Pneumonia Detection Using Deep Learning Techniques

Presented By

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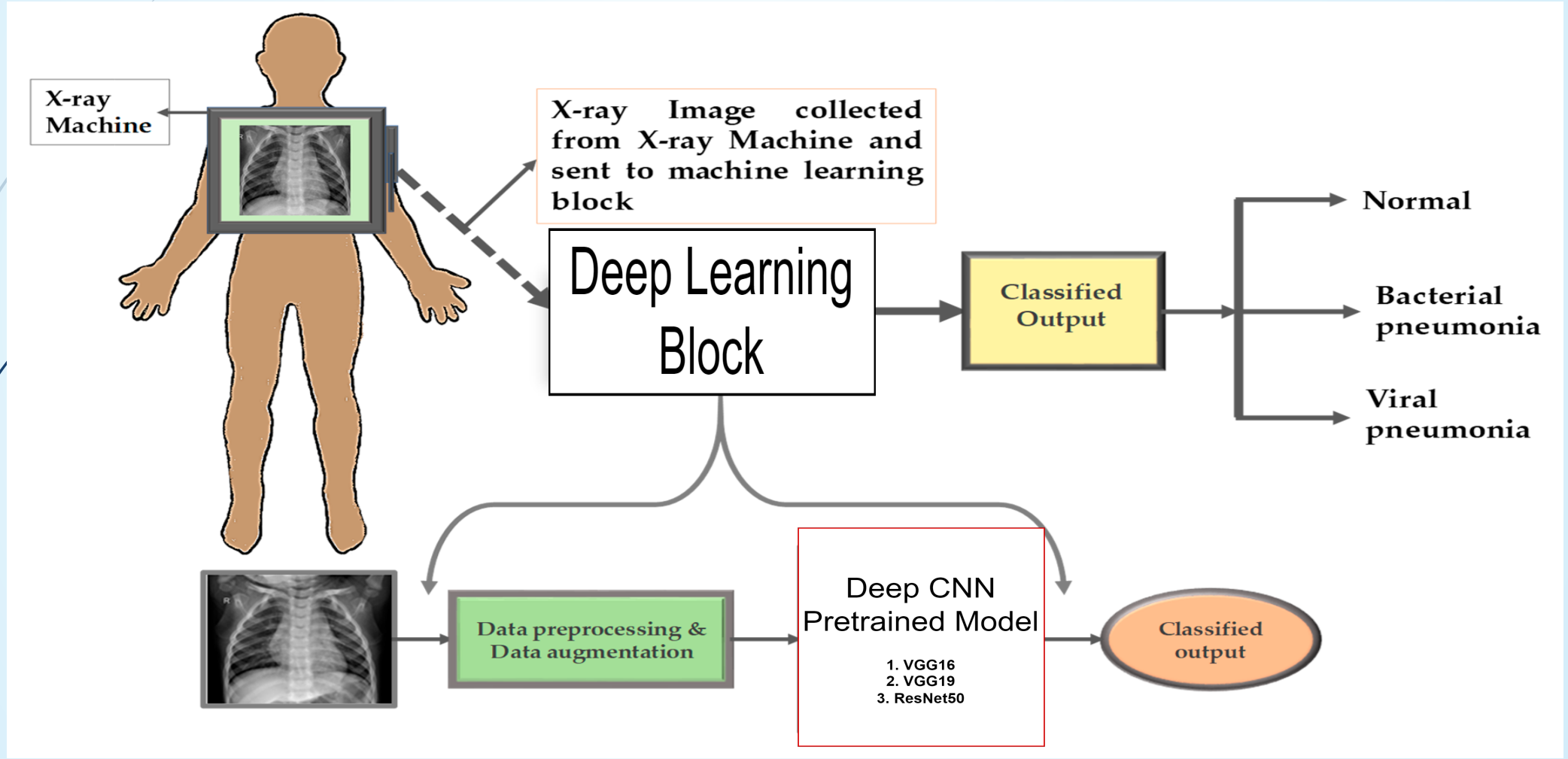
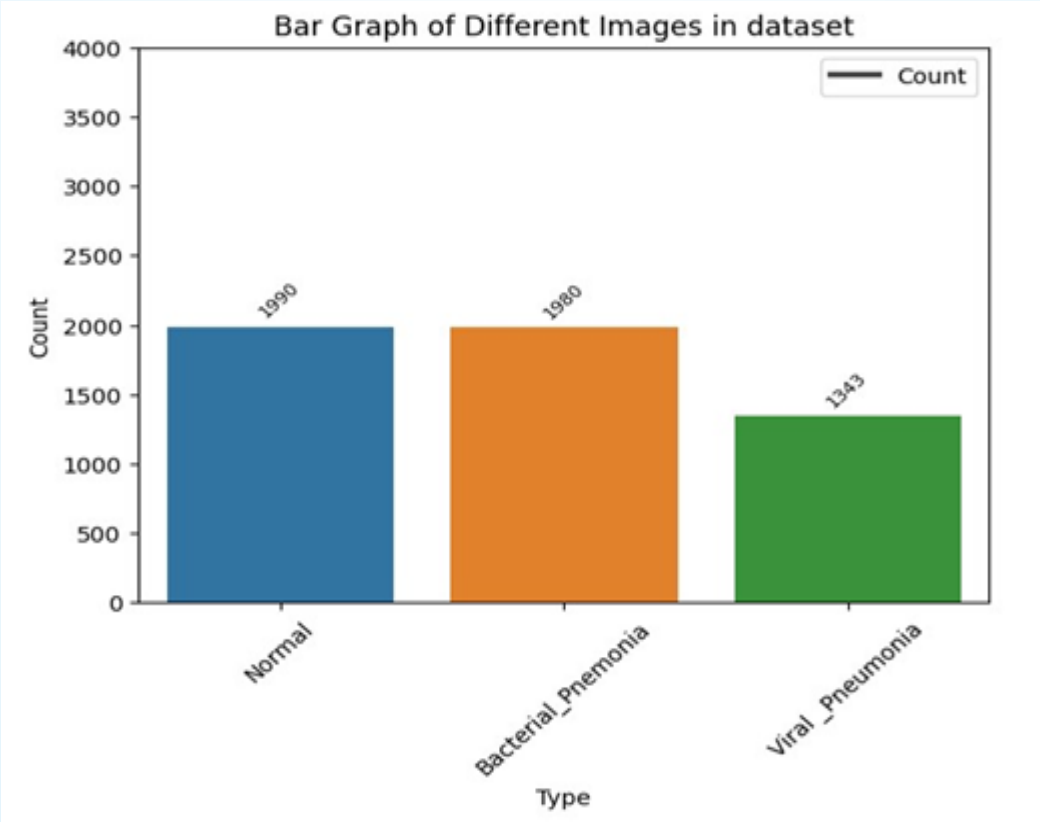
Introduction

