability challenges often faced when dealing with medical imagery.

Introduction

An x-ray exam will allow your doctor to see your lungs, heart and blood vessels to help determine if you have pneumonia. When interpreting the x-ray, the radiologist will look for white spots in the lungs (called infiltrates) that identify an infection.

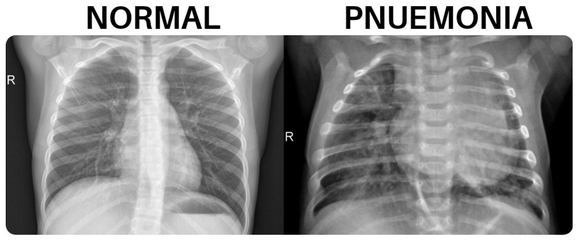


Figure 1:X-ray of normal person and infected person

- Over 150 million people get infected with pneumonia on an annual basis especially children under 5 years old.
- For these populations, accurate and fast diagnosis means everything. It can guarantee timely access to treatment and might be the difference between life and death.
- Build an algorithm to automatically identify whether a patient is suffering from pneumonia or not by looking at chest X-ray images.
- The algorithm had to be extremely accurate because lives of people is at stake.

The approach

- We used three convolutional blocks comprised of convolutional layer and max-pooling,on top of which we used a flatten layer.
- In between the layers we have used dropouts to reduce over-fitting.
- Activation function was Relu throughout except for the last layer where it was Sigmoid as this is a binary classification problem.
- We have used Adam as the optimizer and cross-entropy as the loss.

Contributions

- Developed a model that (a) can capture properties of characters in pixels (b) use them to predict the characters from any new image.
- Performed evaluation using both synthetic and real datasets.

Graphical work flow

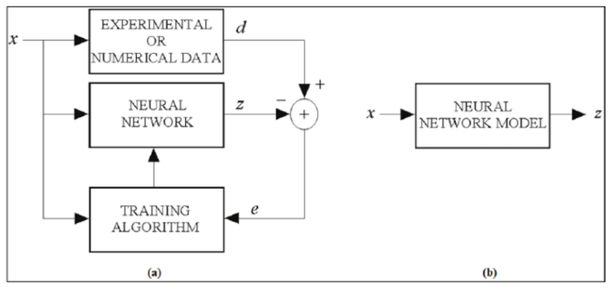
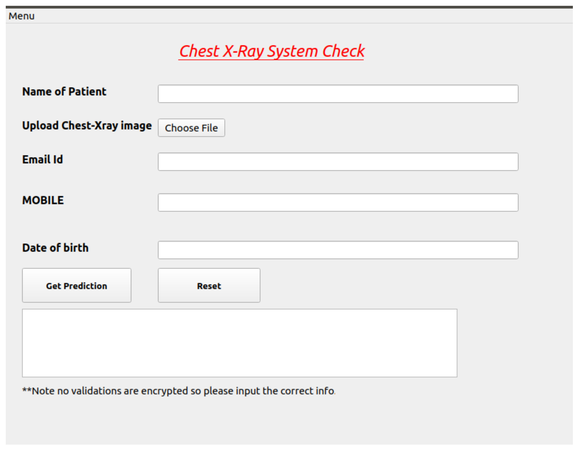


Figure 2:(a) Block diagram of supervised learning; (b) neural network "black box" model

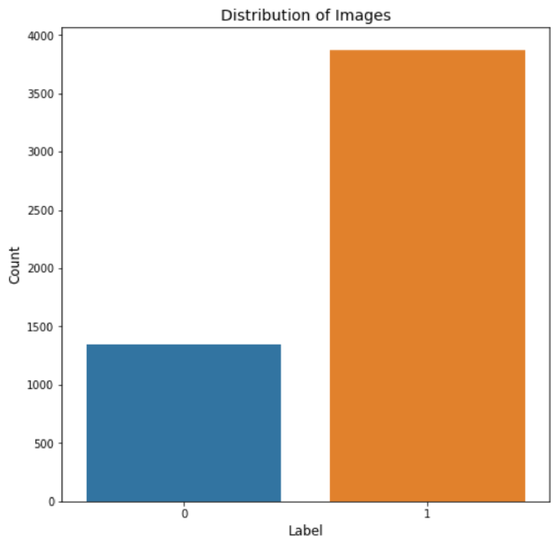
GUI for the code



Inference

We have demonstrated how to classify positive and negative pneumonia data from a collection of X-ray images. We build our model from scratch, which separates it from other methods that rely heavily on transfer learning approach.
In the future, this work will be extended to detect and classify X-ray images consisting of lung cancer and pneumonia, which has been a big issue in recent times.

Data Charts and Reviews



References

- https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia
- https://doc.qt.io/qt-5/qtdesigner-manual.html

Acknowledgements

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