

Image Super-Resolution based Classification ● of COVID-19 patients using CNN-SVM.



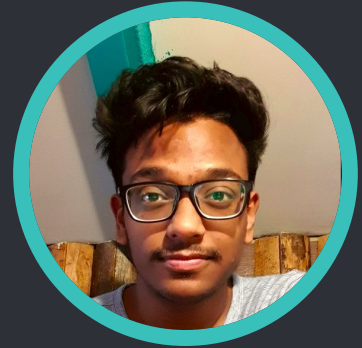
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Problem Statement and Objective

Design a model to perform classification of COVID-19 patients from super-resolution X-ray images using combination of multimodal neural networks and SVM.

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Literature Survey



A brief summary of the base papers we surveyed.

RP 1: Transfer learning to detect COVID-19 automatically from X-ray images, using CNN.

Year: 2020

Method: Very Similar to the standard CAT v DOG classifier using CNN + DNN, where we first pass the data through a CNN(Pre-Trained Model) to extract the features then, passed it into a DNN after flattening the features

They used (ReLU) in all CNN layers. A dropout layer was added to prevent the occurrence of overlapping for NN using 2 hidden layers. The CNNs were compiled using the RMSprop(lr=1e-5) optimization method.

The training lasted 15 epochs, with the batch size set to 32 and time taken was at max 2 mins.

Dataset: COVID Chest X-rays: <https://github.com/ieee8023/covid-chestxray-dataset>
COVID-19 Radiography Database: <https://www.kaggle.com/tawsifurrahman/covid19-radiography-database>

Results:

Model	ACC	F1
COVID-Net	92.4	90
VGG-19	93.48	-
MobileNet-V2	94.72	-
ResNet 50+SVM	-	95.52
DarkCOVIDNet	87.02	87.37
CORO NET	95	95.6
VGG-16	99.57	99.36

RP 2: Detection of coronavirus Disease (COVID-19) based on Deep Features and Support Vector Machine

Year: 2020

Method: The dataset consists of 127 confirmed COVID-19, 127 confirmed pneumonia and 127 healthy X-ray images. i.e. in total 381. The deep features of 13 deep CNN models are extracted and used by SVM classifier for detection of COVID-19.

Finally, a comparative analysis of deep feature plus SVM and traditional image classification method (LBP+SVM, HOG+SVM and GLCM+SVM) is carried out.

Dataset: COVID Chest X-rays: <https://github.com/ieee8023/covid-chestxray-dataset>

X-ray and CT snapshots of CONVID-19 patients: <https://www.kaggle.com/andrewmvd/convid19-x-rays>

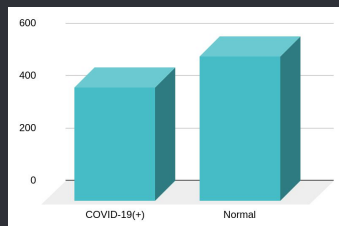
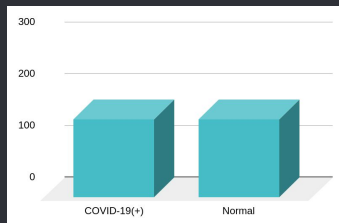
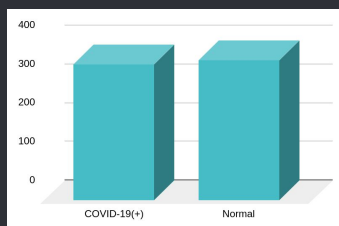
Results:

Model	SEN	FPR	F1
AlexNet	94.86	2.56	94.85
GoogleNet	91.73	4.13	91.74
InceptionV3	90.26	4.86	90.28
MobileNetV2	94.46	2.76	94.46
ResNet18	94.26	2.86	94.25
ShuffleNet	65.26	17.36	58.79
VGG16	94.20	2.90	94.20

