Improved tumor detection using Deep Learning approach

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Introduction:

- Lung problems are a pressing global health issue, impacting individuals across all age groups. From chronic respiratory diseases to lung cancer, these conditions significantly affect quality of life.
- with smoking being the primary risk factor, and with more than 1.1 billion smoker around the world.
- These problems are hard to detect at early stages leading to poor prognosis and limited treatment options.

This technology allows early detection and timely intervention, improving treatment outcomes and increasing the chances of successful recovery.

Objectives:

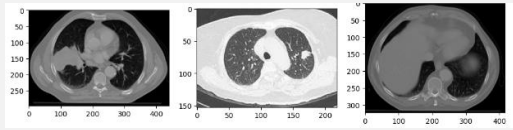
Detecting chest tumor using modified VGG16 Neural Network Architecture.

- Detect cancer tumor on chest CT scan images.
- Maximize the efficiency by achieving high accuracy on a low scale of train data.
- Increasing base VGG16 efficiency by proposing some adjustments.

Methods:

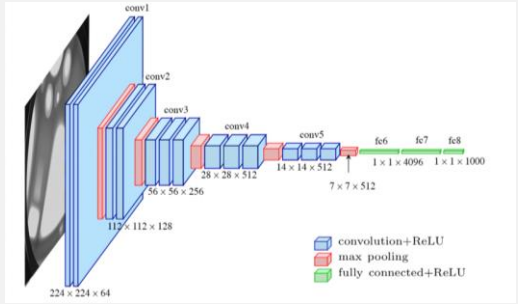
Image processing & manipulation

- Using Pillow and OpenCV, we were able to change the color mode to grey scale, adjust the brightness, contrast, and the size of images.
- Making it ready to be entered to the model.



Feature Extraction & Classification

Using a modified VGG16 CNN architecture



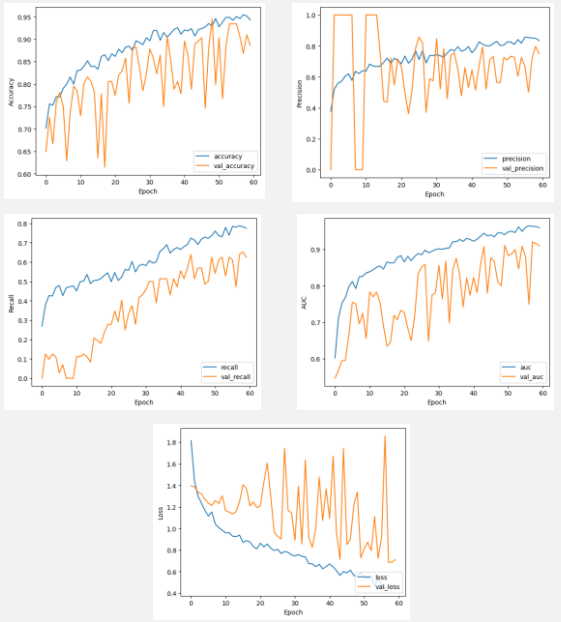
- Using enhanced activation function (selu) instead of (ReLU) to prevent some disadvantages of ReLU such (as dead ReLU) and to use the advantages of standardization in selu.
- Adding drop out and batch normalization layers to prevent over fitting.
- Removing the, last (5^{th})set of convolutional layers to prevent vanishing gradient.

Results:

our model accuracy:

Train : 95.1% ,
Validation: 90.9%
Test: 80%

Result are obtained by training the model on a Kaggle dataset of chest CT scans.



	Train	Validation	Test
Our Model	95.1 %	90.9 %	80.0 %
VGG16	81.7 %	77.4 %	79.3 %
ResNet50	73.0%	80.8 %	81.6 %

These results are provided from other users' scripts in the same Kaggle dataset.

Conclusion:

We were able to achieve higher accuracy compared to the base VGG16 model and achieved accuracy levels like those of the ResNet50's model.

Retaining the model from overfitting by dropping percentage of the data at the entry of each stage as mentioned in the architecture.

Retaining the advantages of VGG16's architecture such as simplicity, readability, generalization, and transfer learning.

Defusing some of the disadvantages of the VGG16 like large model size, high memory requirements, and overfitting.

Acknowledgment:

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and we are seeking towards more upcoming projects like those for having a greater insights towards AI.