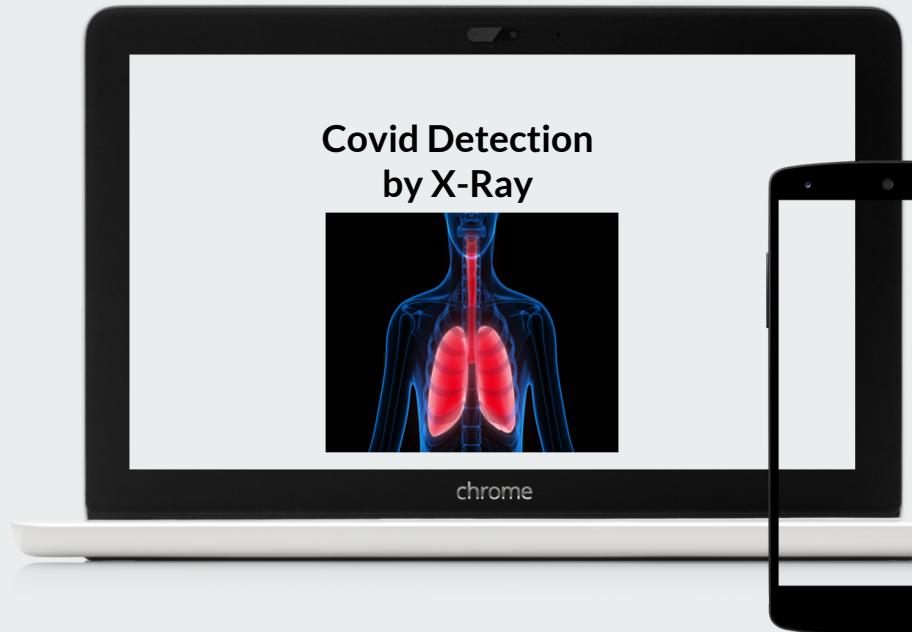

Artificial Intelligence for Medical Diagnosis

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Problem statement

Diagnose a patient given their Lungs X-Ray Scan

With the ongoing pandemic, it becomes necessary to provide citizens with means of conducting a preliminary testing while reducing the strain on the medical community.

The concept here is to avail an open-source resource to help users with a very basic diagnosis, wherein they can conduct preliminary tests at home with their most recent scans.

Introduction

The objective of this project is to use AI and Deep Learning to detect the presence or absence of infection from Coronavirus in the lungs of the patient.

The Coronavirus infects the body by entering healthy cells. There, it slowly makes copies of itself and multiplies throughout the body infecting more cells. It latches its spiky surface proteins to receptors on healthy cells, especially those in your lungs. The lungs become inflamed, making it tough for you to breathe. This can lead to pneumonia, an infection of the tiny air sacs inside the lungs where the blood exchanges oxygen and carbon-dioxide. These show up in X-rays as shadows or patchy areas called ground-glass opacity.

Goals

For any given case

- Diagnose disease with confidence interval
- Highlight problem region in X-ray if diagnosed positive for disease
- Present a model with a high accuracy
- Develop an website which takes the X-Ray as an input and continues to provide a diagnosis with a pre-trained model
- The website would also require CV integration to recognize.

Technology used

- Deep Learning
- Computer Vision
- Python
- Flask
- HTML, CSS

Dataset Used

This Kaggle dataset is a database of COVID-19 cases with chest X-ray or CT images. It contains COVID-19 cases.

The dataset can be found at:
<https://www.kaggle.com/bachrr/covid-chest-xray>

The repository of Chest X-Ray images for COVID-19 can also be found at:

<https://github.com/ieee8023/covid-chestxray-dataset>

A smaller dataset can be found at

<https://www.kaggle.com/nabeelsajid917/covid-19-x-ray-10000-images>

Model Comparison

Transfer Learning and Fast AI

- **Transfer Learning :**
 - Transfer learning is a flexible method, allowing the use of pre-trained models directly, as feature extraction preprocessing, and integrated into entirely new models.
 - Keras provides convenient access to many top performing models on the ImageNet image recognition tasks such as VGG, Inception, and ResNet.
- **Fast AI :**
 - FastAI is designed to support both interactive computing as well as traditional software development.
 - For interactive computing, where convenience and speed of experimentation are a priority, data scientists often prefer to grab all the symbols they need.

Best Model

Transfer Learning

- Transfer Learning :
 - Accuracy : Accuracy obtained ~95%
- Model Accuracy and Loss Plots show that with increasing epochs the accuracy of the model rises as the loss falls