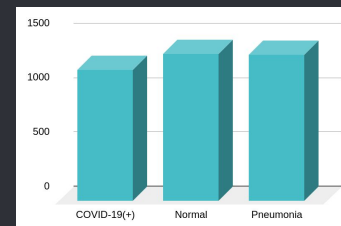
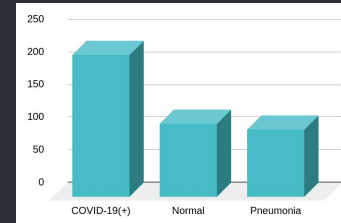
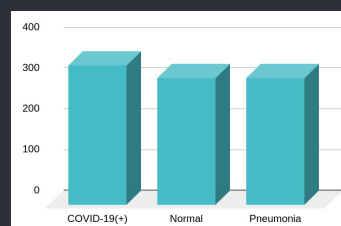
COVID-19 DATASETS: A SURVEY AND FUTURE CHALLENGES

Datasets :

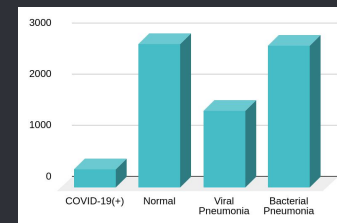
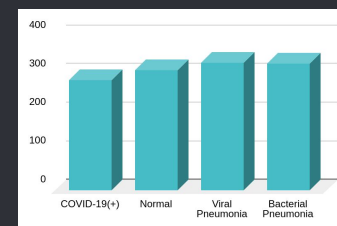
2 Classes



3 Classes



4 Classes



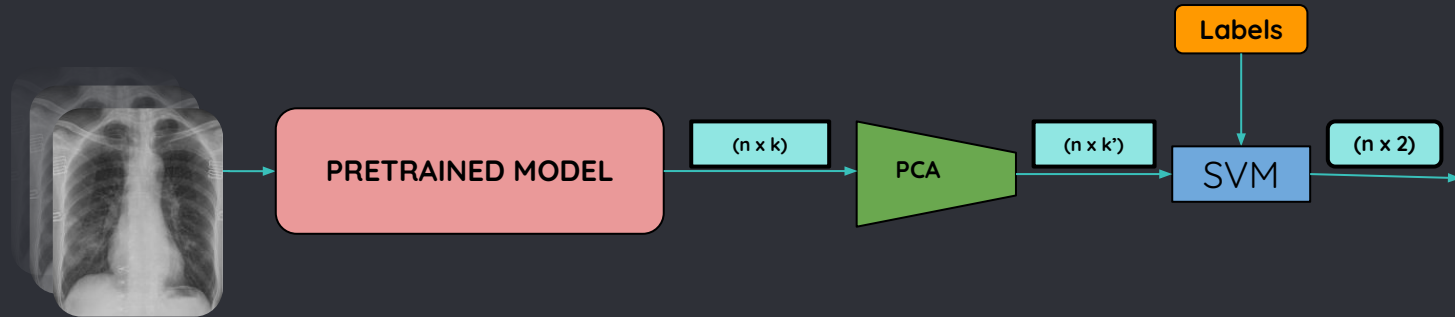
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Proposed methodology