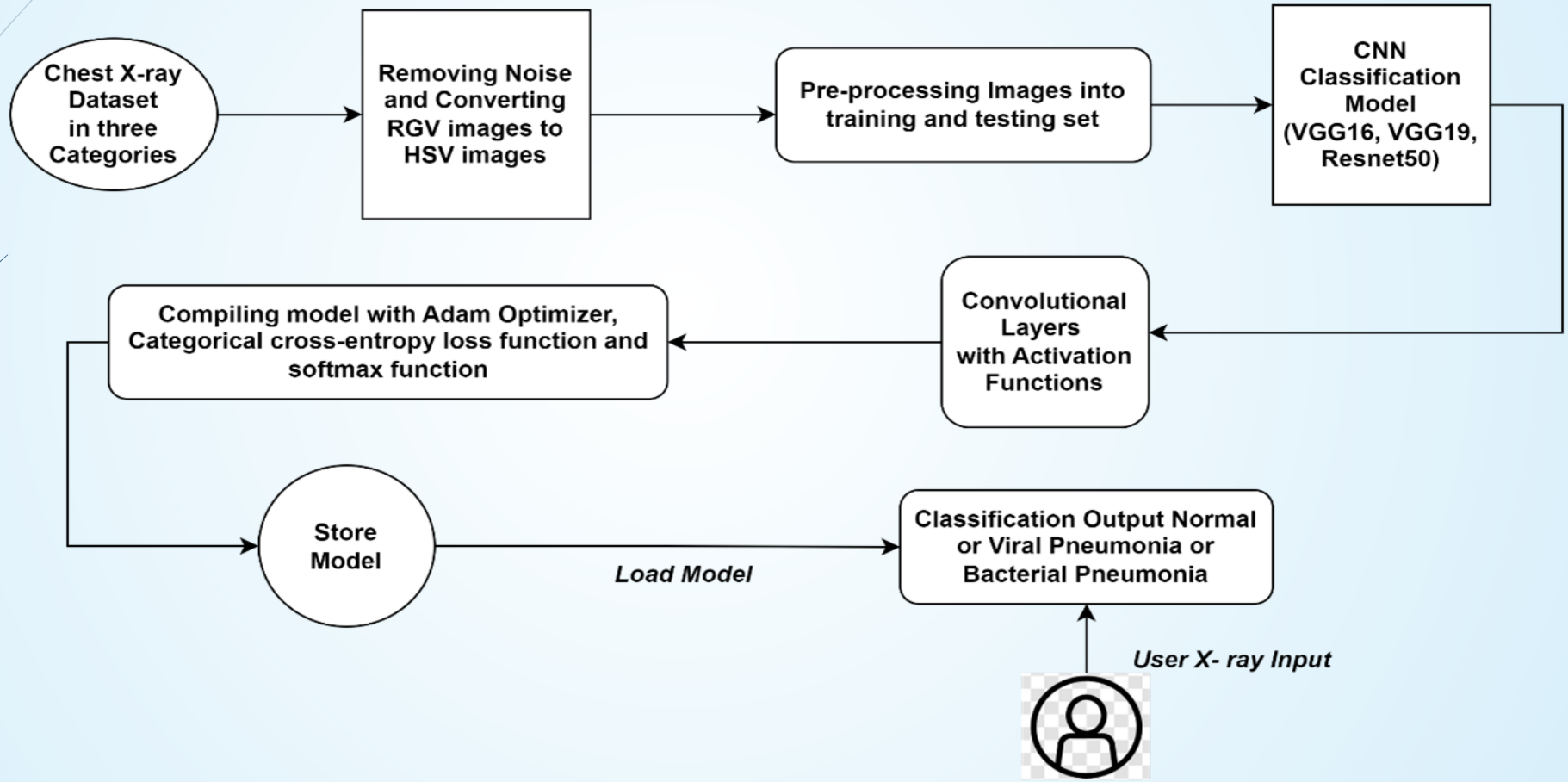


Dataset

From Kaggle: https://data.mendeley.com/datasets/rscbjbr9sj/2

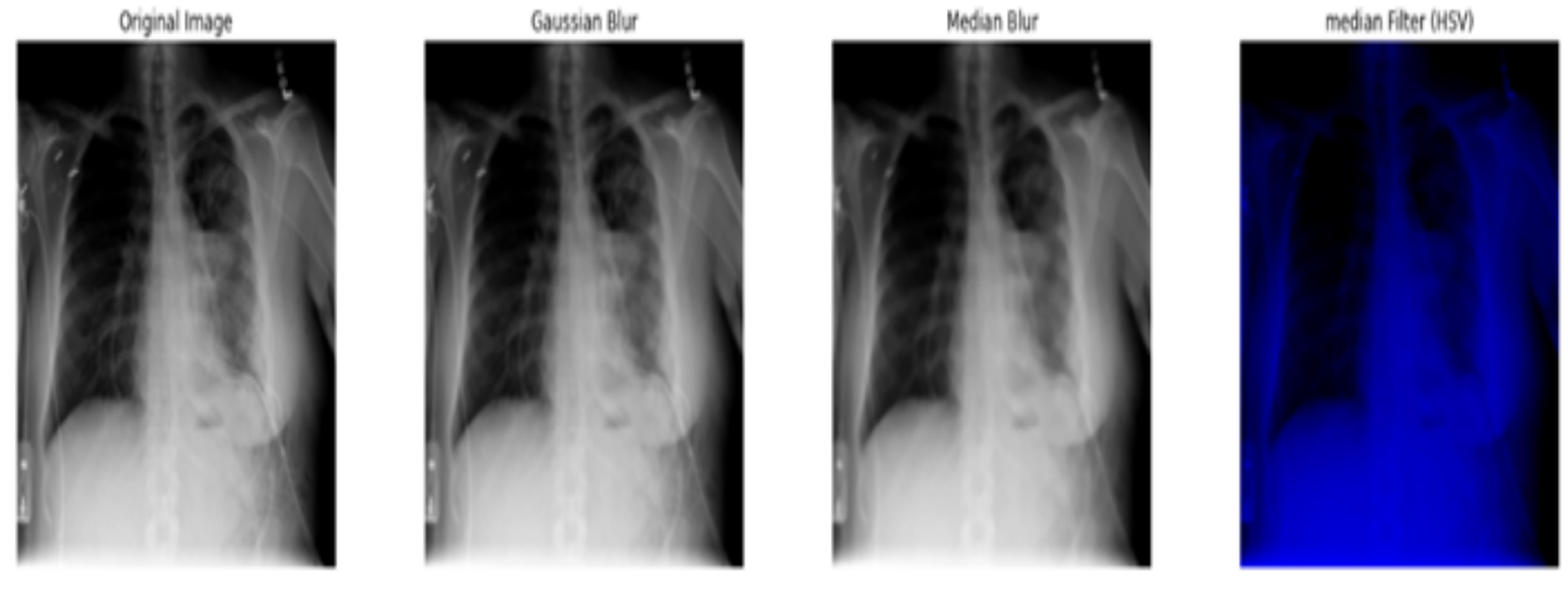


Methodology



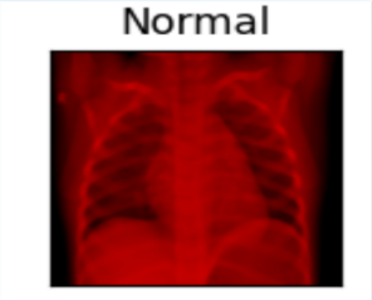
Step 1: Image Processing

Original image→ Gaussian Blur → Median Blur → Median Filter(HSV)
Generated new Dataset2



Step 2: Pre-processing Image

Divided the data into a 75% training set and a 25% testing set using scikit-learn.



Next utilized the Keras library for creating image data generators to facilitate efficient training and testing of a neural network. The ImageDataGenerator is configured with a preprocessing