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CLASSIFICATION OF BREAST CANCER IMAGES WITH TRANSFER LEARNING AND DEEP CONVOLUTION NEURAL NETWORKS

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Abstract: Breast cancer is the leading cause of death among women worldwide. Approximately 8% of women are diagnosed at some point in their lives. In order to limit the number of people dying from cancer, early diagnosis is necessary to stop the growth of cancerous cells. Deep Learning (DL) algorithms are now widely employed in the categorization of breast cancer. They have a high degree of classification accuracy as well as diagnostic capabilities. As a result, in Classification of Breast Cancer, we utilize transfer learning approaches to classify breast cancer utilizing a Deep Convolutional Neural Network (CNN).

Keywords: Deep Convolutional Neural Network, transfer learning, Breast Cancer, Deep Leaning

I. INTRODUCTION

The second most common cause of mortality for women is breast cancer. Treatment outcomes for breast cancer can be improved by using computer-aided detection (CAD) technologies for mammographic detection. Breast Cancer is a type of cell that results in a lot of mass growth in the breasts of women. Biopsy is done for diagnosis where affected tissue is extracted and a pathologist examines the sample under a microscope.

These microscopic images are called histopathological images. Pathologists can distinguish between benign and malignant lesions via biopsies based on density of cells in the sample which can be a tedious job. Deep neural networks, among the numerous ML techniques, can be implemented to automate this process.

II. RELATED WORK

A. Saber, M. Sakr, O. M. Abo-Seida, A. Keshk and H. Chen, "A Novel DeepLearning Model for Automatic Detection and Classification of Breast Cancer Using the Transfer-Learning Technique," in IEEE Access, vol. 9, pp. 71194-71209, 2021, Doi: 10.1109/ACCESS.2021.3079204. Abeer Saber et al. have written about Convolution Neural Network and Transfer Learning techniques are used on Mammographic images to classify them and comparison of various pre-trained models and has concluded that VGG19 as better model. From this paper we have learnt about how transfer learning can help speed up the process of classification by reducing training time.

Noorul Wahab, Asifullah Khan, Yeon Soo Lee, Transfer learning based deep CNN for segmentation and detection of mitoses in breast cancer histopathological images, Microscopy, Volume 68, Issue 3, June 2019. Wahab N, et al presented this paper on how mitoses in breast cancer images are counted using TL-HCNN-Mit-Det techniques and use of various pre-trained models are compared. This paper also talks about transfer learning methods but here, it is applied on histopathological images to detect mitoses.

2.1PROPOSED ARCHITECTURE

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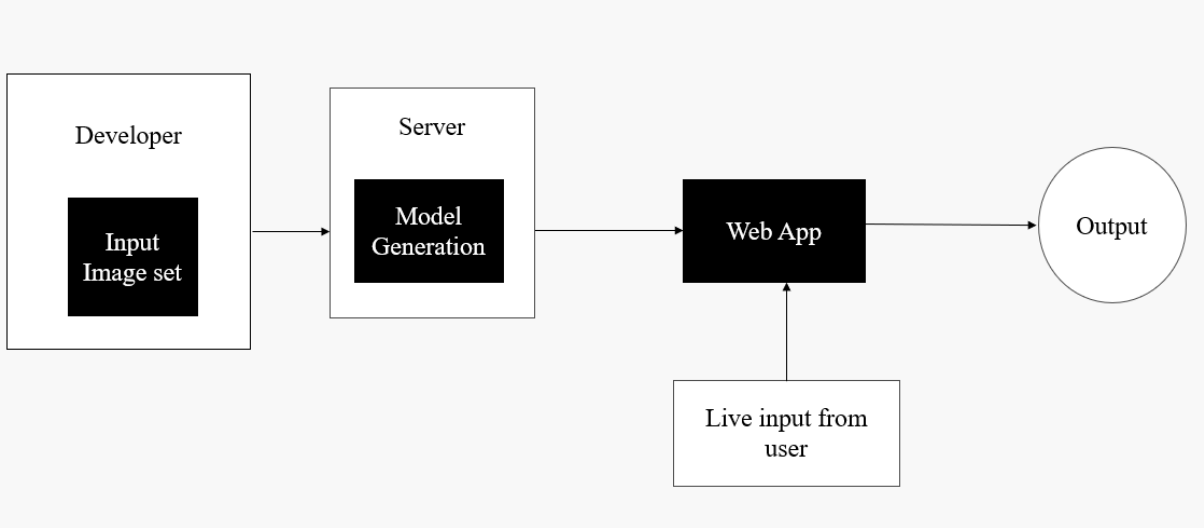