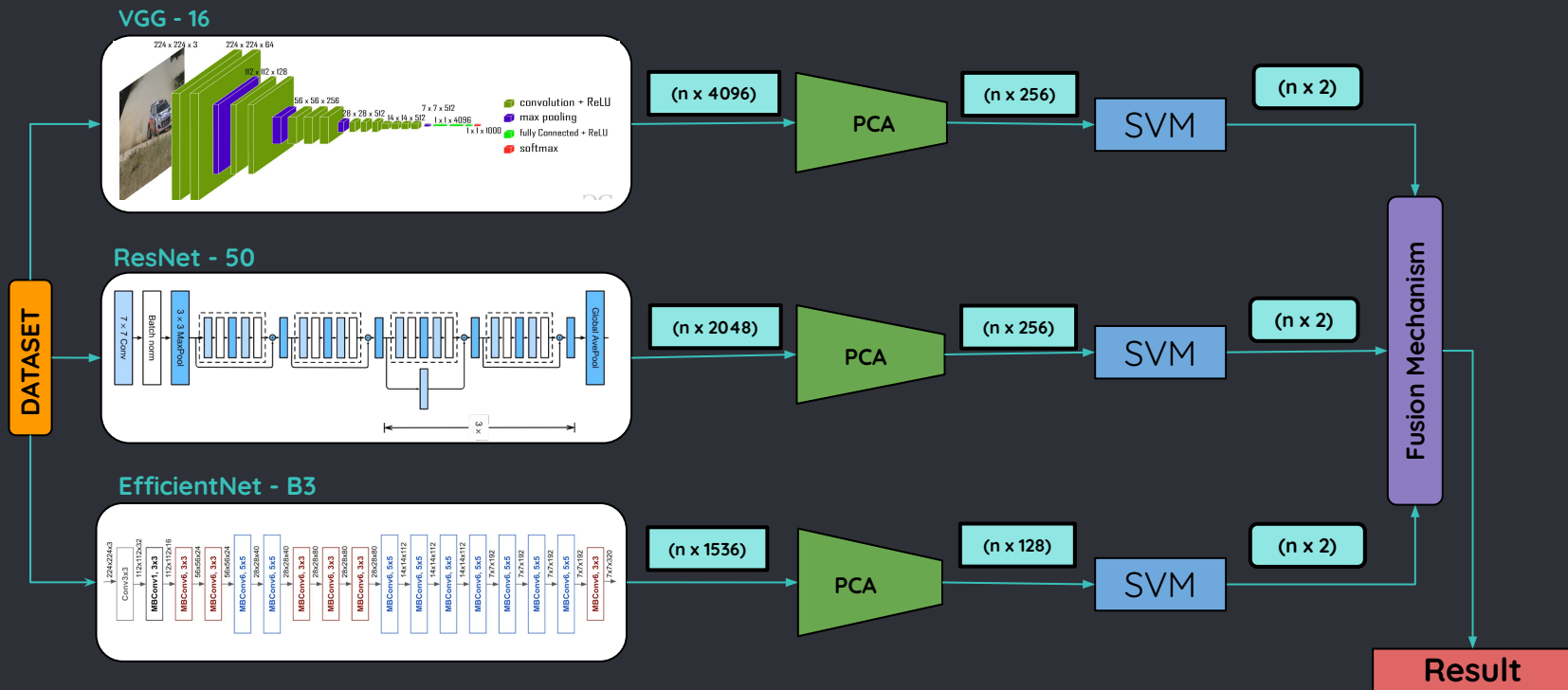
The Inner workings of our model.



- Workflow Diagram



Visual Representation



What is IMAGENET?

1. It is an image database organized according to the WordNet hierarchy, in which each node of the hierarchy is depicted by hundreds and thousands of images.
2. It consists of millions of images containing over 1000 classes and many thousand groups.
3. It is used to train various models over long periods of time, to attain superior accuracy.

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Results and Conclusion

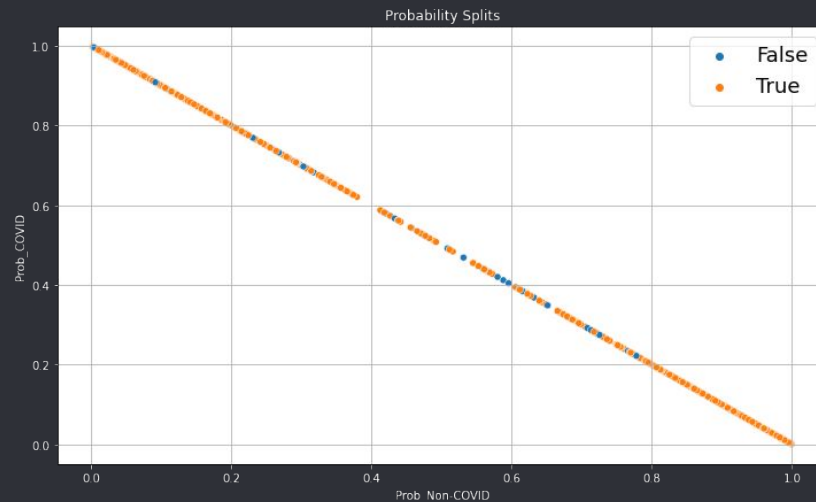
What we have achieved after this project

Confusion Matrices

Model	ACC	F1
VGG-16	92.73	89.32
EffNetB3	96.29	93.61
ResNet50	96.68	95.83
Final Model	97.31	96.16



Probability Plot & Intermediate Results



Model	Accuracy (%)
VGG + SVM	92.77
VGG + KNN	88.02
VGG + DT	79.43
VGG + RF	87.15

Model	Accuracy (%)
ResNet50 + SVM	96.68
ResNet50 + KNN	95.21
ResNet50 + DT	89.24
ResNet50 + RF	94.51

Model	Accuracy (%)
EffNet + SVM	96.29
EffNet + KNN	93.57
EffNet + DT	86.31
EffNet + RF	93.08

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Dataset

COVID - Data



The dataset used is the [Mendeley Dataset](#).