function and a validation split of 20%. It is then applied to create generators for training, validation, and testing datasets, specifying parameters such as file paths, labels, target size, class mode, batch size, and shuffling preferences. These generators streamline the process of feeding image data into the neural network during model training and evaluation.

Step 3: Applying CNN model

VGG16

- VGG16: 16 layers, uniform design, 3x3 filters, with fully connected brilliance.
- VGG16 excelled in ImageNet, showcasing remarkable image classification capabilities.
- VGG16: Premier choice for transfer learning in diverse computer vision projects.

VGG19

- VGG19 extends VGG16 by adding three additional convolutional layers, offering a deeper network.
- Due to its increased depth, VGG19 often exhibits enhanced accuracy compared to VGG16.
- Like VGG16, VGG19 is a valuable pre-trained model for transfer learning.

ResNet50

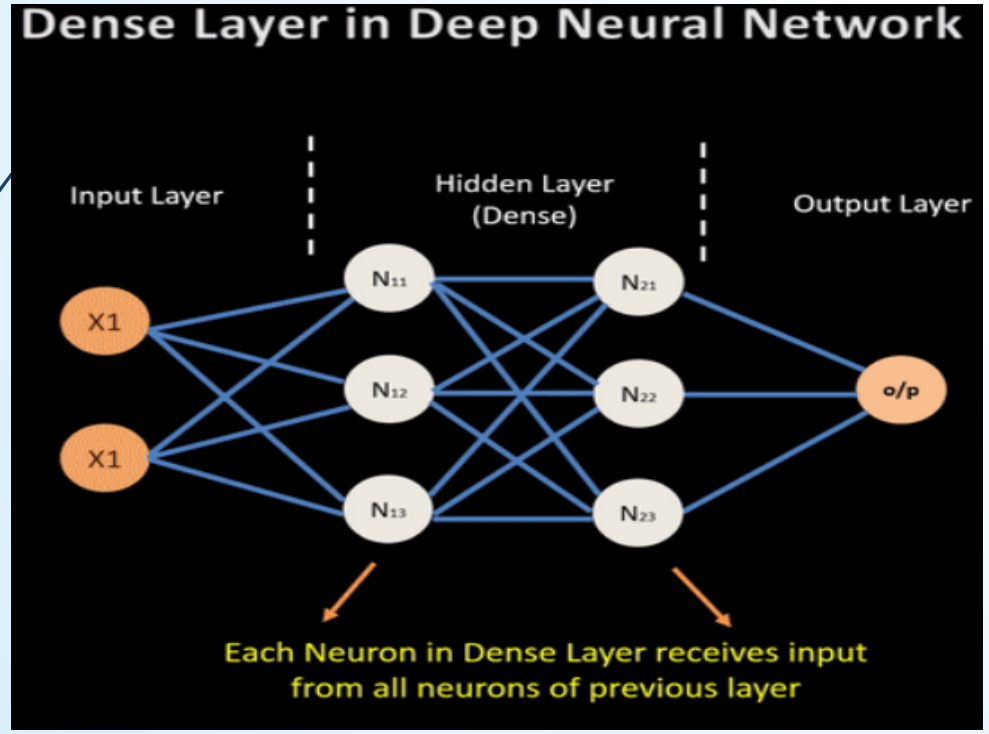
- ResNet-50 introduces the concept of residual learning, addressing the vanishing gradient problem in deep neural networks.
- ResNet-50: High accuracy, fewer parameters, surpassing traditional deep networks' efficiency.
- ResNet-50 excels in transfer learning with pre-trained weights

