Chest X-ray Classification

using

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INTRODUCTION

Introduction

- We were given a dataset containing chest X-ray images of n patients, and the corresponding diseases diagnosed.
- Given a set of 998 test images, we were asked to classify the images on any detection.
- We have used Convolutional deep learning models and developed stacked models to accomplish the given task.

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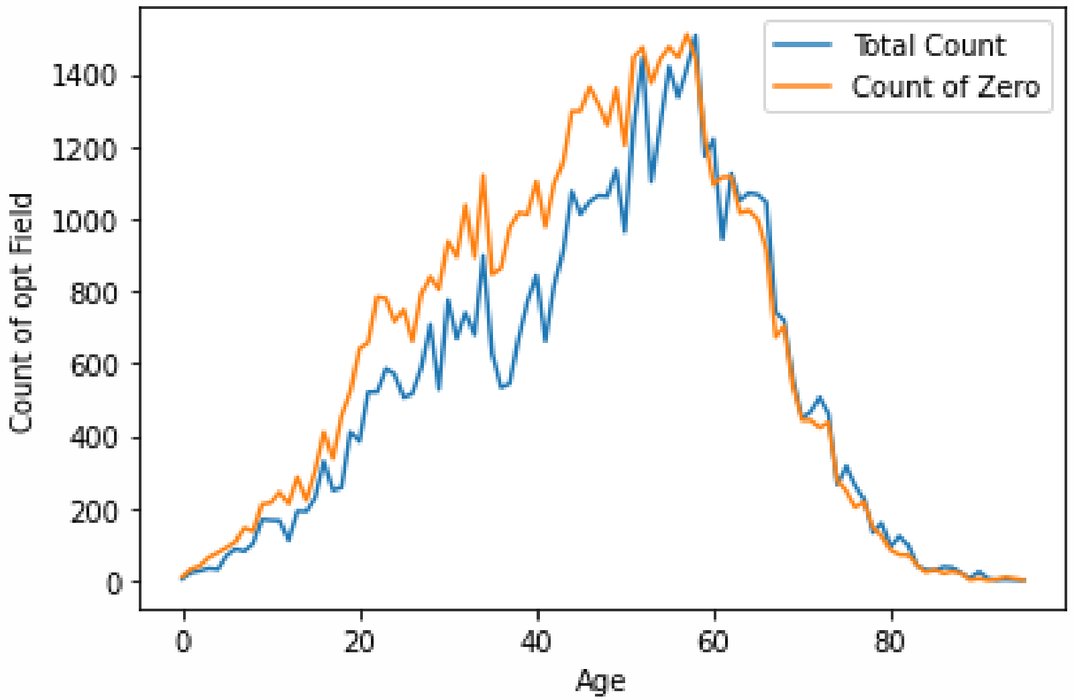
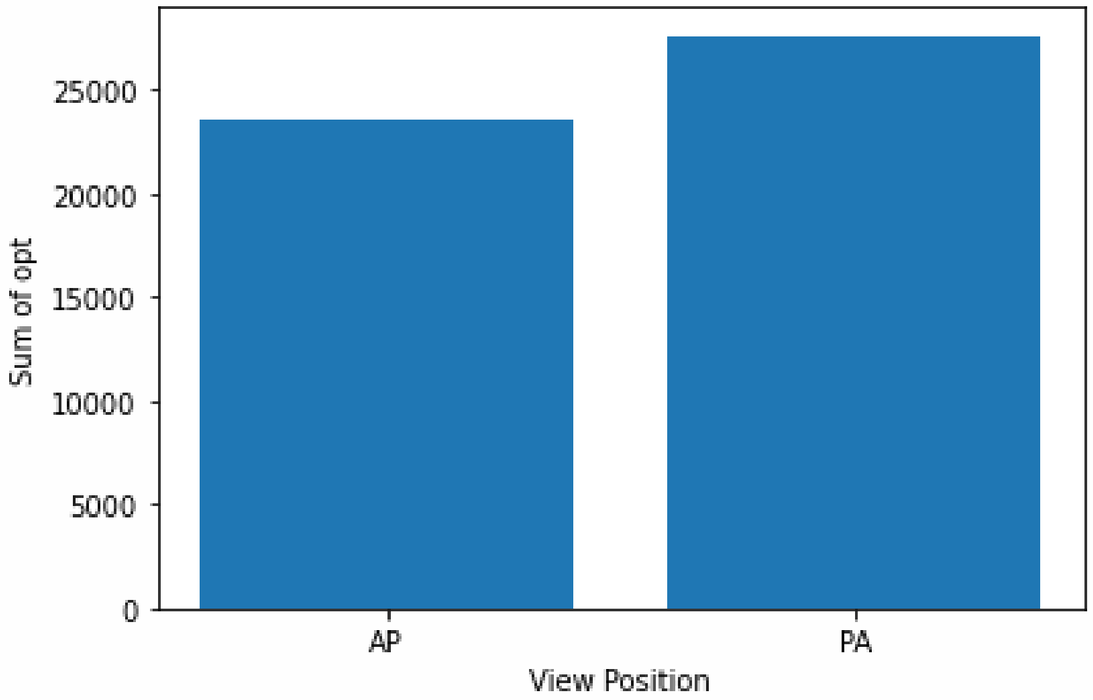
EXPLORATORY ANALYSIS

