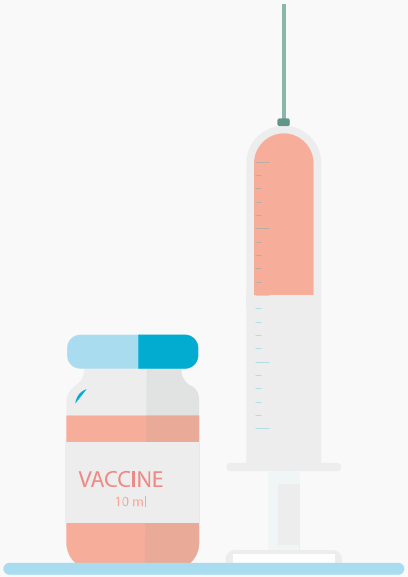
COVID

Detection Based on Lung CT Image

Jiazhi Jia, Yifang He, Yihan Jia, Risheng Guo

TABLE OF CONTENTS



01

INTRODUCTION

Overview of our analysis

Business Objective

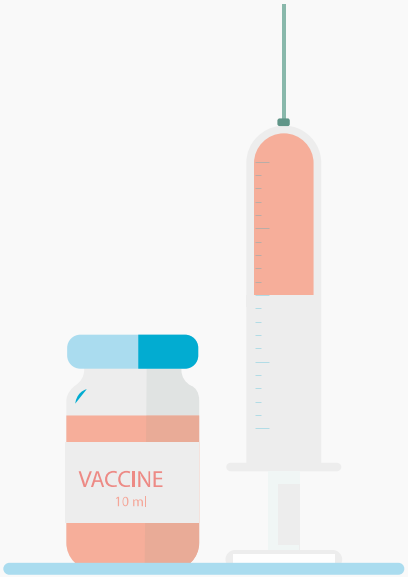
Doctors' workload has increased significantly as a result of the COVID-19 outbreak.

We want identify if one gets affected by covid-19. Besides demonstrating detection of COVID-19 affected lungs, our group is also trying to detect the region of lungs affected by COVID-19.

About the dataset

We found our dataset on kaggle:
https://www.kaggle.com/basu369victor/covid-19-detection-with-heat-map-visualization/data

- 349 CT images of covid patients
- 397 CT images of non-covid patients.



02

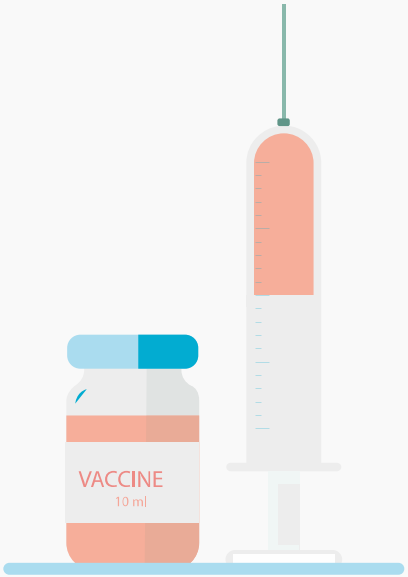
DATA PROCESS

Basic Data Preparation
and Processing

Split Dataset

- Shuffle and assign 20% of the data in to test set, rest goes in to train dataset