Step 4: Convolution layers with activation functions

Dense Layer

Rectified Linear Unit(ReLu)

Softwax Function



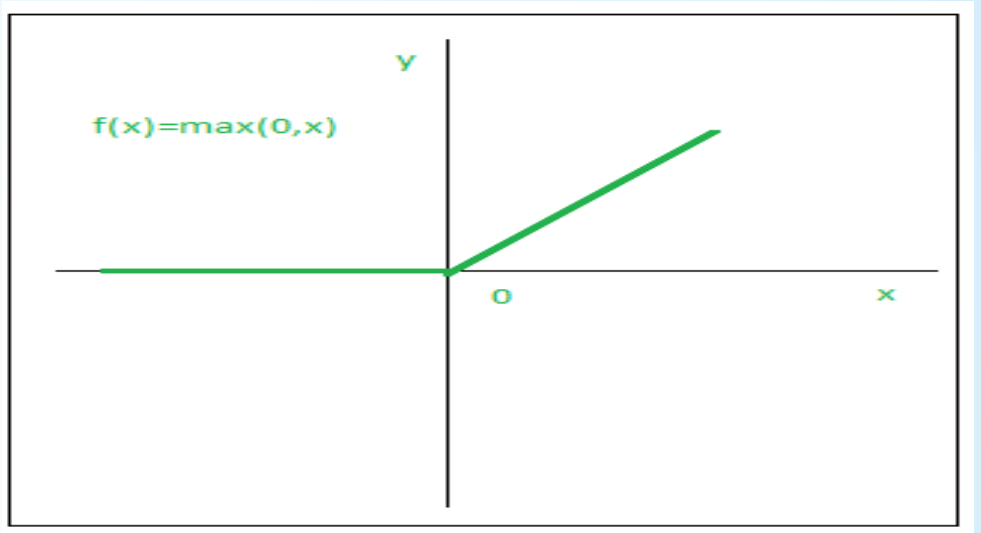


Fig 1: ReLu Activation Function

$$P(y = i) = \frac{e^{z_i}}{\sum_{j=1}^{K} e^{z_j}}$$

Fig 2: SoftMax Activation Function Formula

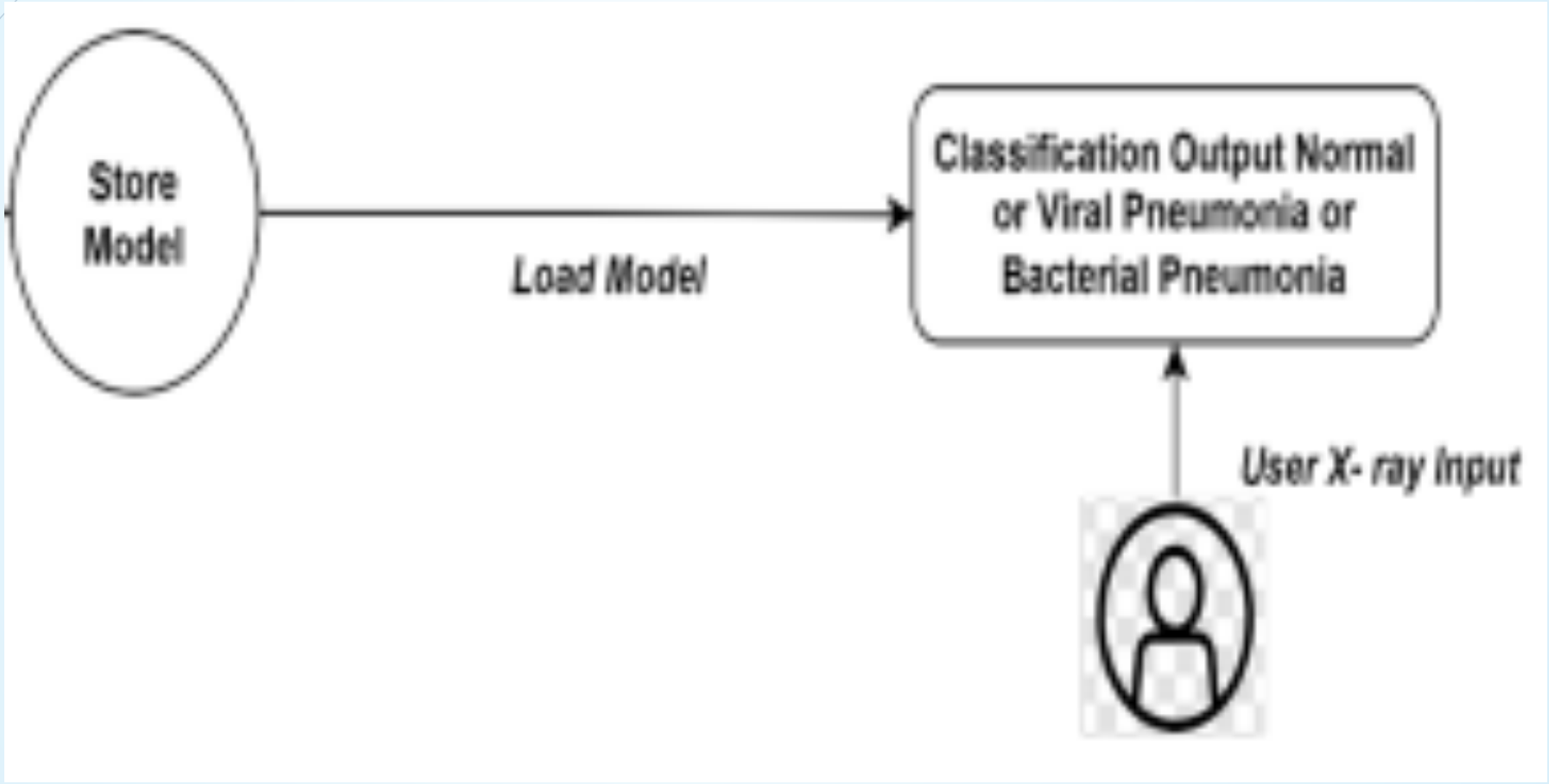
Step 5: Compiling Model

Adam Optimizer

Categorical cross-entropy

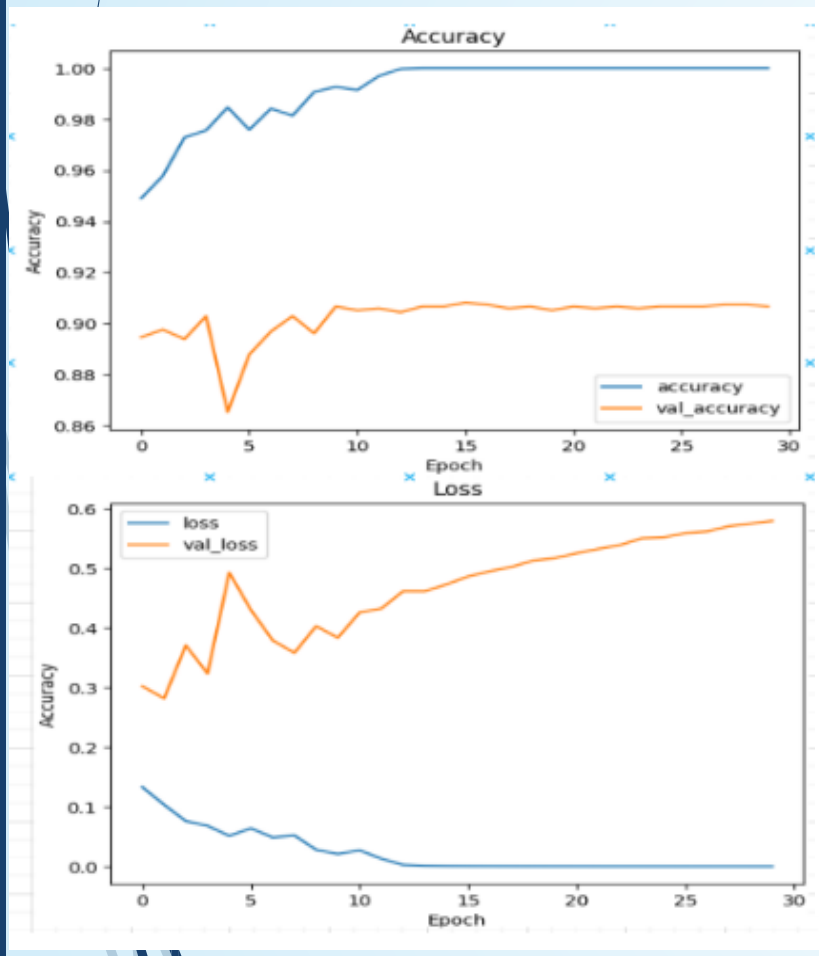
Accuracy Metric

Step 6: Classification of image

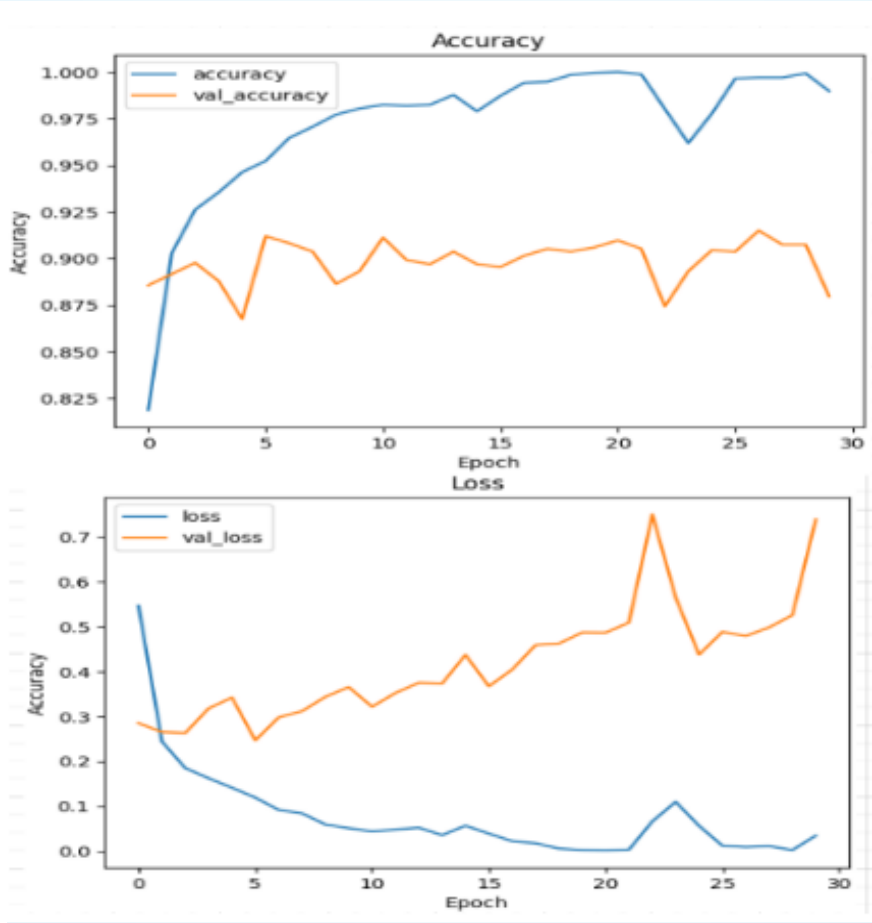


Results

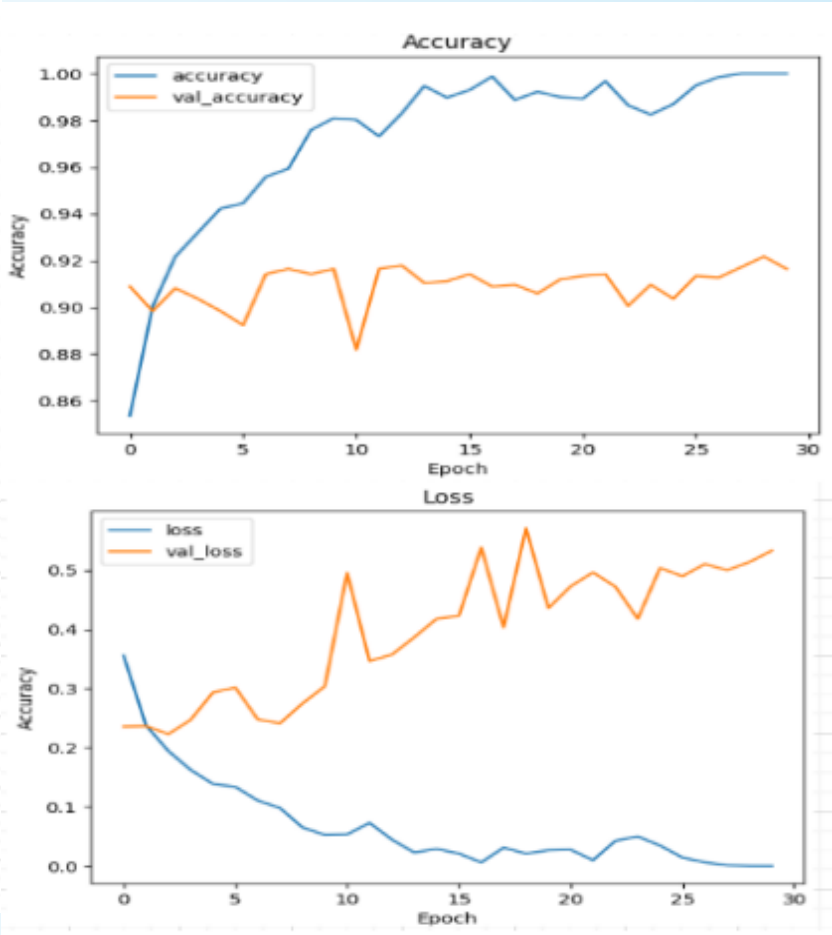
VGG16



VGG19



ResNet50



Accuracy and Loss graphs of VGG16, VGG19, ResNet50