2.2PROPOSED SYSTEM

In the Classification of Breast Cancer (Breast Cancer) we used histopathological images from dataset. We apply transfer learning in Convolution Neural Network to detect breast cancer from images and training a Neural Network-classifier by feature extraction is a faster method. Histopathologic images are used to classify Breast Cancer image as benign or malignant using the technique of Convolution Neural Network along with transfer learning with pre-trained models like ResNet50 v2.

Advantages:

In the classification of breast cancer, we can able to find the women is suffering from the breast cancer in earlier stages so, by using this technique there are more chances to decrease the death rate of women who is suffering from breast cancer. Biopsies are more accurate than X- Rays or mammographic images. We use histopathological images, which are biopsy images. Whereas traditional methods require extensive time-consuming one data at a time analysis, after a brief training phase, the convolution neural network analyses a significant amount of data. Convolution neural networks are simple to code and have good predictive accuracy. In contrast, conventional wisdom holds that forecasting outcomes in medicine requires years of expertise. The non-availability of sufficient data in this particular situation is curbed with the use of transfer learning techniques whing learns from a pre-trained or previously learnt problems.

2.3 PROPOSED ALGORITHM

Transfer Learning:

Transfer learning is a technique used in deep learning to leverage pre-trained models on a large dataset and apply them to a new task or dataset with limited labelled data. In the provided code snippet, transfer learning is demonstrated using the ResNet50V2 model from the Keras library.

The code begins by importing the necessary modules from TensorFlow and Keras. The ResNet50V2 model is loaded with pre-trained weights from the ImageNet dataset, which is a large dataset containing various images across multiple categories. The input shape is (224, 224, 3), indicating that the model expects images of size 224x224 pixels with three color channels (RGB).

CCN:

The next step is to define the input layer of the new model using keras. Input with the same shape as the input shape specified earlier. This creates a symbolic tensor that can be used as an input to the model.

The base model is then applied to the input tensor x using base model (inputs, training=False). By passing training=False, the base model's batch normalization layers are set to inference mode, ensuring they use the learned statistics during training and inference consistently

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1. Pooling Layer

The output of the base model is then passed through a GlobalAveragePooling2D layer, which computes the spatial average of each feature map, reducing the spatial dimensions. This step helps capture the global context of the image.

2. Dropout Layer:

To regularize the model and reduce the risk of overfitting, a layer that drops out at a pace of 0.2 is applied after the pooling layer. Dropout prevents over-reliance on any one feature by setting a percentage of input units to 0 at random during training.

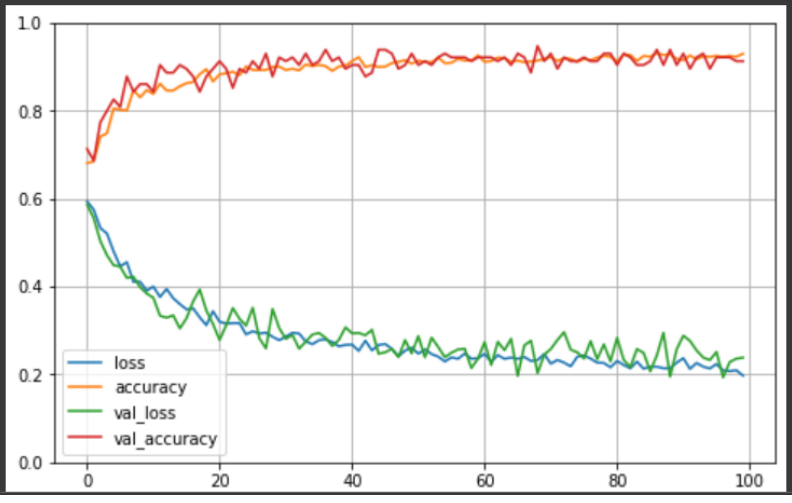
3. Dense Layer:

Finally, the output of the dropout layer is connected to a Dense layer with a single unit and a sigmoid activation function. This dense layer serves as the classifier for the new task and is responsible for predicting a binary output (0 or 1) by applying the sigmoid activation function.