- Shuffle and assign 50% of the data in to validation set



03

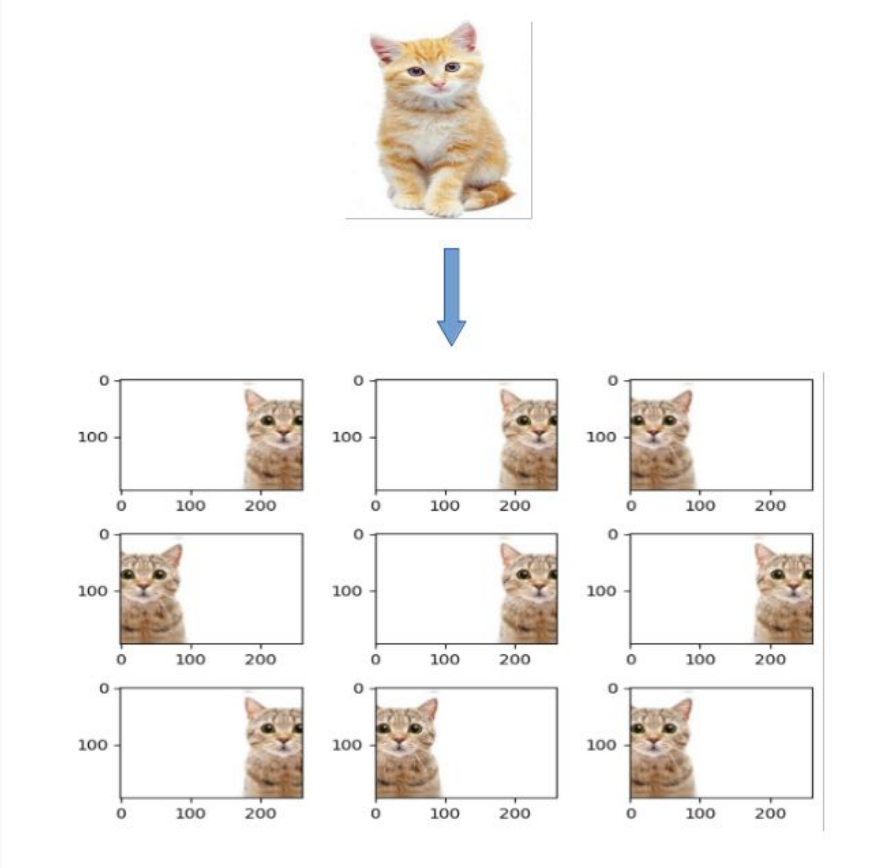
NEURAL NETWORKS

Model design

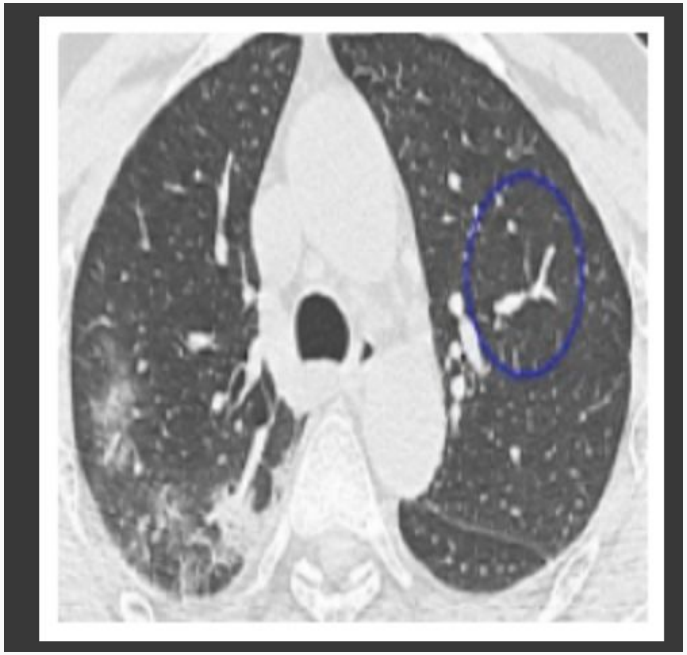
Data Augmentation

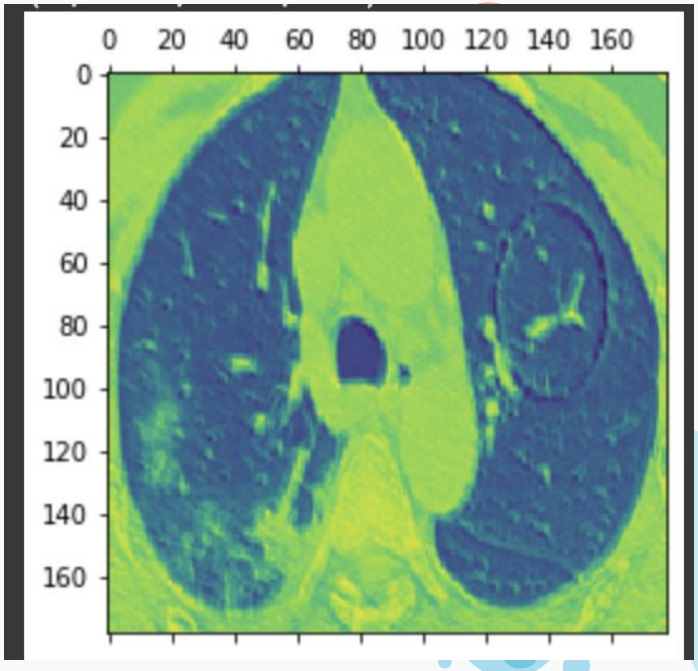
The data source only provides less than 1000 pictures, which is not sufficient to train a CNN, we decide to use data augmentation to enhance its performance.

To ensure accuracy of the outcome, we didn’t change the original picture to a large extent, just random rotation, zoom and flip in small scales.