Classification Reports Of CNN Models

	precision	recall	f1-score	support
Bacterial_Pnemonia	0.36	0.37	0.36	482
Normal	0.36	0.34	0.35	504
Viral _Pneumonia	0.25	0.25	0.25	343
accuracy			0.33	1329
macro avg	0.32	0.32	0.32	1329
weighted avg	0.33	0.33	0.33	1329

VGG16

	precision	recall	f1-score	support
Bacterial_Pnemonia	0.92	0.91	0.92	501
Normal	0.90	0.78	0.84	488
Viral _Pneumonia	0.81	0.98	0.89	340
accuracy			0.88	1329
macro avg	0.88	0.89	0.88	1329
weighted avg	0.88	0.88	0.88	1329

VGG19

	precision	recall	f1-score	support
Bacterial_Pnemonia	0.90	0.93	0.92	494
Normal	0.91	0.87	0.89	493
Viral _Pneumonia	0.95	0.96	0.95	342
accuracy			0.92	1329
macro avg	0.92	0.92	0.92	1329
weighted avg	0.92	0.92	0.92	1329

ResNet50

Accuracy Comparison Table

Model Name	Training Accuracy(%)	Training Loss(%)	Validation Accuracy(%)	Validation Loss(%)	Testing Accuracy(%)	Testing Loss(%)
VGG16	100	12.82	**90.67**	57.93	90.67	57.932
VGG19	98.97	35.0	**87.96**	52.50	87.96	73.796
ResNet50	100	27.51	**91.65**	53.29	91.65	53.286

Predicting the Type of Cancer (Output)

```
labels = ["bacterial_pneumonia", "normal", "viral_pneumonia"]

[[99  0  0]]
Predicted Label: bacterial_pneumonia

[[ 0 99  0]]
Predicted Label: normal

[[ 0 41 58]]
Predicted Label: viral_pneumonia
```

Conclusion

In summary, ResNet50 demonstrates the highest training accuracy (100%) and impressive validation accuracy (91.65%), making it the most robust model among VGG16, VGG19, and ResNet50. VGG16 follows closely with a training accuracy of 100% and a validation accuracy of 90.67%. Meanwhile, VGG19 lags behind with a slightly lower training accuracy (98.97%) and the lowest validation accuracy (87.96%) among the three models. ResNet50 emerges as the best model among the three, showcasing both high training accuracy (100%) and superior validation accuracy (91.65%).

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THANK YOU

Q&A