Exploratory Analysis





- The graph on the left, shows that the difference between the number of images corresponding to the 2 classes in negligible.
- The graph on the right, shows that P(y=1/AP) is almost equal to P(y=1/PA) .

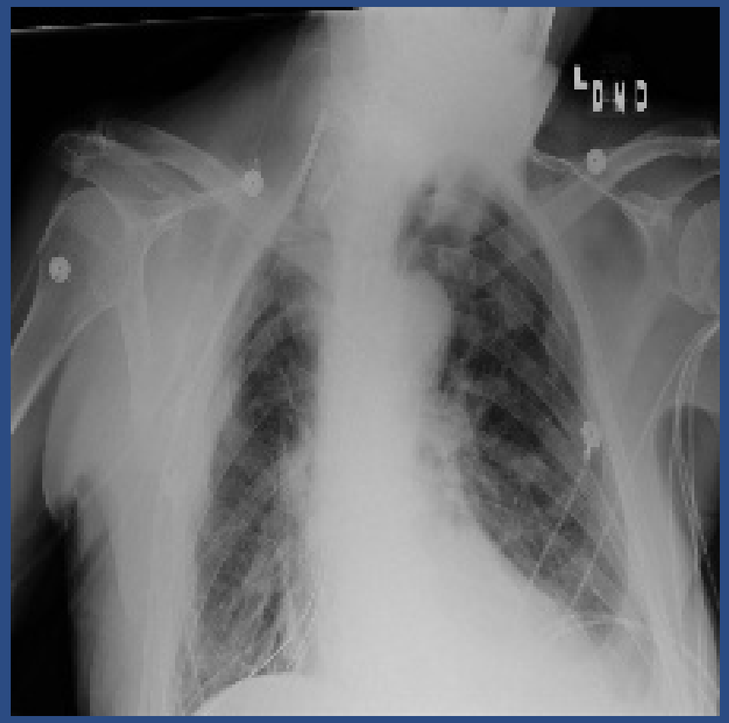
Image preprocessing Techniqueues

- We started with a simple resize function that resizes the images to size 224x224 from 1024x1024, retaining the 3 channels, to ease the training process and to reduce the training time.

- We then used the resize function with cubic interpolation, which downsizes the image by taking the pixel values from interpolation of the nearest pixels WRT a cubic function.

- We finally found that the information loss is minimum when using a equilizer function which normalizes the R,G,B histograms of the resized images.