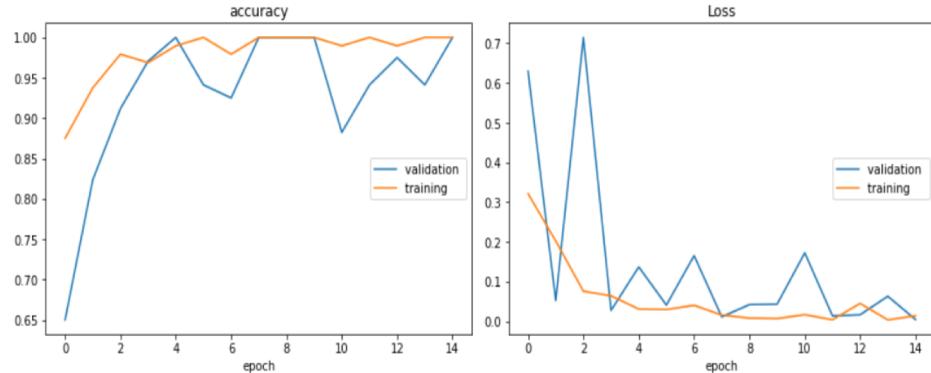


Fig. Model Accuracy and Loss Plots

Results

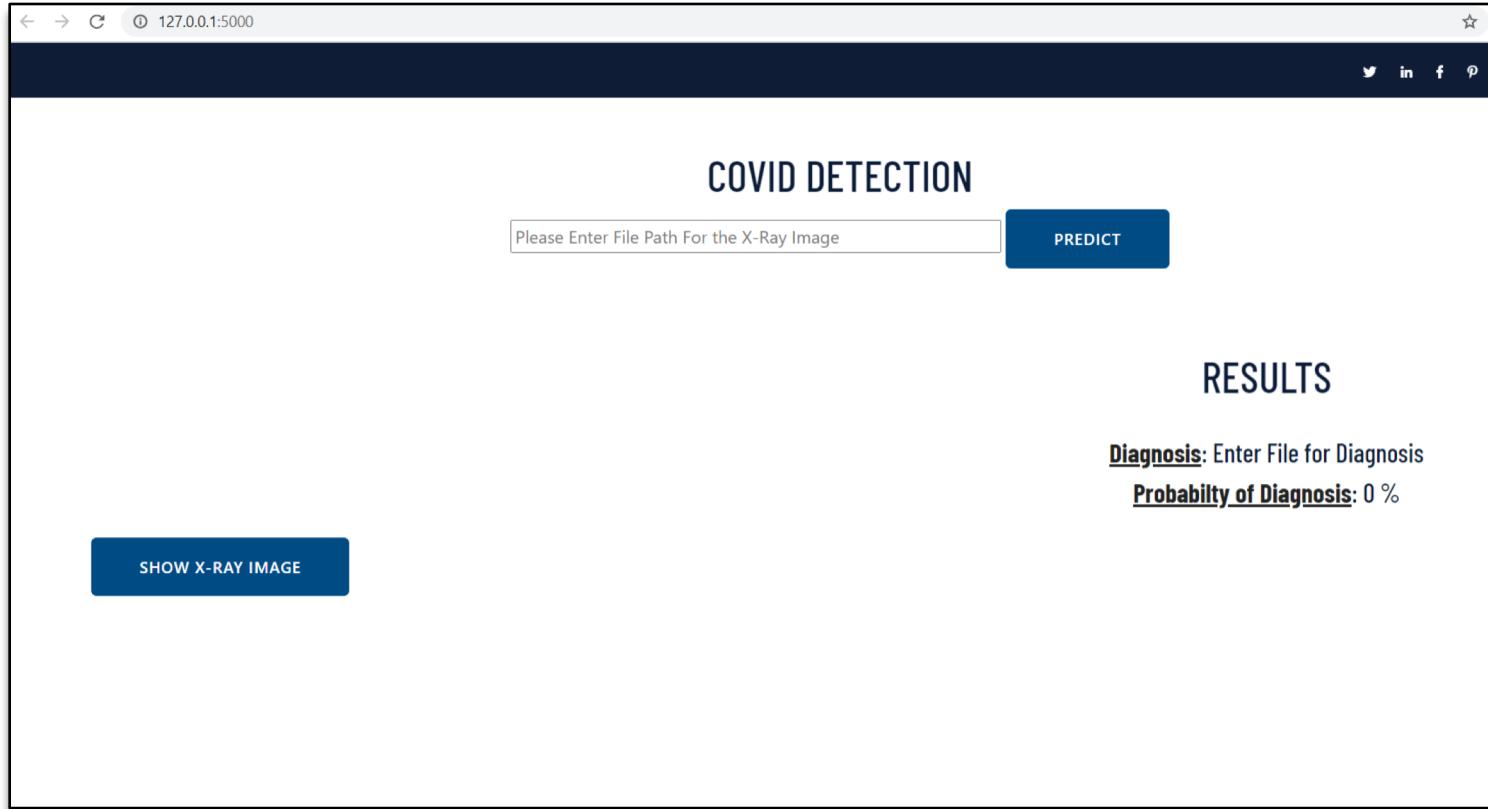
Predictions for Test Images

Using Flask, we were able to display the results on a locally hosted HTML page.

The following slides showcase the same.

We have showcased instances of both, COVID positive and negative cases.

For any input X-ray image, the Diagnosis and the Probability/Accuracy of the Diagnosis are both provided to the users.



Home Page: The page simply provides an input to enter the file path

← → ⌂ 127.0.0.1:5000/?f_path=dataset%2FTest%2Fnormal%2FIM-0243-0001.jpeg ☆

Twitter LinkedIn Facebook Print

COVID DETECTION

Please Enter File Path For the X-Ray Image

PREDICT



RESULTS

Diagnosis: Covid Not Detected
Probability of Diagnosis: 99.98 %

Case 1: An X-Ray of a COVID-negative individual, diagnosed correctly

← → ⌂ 127.0.0.1:5000/?f_path=dataset%2FTest%2Fcovid%2Fcovid+%2820%29.jpg ☆

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COVID DETECTION

Please Enter File Path For the X-Ray Image

PREDICT



RESULTS

Diagnosis: Covid Detected
Probability of Diagnosis: 99.44 %

Case 2: An X-Ray of a COVID-positive individual, diagnosed correctly

Conclusion

We developed a Deep Learning model with Transfer Learning to detect abnormalities in lungs resulting from the COVID-19 virus. We used CNN to develop the model to uncover hidden patterns in X-Ray images that could indicate infection. We used public datasets available on Kaggle and IEEE to train and validate the model.

Using this approach, we could predict presence or absence of infection due to COVID-19 with an accuracy of 95% and above.

References

- <https://www.nih.gov/news-events/nih-research-matters/novel-coronavirus-structure-reveals-targets-vaccines-treatments>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7187882/>
- [HTML Template by https://colorlib.com/](https://colorlib.com/)