Class	No. of Images
Covid	4404
Non Covid	5500

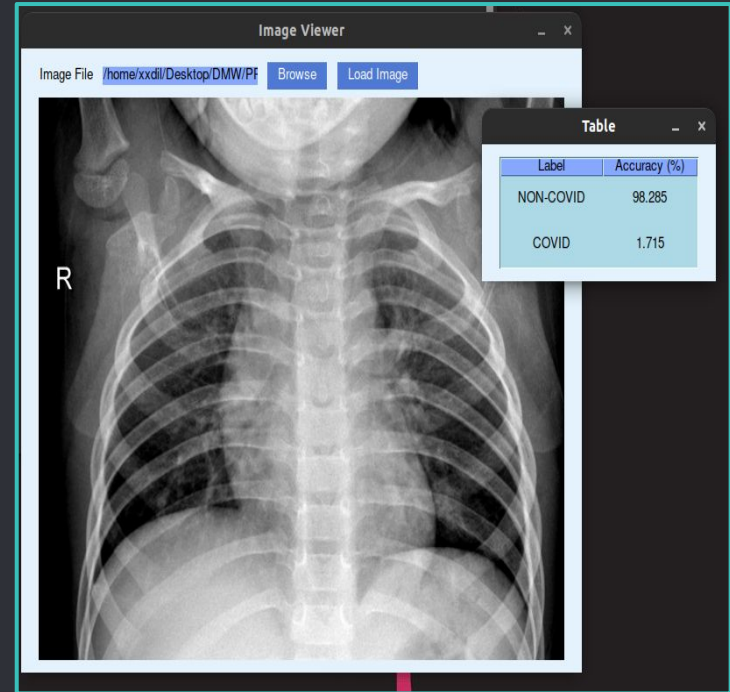
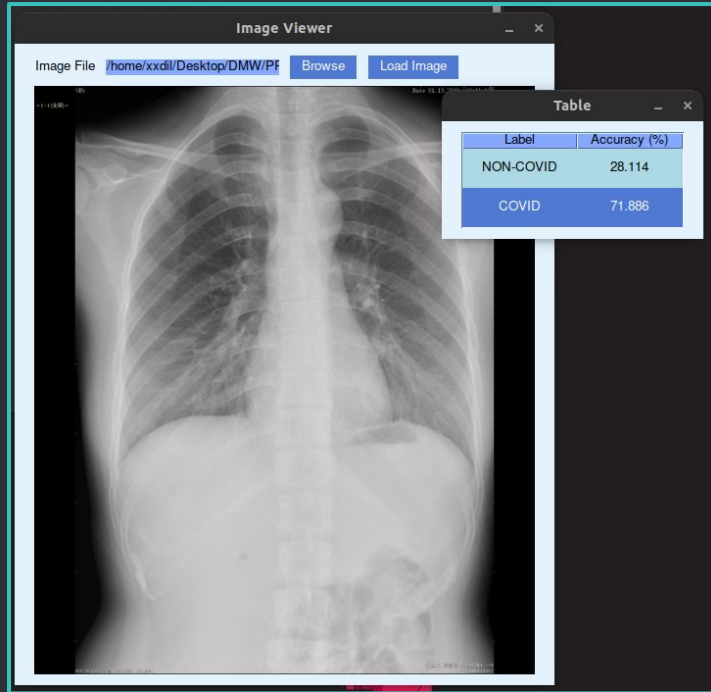
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Software & Technology

Software	Hardware
Numpy	Intel i7 (Our System)
Pandas	18 GB RAM (Colab)
Sklearn	NVIDIA 1080-Ti (Colab)
SimpleGUI	
Keras	
Tensorflow	



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Thank You.