Image preprocessing Techniqueues



cubic_interpolation

Equilized image

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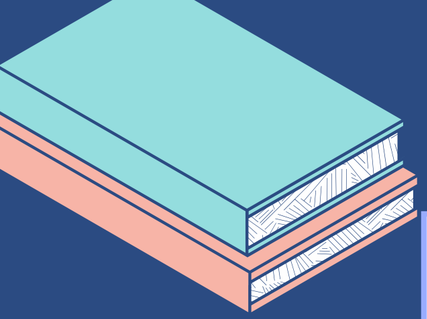
APPROACH & MODEL



Approach and Models

Models	Pretrained weights	Validation accuracy
InceptionV3	Imagenet	68.45
ResNet50V2	Imagenet	64.37
MobilNetV2	Imagenet	67.43
VGG16	Imagenet	66.89
DenseNet169	Imagenet	64.21
DenseNet169+VGG16+MobNetV2	Imagenet	68.38
DenseNet121+InceptionV3+ResNet	Imagenet	64.74
Shallow CNN	None	41.13
Densenet121+ResNet224	cheXnet	72.79

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FINAL APPROACH

Problem

- In our initial approach, we made use of Resnet, Densenet, VGGnet, Mobilenet, inceptionNet, initialized with pretrained weights over imagenet and added a few dense layers with variable weights.

- They turned out to be very similar in terms of prediction since there was no updation of weights in the principal architectures.

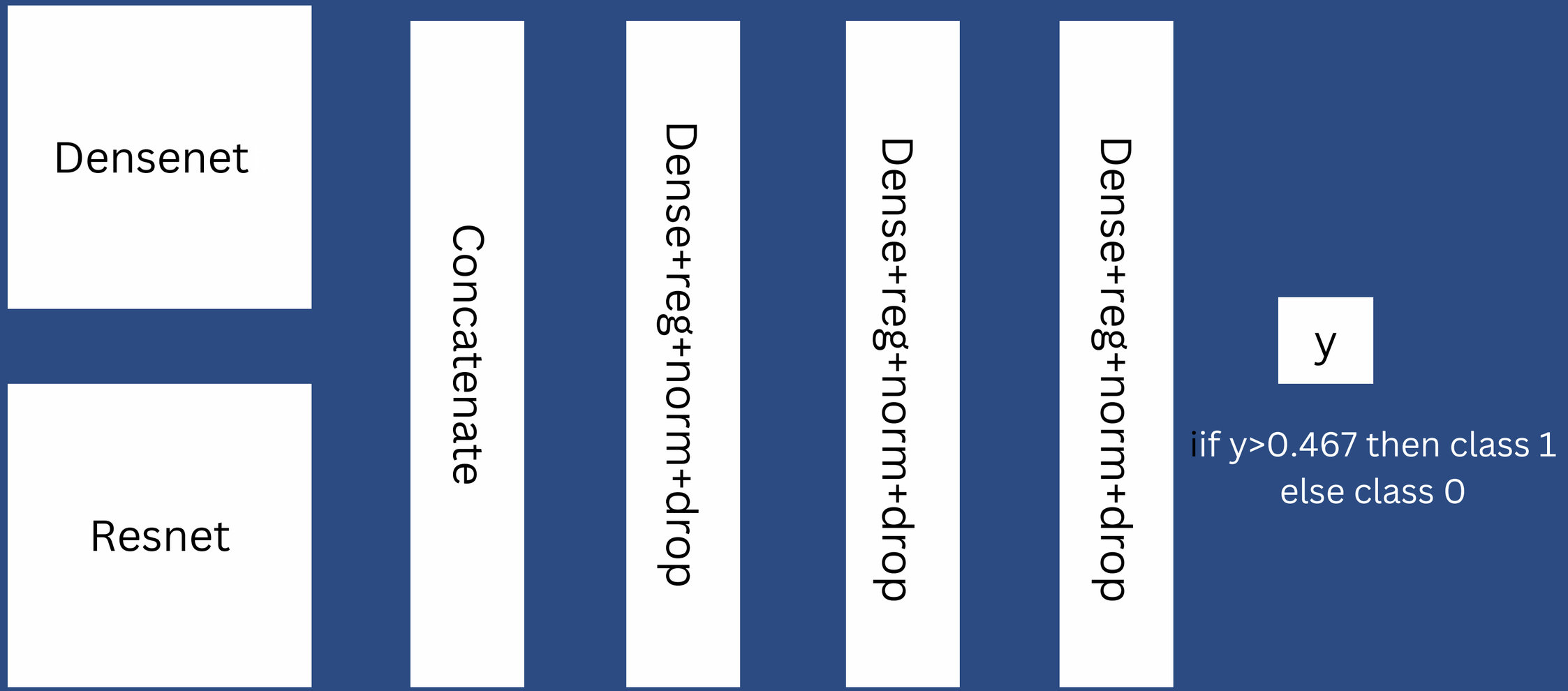
Solution

- We used the cheXnet weights obtained from pre-trained models trained over chest X-ray dataset over Resnet and densenet which predicts 14 classes of diseases.

