Product: Deep Learning application to diagnose Covid 19 through Chest X-ray Images

Hack Cô Vy Hackathon Challenge 2020

Team: Import Keras

Author:

- Trinh Quoc Huy (trnhquchuy@yahoo.com.vn)
- Huynh Thiet Gia (huynhthietgia123@gmail.com)
- Dao Anh Hao (dahaodl@gmail.com)
- Pham Huy (huyhamada2465@gmail.com)
- Huynh Minh Nhat (minhnhat00789@gmail.com)

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1) Summary

Our project is a Window application in order to support doctors to diagnose abnormal chest X-ray images can have Covid 19. By using Deep Learning model, application can directly predict the input (Lung X-ray images) can have Covid or not and generate heatmap that covered the area that maybe the symptom. As result, doctor can more quickly diagnose the images and the accuracy of diagnosis improve.

Hardware requirement

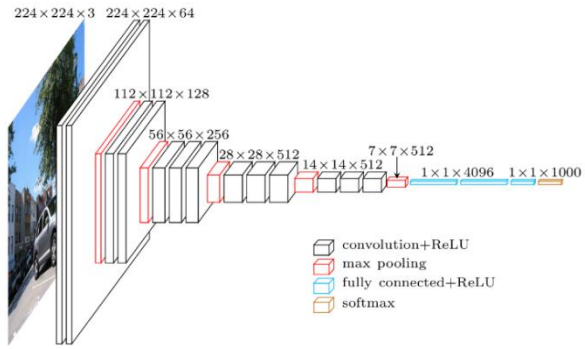
Hardware and OS	Minimum requirement	Well-perform requirement
CPU	Total 2GHz	Total 4 GHz
GPU	Intel HD	Intel UHD
RAM	2 GB	4 GB
Memory	2 GB at least	4 GB to store data
OS	Window 7 64bit	Window 10 64bit

2) Issue

As the developing of the numbers of patients, time-consume for predict X-ray image increases. It is necessary to reduce time diagnose but the accuracy of diagnosis still at the same.

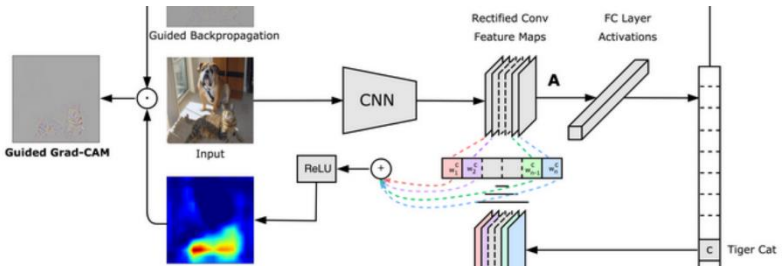
3) Convolutional Neural Network

To solve this problem, we use Convolutional Neural Network to classify multi-label. By using VGG 16 architecture and Transfer Learning, model can classify little data with high-perform. This is Architecture of Mini VGG:



