

Covid-19 Lung CT Scan Auto-diagnostic Model

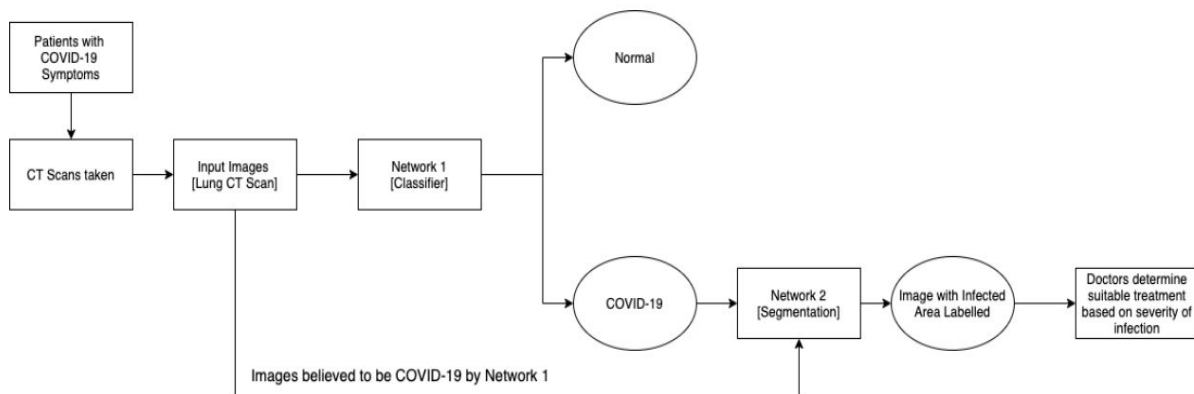
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Purpose and Impact: The COVID-19 pandemic is devastating our way of lives, the public health system, and global economy. To prevent spread of the virus and stabilize the patient's illness, early detection of COVID-19 is critical. In poorer and mismanaged economies, the lack of reliable RT-PCR test kits and shortage of specialized physicians mean that those healthcare systems are under serious threat. An alternative testing method that is reliable and easy to use is essential.

Compared to RT-PCR test, Lung CT imaging, a routine imaging tool for pneumonia diagnosis, is increasingly seen as a more reliable method to detect and evaluate the severity of COVID-19. However, this method requires hours of manual classification from a radiologist, which is difficult to afford in an overwhelmed hospital. Therefore, an automated system that classifies and evaluates the severity of COVID-19 from Lung CT images is valuable for health workers.

Our primary goal is to gain exposure in building a software incorporating a deep neural network with a frontend interface, while also inspiring others to join the action in search of a COVID-19 classification model. We hope that in the near future such softwares could be employed to guide clinical practice.

Function and Technicalities: For this project, we apply machine learning algorithms to build a Convolutional Neural Network (CNN) model that determines whether a given Lung CT image is from a person with COVID-19. If the person is indeed classified to be a COVID-19 patient, the model generates an image with the infected area labeled. We also built a web app around the model to allow for users to upload images and receive diagnosis. An illustration of the pipeline is shown below.



Specifically, the frontend is built using Figma for design and Electron (JavaScript, HTML, CSS) for framework. We used Pytorch to implement our model. The dataset used is Mosmed COVID-19 CT Scans. The classification model uses ResNet18 with more fully connected layers to get binary output, while the segmentation model is a modified U-net. The model is able to achieve 90% classification accuracy on never before seen data, while the UI is simplistic and easy to use.