III. RESULTS

Output Screens

```
pd.DataFrame(history.history).plot(figsize=(8, 5))
plt.grid(True)
plt.gca().set_ylim(0, 1)
plt.show()
```



SS

```
[ ]  test_loss, test_acc = model.evaluate(test_gen)
     print('Test accuracy:', test_acc)

     4/4 [==============================] - 1s 306ms/step - loss: 0.1723 - accuracy: 0.9344
     Test accuracy: 0.9344262480735779
```

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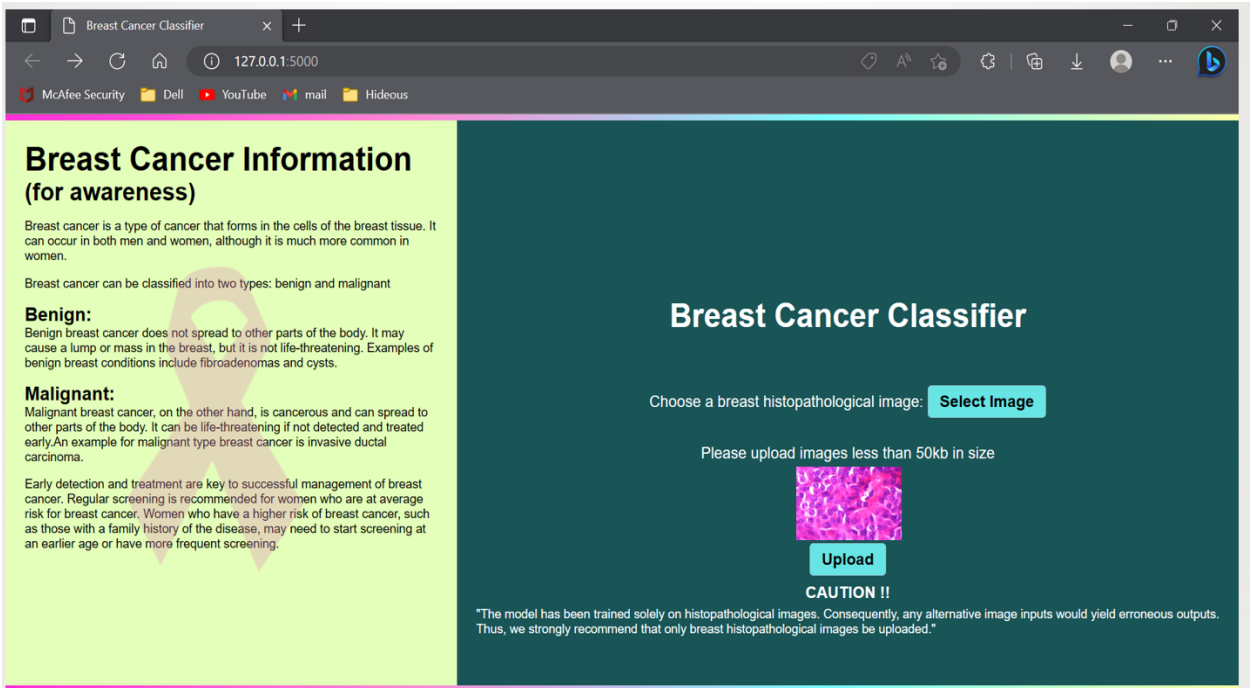