- We then applied a Dense stack over the outputs from the last but one layer with trainable weights and trained the model on 5 fold cross validation.

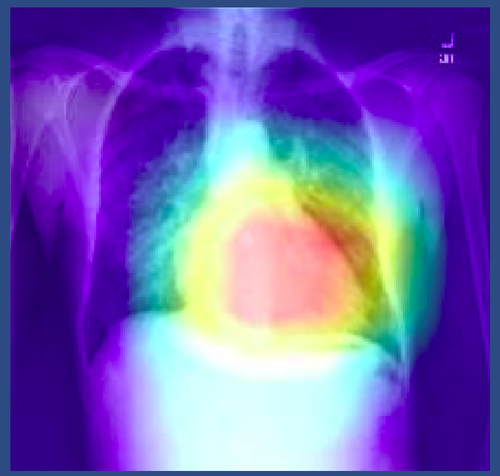
- And then applied suitable tresholding(treshold = 0.467), to convert the output probability to 0/1 predictions.
- Link to the code:https://github.com/mikerajurocks246/Chest_XRAY

Our Model

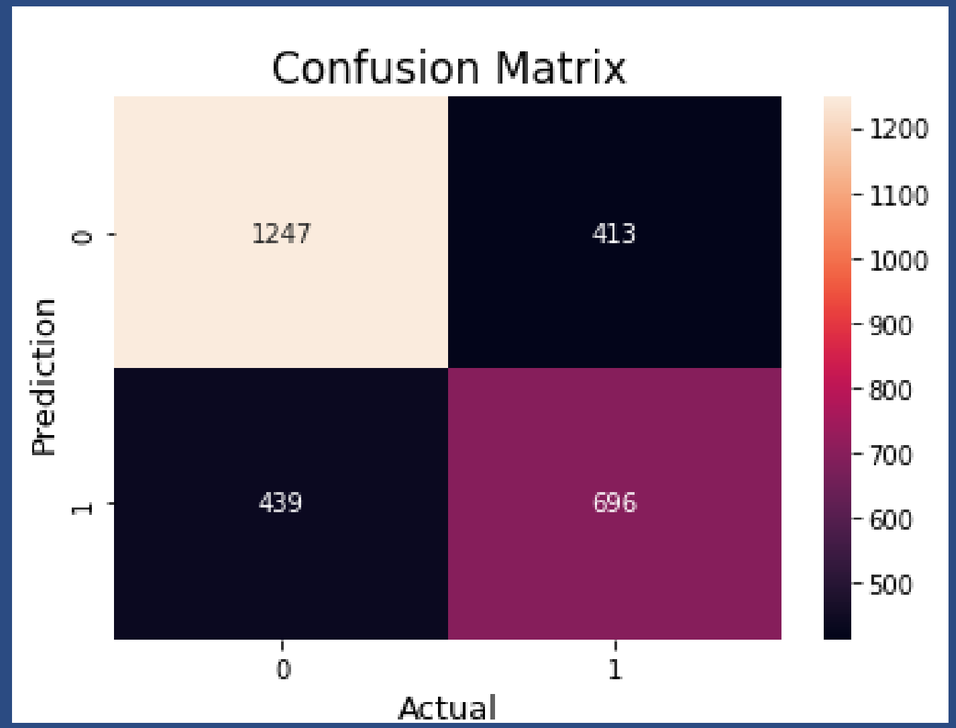

Densenet
Resnet
Concatenate
Dense+reg+norm+drop
Dense+reg+norm+drop
Dense+reg+norm+drop
y
iif y>0.467 then class 1
else class 0

Heatmap of predictions and confusion matrix over y_val

image



GradCAM heatmap



Thank You!