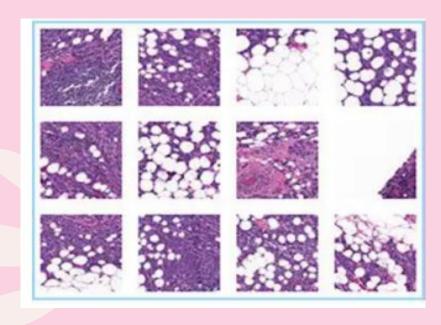
Breast Cancer Prediction using CNNs

Problem Statement

The input is patches of size 50 x 50 of breast cancer images. Output is 0 (Negative) or 1 (Positive) if there is Invasive Ductal Carcinoma (IDC).

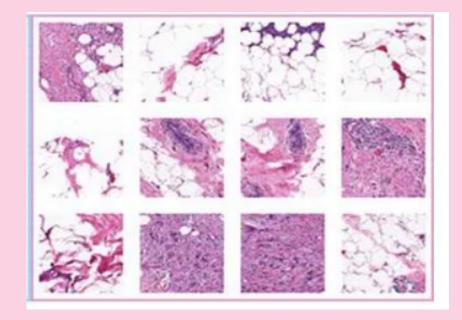
INPUT



OUTPUT

Negative

INPUT



OUTPUT

Positive

Original model from literature

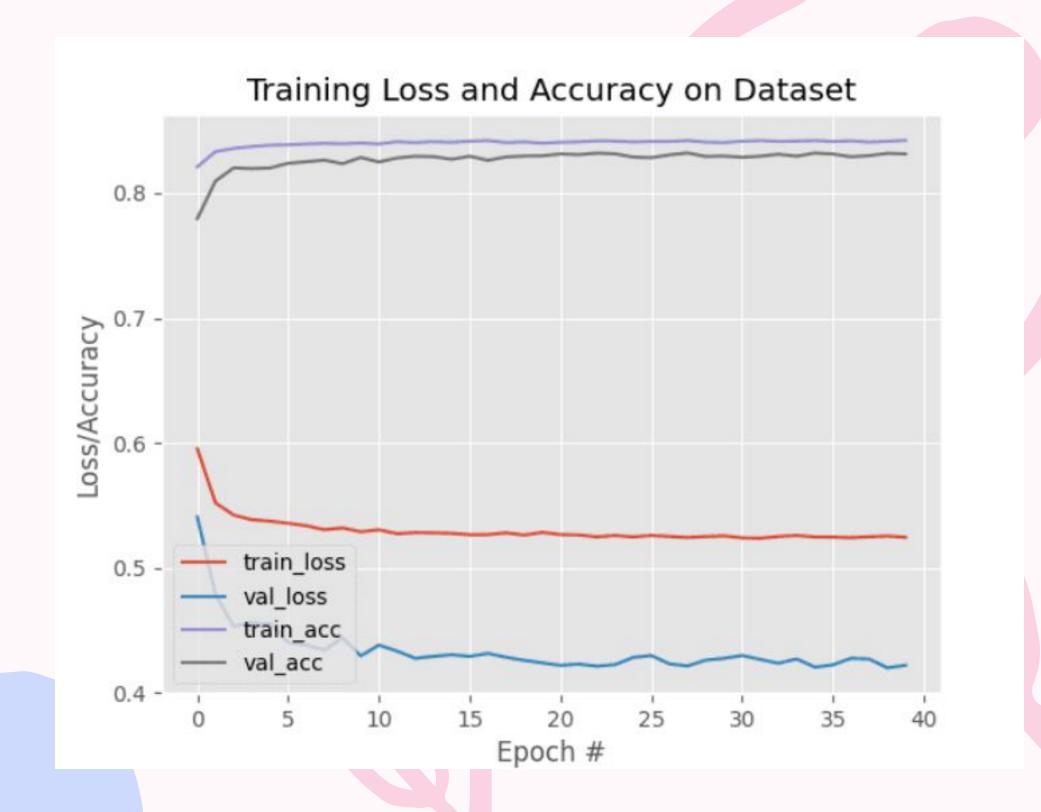
Link to model

Accuracy: 83.7%

• Sensitivity: 83.07%

• Specificity: 85.29%

• Epochs: 40



Proposed model architecture

CNN Model

- Changes in layers,
- Activation functions,
- Number of epochs,
- Preprocessing data,
- Regularizers

Final model architecture

- Changes in layers,
- Activation functions,
- Number of epochs,
- Data Augmentation,
- Optimizers