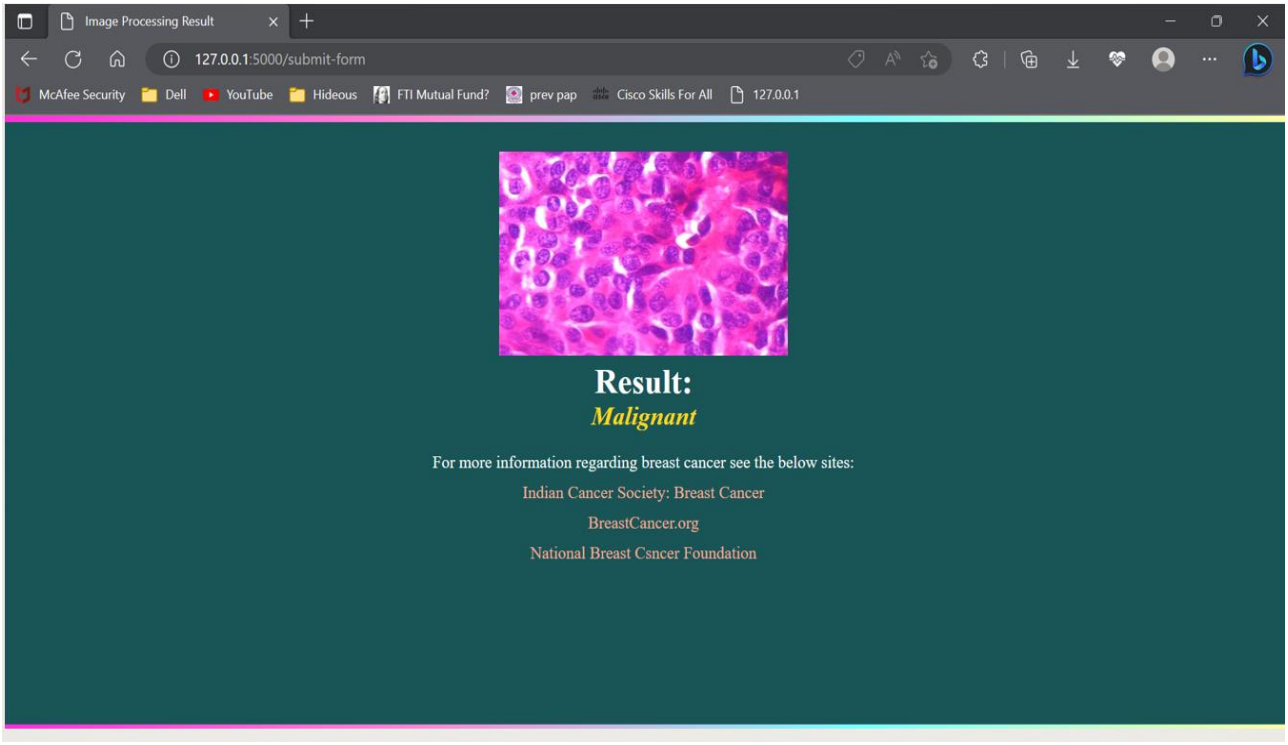

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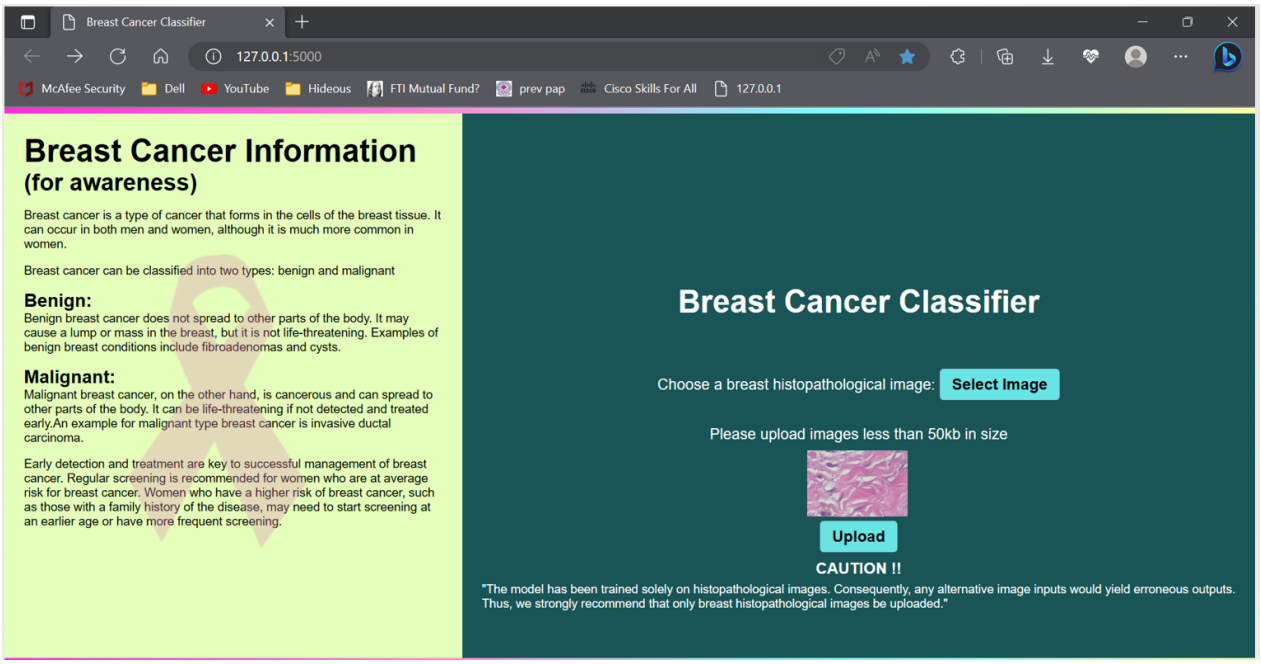