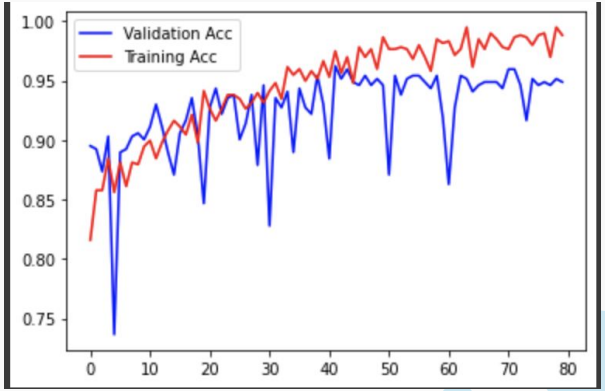
Layers & Activate functions





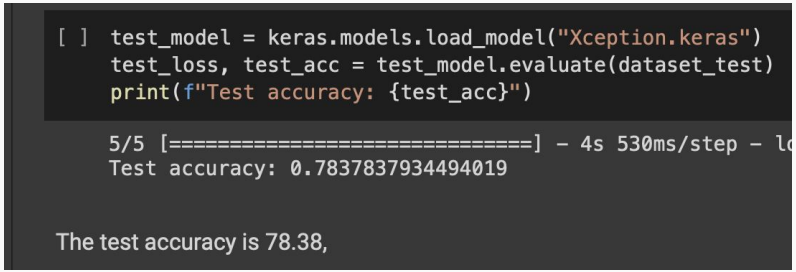
Callback & Epochs

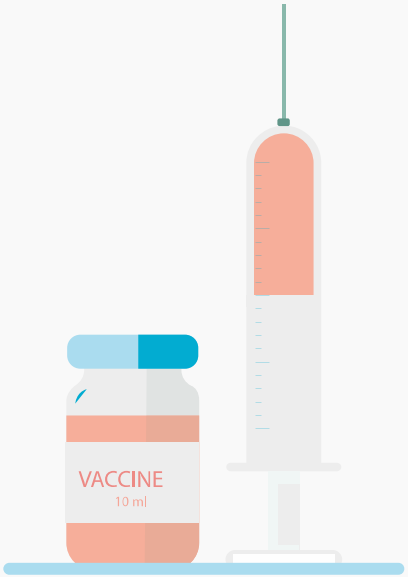
- We first trained the model using 150 epochs to make it overfitted on the validation dataset, and cutted down to 80.
- We also added callback to save the model which performed best on the validation data set.
- The Validation accuracy is converged after 75 epochs, which is nearly 95%!



Outcome

The accuracy of the best model on test dataset is 78.38%, which is enough for primary identification and screening.





04

ADJUSTMENT PARAMETERS

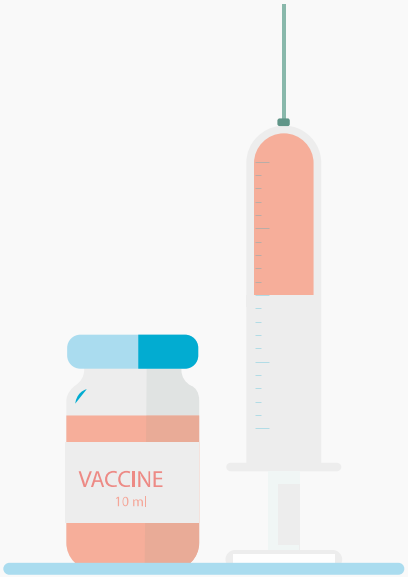
Activation Function and other parameters

Activation Function

1. ELU
    a. ELU becomes smooth slowly until its output equal to -α whereas RELU sharply smoothes.
    b. ELU is a strong alternative to ReLU.
    c. Unlike to ReLU, ELU can produce negative outputs.
2. PRELU
    a. PRELU increases the speed of learning by not deactivating some neurons

Other Parameters

1. Loss Function: Binary Crossentrophy (Classification)
2. Optimizer: Root Mean Squared Propagation
3. Metrics: Accuracy
4. Number of Epochs: 80
5. Batch Size: 25



05

CONCLUSION

Summarize the results obtained

CONCLUSION

- The goal of our project is to use neural networks to analyze patients' lung CTs in order to quickly determine whether they have COVID.
- Neural networks has 78.38% accuracy.
- We got 71% recall rate by confusion matrix.
- Doctors only need to examine CTs judged asymptomatic by the neural network to determine whether the patients are at risk of getting COVID.

THANKS FOR YOUR LISTENING!

Do you have any questions?