VGG16 architecture-Image from Heuritech

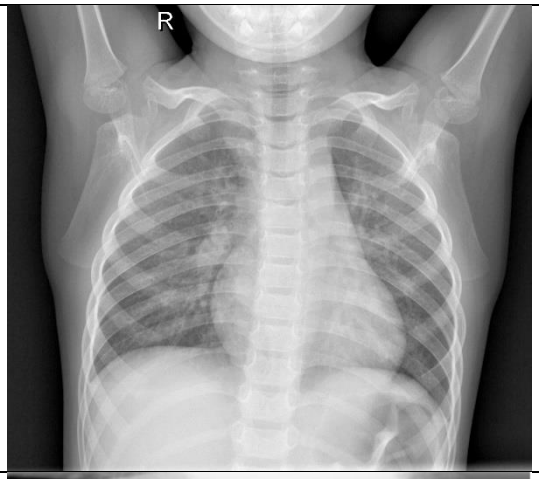
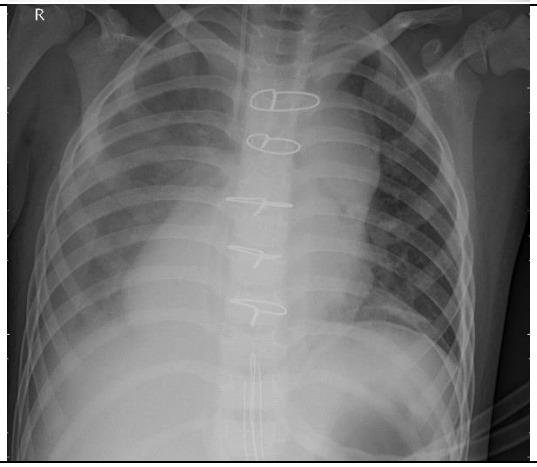
To generate heatmap, we use Gradient-weighted Class Activation Mapping (Grad-cam)