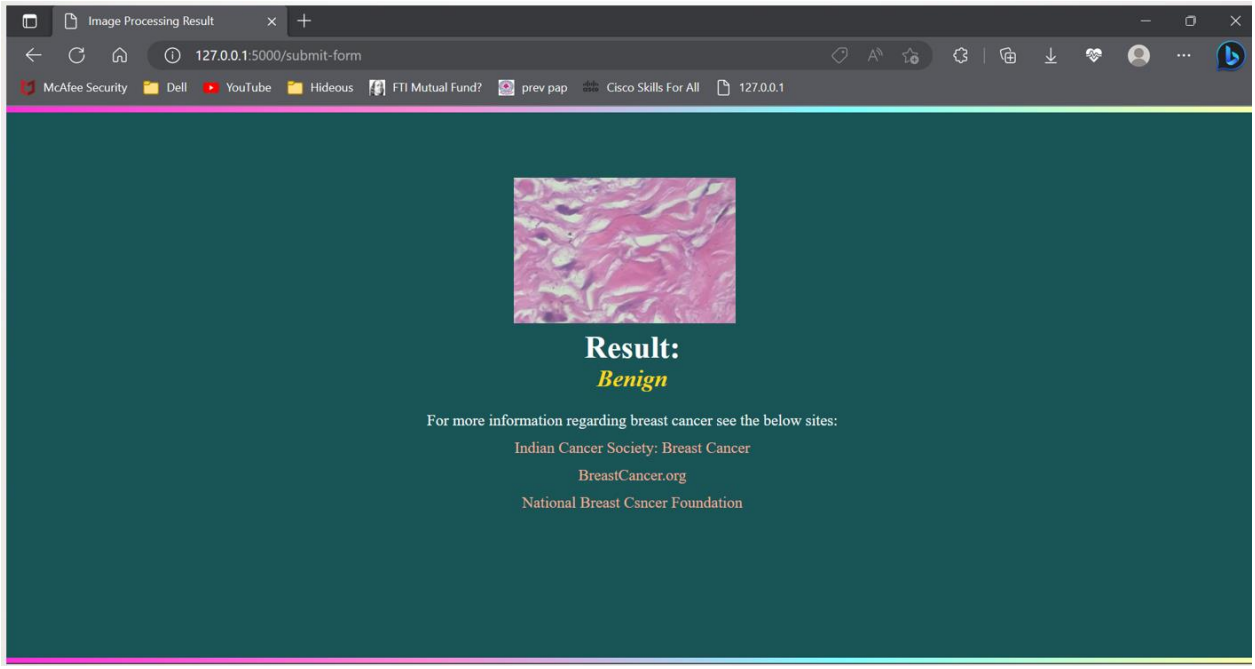

IV. CONCLUSION

- In the Future we can develop few more additional features such as by how much percentage the women are affected by the breast cancer.
- This system reduces training time and increases accuracy.
- To conclude, this system aids in diagnosing the breast cancer in the earlier stages so the we can save lives.

REFERENCES

[1] Sara Laghmati, Bouchaib Cherradi, et. al., [1] presented a model to classify BC using Neighborhood examination and supervised ML methods. This model uses and contrasts four ML methods (KNN, decision tree, BIRY SVM, and

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Adaboost) to determine if a patient's tumour is cancerous or benign Before being examined on the Breast Cancer Wisconsin dataset, the machine learning methods were trained.

[2] Amartya Ranja aikia et. al., [2] provided a comparison of CNN architectures for breast FNAC (Fine needle aspiration cytology) image classification. This Breast Cancer compares multiple fine-tuned transfer learnt classification approaches for the identification of cell samples based on deep CNNs.

[3] Fung Fung Ting et. al., [3] Improved CNN for breast cancer categorization was presented. Without knowing the existence of a dangerous tumor, the current process can support classify mammographic medical images into benign, malignant, and healthy patients