

## **Automated Detection of COVID-19 Cases Using Deep Neural Networks with X-ray images**

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Project Proposal

## **Description of the Problem**

COVID-19 was identified in Wuhan, China in December 2019. The disease is termed as COVID-19 and the cause by the virus is termed as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a new virus in humans causing respiratory illness which can be spread from person-to-person. Its impact has been broad, affecting general society, economy, culture, ecology, politics, and other areas.

It is crucial to treat, isolate or hospitalize people who are infected. Testing plays a major role in the extensive public health picture on mitigation efforts, helping investigators characterize the prevalence spread and contagiousness of the disease.

COVID-19 is being provisionally diagnosed based upon the symptoms and confirmed using the technique called real-time reverse transcription polymerase chain reaction (RT-PCR) of infected secretions, computed tomography (CT) imaging of the chest and X-Rays. Researchers state that combining clinical image features with laboratory results may help in early detection of COVID-19.

Machine Learning methods have leaped across boundaries and made its impact widely in medical fields by becoming adjunct tool for clinicians. Deep learning is a part of family of Machine learning have produced results surpassing human expert performance in many fields. Using Deep learning models in detection of COVID-19 plays a vital role without the need of manual feature extraction.

Deep learning models in radiology can be assistive to obtain accurate diagnosis and useful in eliminating the limitations such as insufficient number of available RT-PCR test kits, test costs, and waiting time of test results. Hence, our proposed project is an attempt to leverage artificial intelligence tools to develop more effective treatments and testing for coronavirus.

## **Proposed Solution**

In this project, a deep learning model is proposed for the automatic diagnosis of COVID-19. The proposed model is developed to provide accurate diagnostics for binary classification (COVID vs. No-Findings) and multi-class classification (COVID vs. No-Findings vs. Pneumonia).

The proposed model has an end-to-end architecture without using any feature extraction methods, and it requires raw chest X-ray images to return the diagnosis. This model is to be trained with 127 chest X-ray images, which are not in a regular form and were obtained hastily. The dataset is taken from the COVID-19 X-ray image database developed by CohenJP using images from various open sources and ChestX-ray8 dataset by Wang from NIH clinical center.

The paper talks about implementing the existing model by using DarkNet model as a classifier that forms the basis for You Only Look Once (YOLO) real time object detection system. We have decided to further improvise and distinguish from the existing model by using ResNet, with different learning rates. We are also planning to test on

different training and validation splits to observe the best generalization performance using this highest accuracy ResNet50 model. This is not included in the existing research paper. Our goal is to achieve the highest accuracy in comparison with DarkNet model qualitatively and quantitatively.

This model can be employed to assist radiologists in validating their initial screening, and can also be employed via cloud to immediately screen patients.

Dataset: [covid-chestxray-dataset](#) [Chest X-ray8-dataset](#)

## **Preliminary Plan**

The study plan enlisted below, showcases the actions to be undertaken to perform the correct testing of the tool in a systematic and effective way.

- Read the paper. This proposed project is developed as a working model based on this paper.  
[https://www.researchgate.net/publication/340935440\\_Automated\\_Detection\\_of\\_COVID-19\\_Cases\\_Using\\_Deep\\_Neural\\_Networks\\_with\\_X-ray\\_Images](https://www.researchgate.net/publication/340935440_Automated_Detection_of_COVID-19_Cases_Using_Deep_Neural_Networks_with_X-ray_Images)
- Extensive research for the dataset from various sources and plan ahead to solve if in case any unbalanced data problem occurs.
- Enlist all required algorithms, models, libraries, tools / IDE / plugins that are required to build the project. We have planned to start by using DarkNet model and implement using Jupyter Notebook with all the libraries installed.
- Created a GitHub repository and collaborating the work using Git.
- Initially planning to run using Jupyter Notebook from local, and later train the model in Google Colab using GPU/TPU.
- Roles and Responsibilities are splitted among both the team members and have started working.
- Selection of Model, learning rate, data split is discussed and done collaboratively.

## Milestones and Dates

Dates	Project Status
Choose a paper for coursework project	September 17, 2020
Got Approval from the Professor	September 18, 2020
Read about the paper thoroughly & gather information from various sources	September 20, 2020
Setup the environment	September 24, 2020
Installing all the libraries, Importing the dataset	September 25, 2020
Choosing the model and exploring the Learning rates	September 30, 2020
Preprocessing the data	October 4,2020
Submission of Project Proposal	October 10, 2020
Decide on best optimizer,how many epoch, And learning rate	October 20, 2020
Train the model with different learning rate,epoch and choose the best accuracy	October 30, 2020
Submission of Intermediate Project Report	November 1, 2020
Analyze the performance	November 10, 2020

## References

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