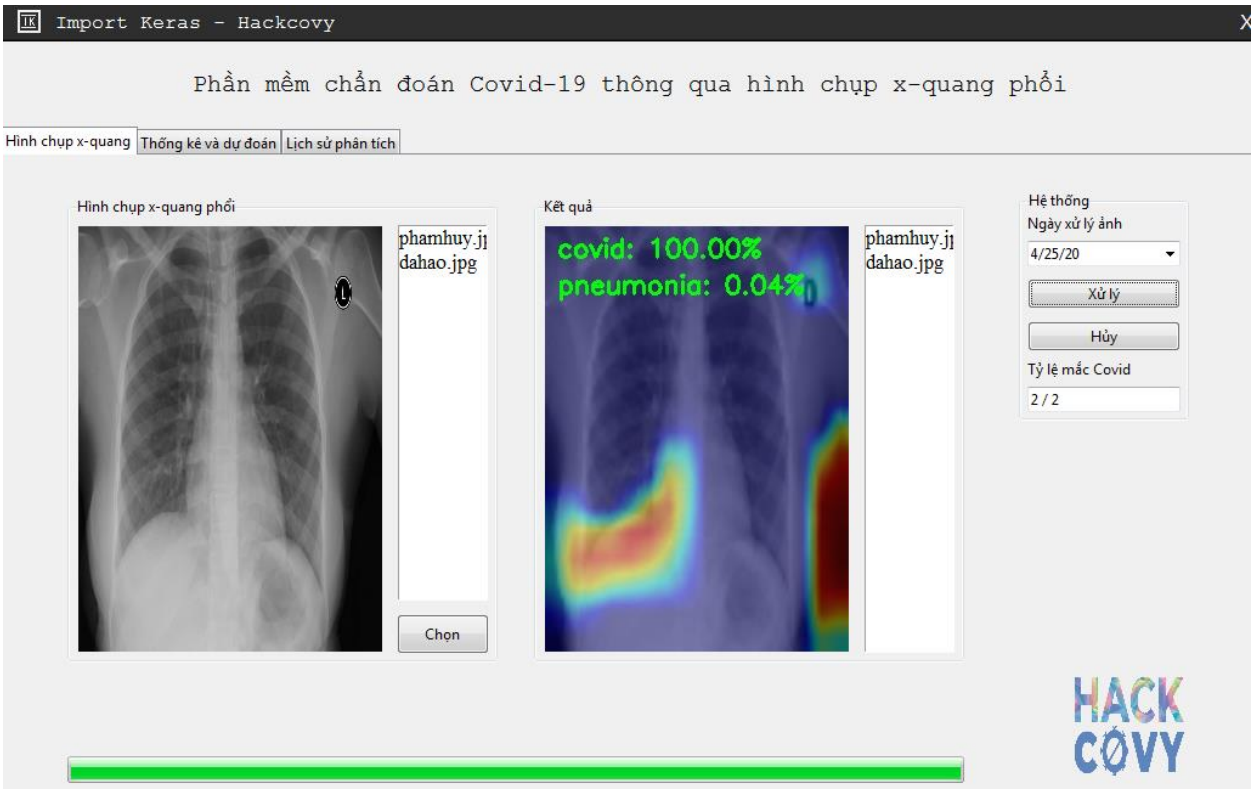
Grad-cam process- Researchgate.com

4) Dataset

Data was collected by Dr. Joseph Cohen and ChestXray dataset from Oxford. The dataset contain 334 images each label to train model, data will be preprocessed and resized to (256,256, 3) in order to train.

Label	Images
Normal	
Covid	
Pneumonia	

5) Result



User Interface of App

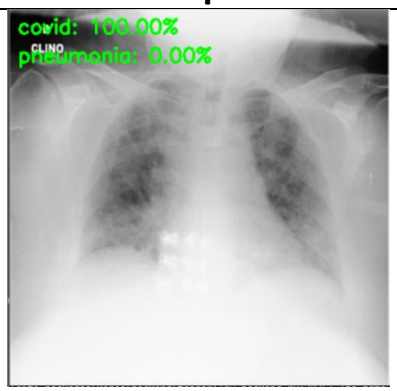
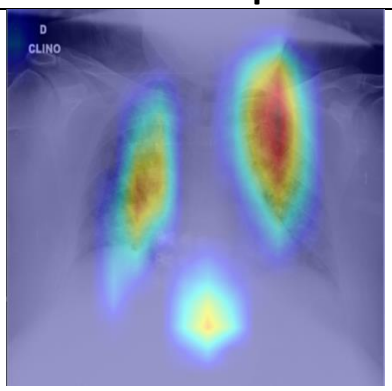
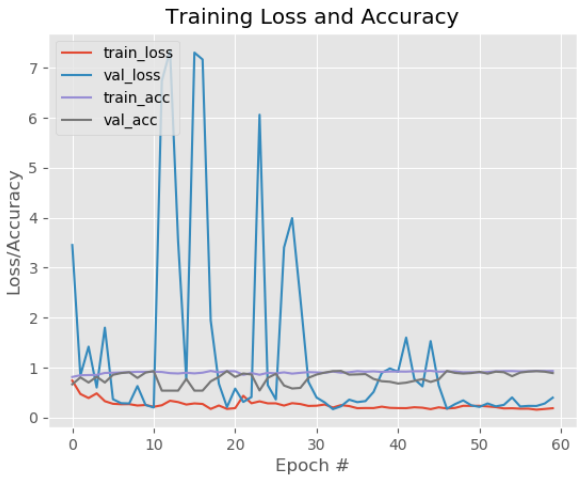
Input	Output	Heatmap
		

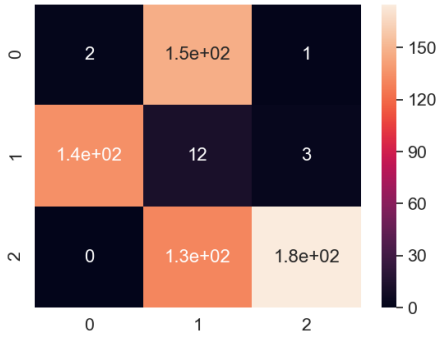
Table illustrates input and output of application

6) Evaluation

- Accuracy = 90.66%



Graph visualize train loss/accuracy per epoch in training process



Confusion Matrix visualize the performance of model on test

with y_label= True_label, x_label= predicted_label (0=normal,1=covid,2 =pneunomina)

7) Unsolved problem

- Need more data to diagnose and generate heatmap more accurate.
- Need Lung segmentation in order to improve diagnosis accuracy and generate heatmap while train and predict.
- More beautiful UI.

8) Solution

- Collect more data from local hospital.
- Segment Lung from images before training.
- Use better templates to create UI.

THE END.