Proposed Updates

Different EPOCHs

3 EPOCHs

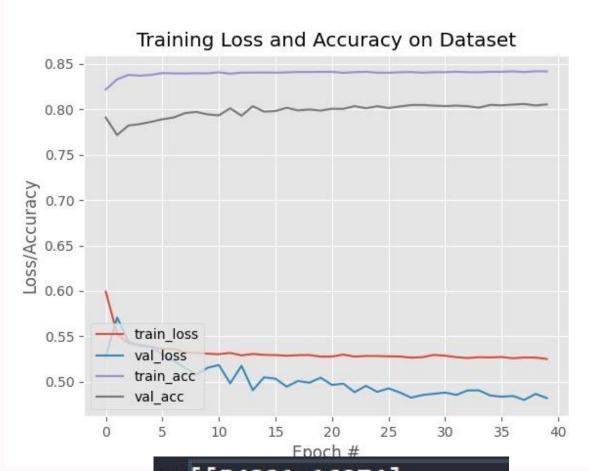


[[59808 11487] [4093 24355]]

acc: 0.8438

sensitivity: 0.8389 specificity: 0.8561

40 EPOCHs

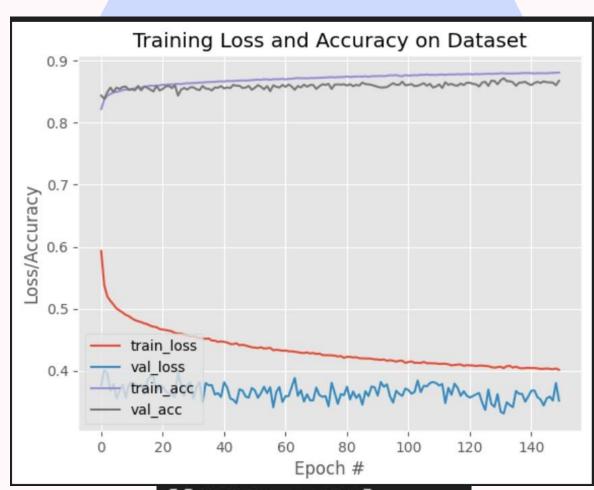


[[54321 16974] [2481 25967]]

acc: 0.8049

sensitivity: 0.7619 specificity: 0.9128

150 EPOCHs



[[63950 7345] [5699 22749]]

acc: 0.8692

sensitivity: 0.8970 specificity: 0.7997

Optimizer

Change Optimizer from Adagrad to Adam



[[58964 12331] [2386 26062]]

acc: 0.8525

sensitivity: 0.8270

Change train, test, validation division

Change division from 80, 10, 10 to 90, 5, 5

acc: 0.7907

sensitivity: 0.7388



Changes in Augmentation

Original

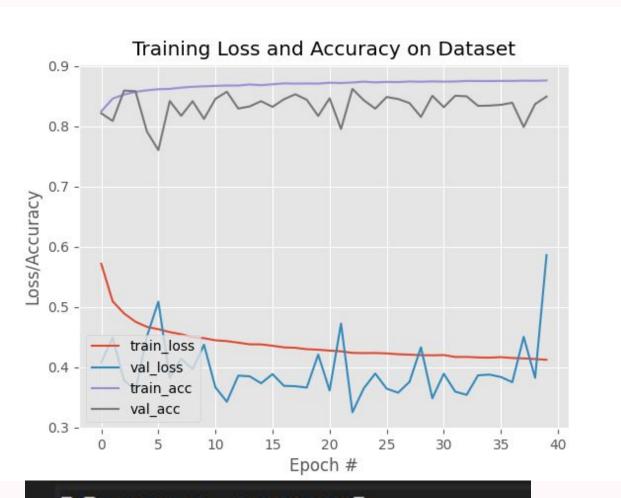


```
[[58964 12331]
[ 2386 26062]]
acc: 0.8525
```

sensitivity: 0.8270

specificity: 0.9161

No augmentation



```
[[58375 12920]
[ 1856 26592]]
```

acc: 0.8519

sensitivity: 0.8188

Changes in Augmentation



[[59001 12294] [2132 26316]]

acc: 0.8554

sensitivity: 0.8276 specificity: 0.9251

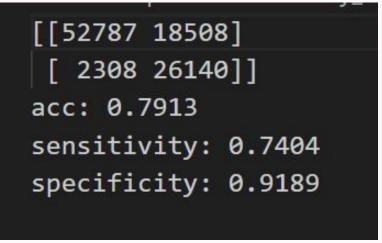
Changes 1 in augmentation:

- Changed in Zoom range from
 0.05 to 0.5
- Changed in Rotation range from 20 to 10

Changes 2 in augmentation:

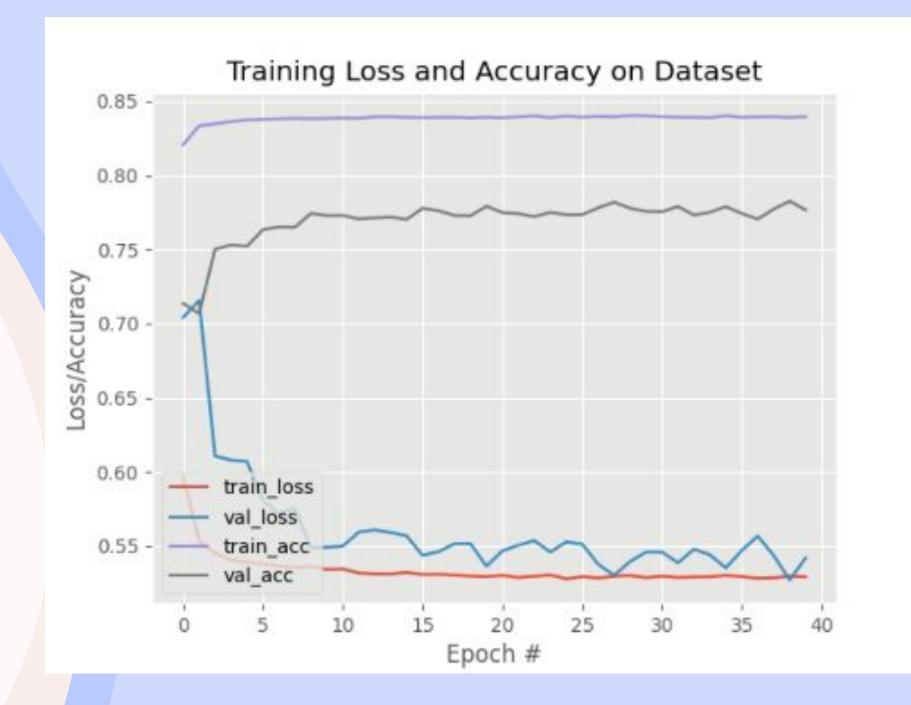
- No rotation
- Making fill-mode from nearest to reflect





Added Attention Layer

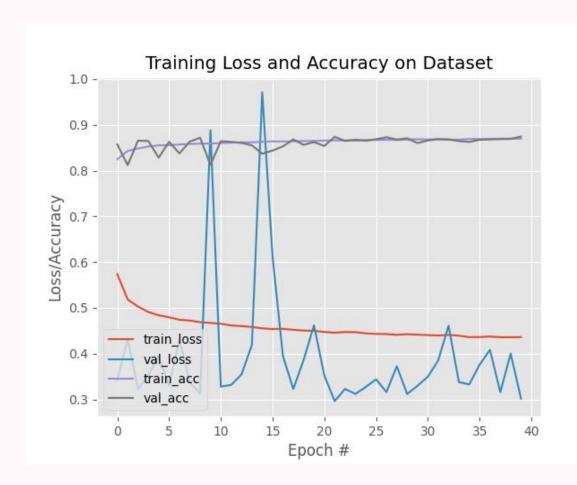




acc: 0.7765

sensitivity: 0.7157

Changes in CNN Model



```
[[61822 9473]
    [ 2910 25538]]
```

acc: 0.8759

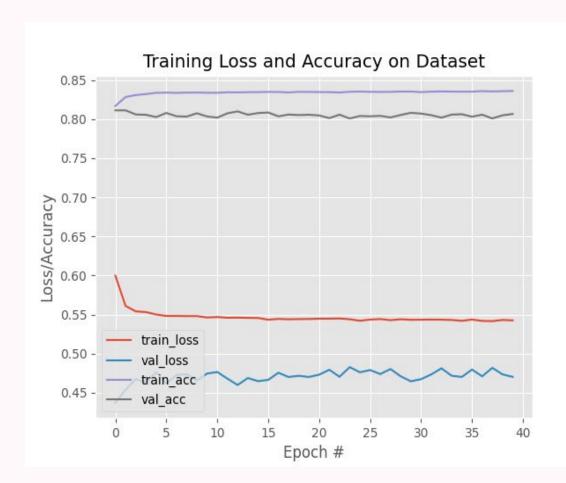
sensitivity: 0.8671 specificity: 0.8977

Changes 1 in Model:

- Reducing number of layers:
- Removing 3 Convolutional layers of 128 filters with their pooling layer

Changes 2 in Model:

- Reduced the number of layers and changed the number of filters
- Changed from 32, 64 filters to 16, 32 filters

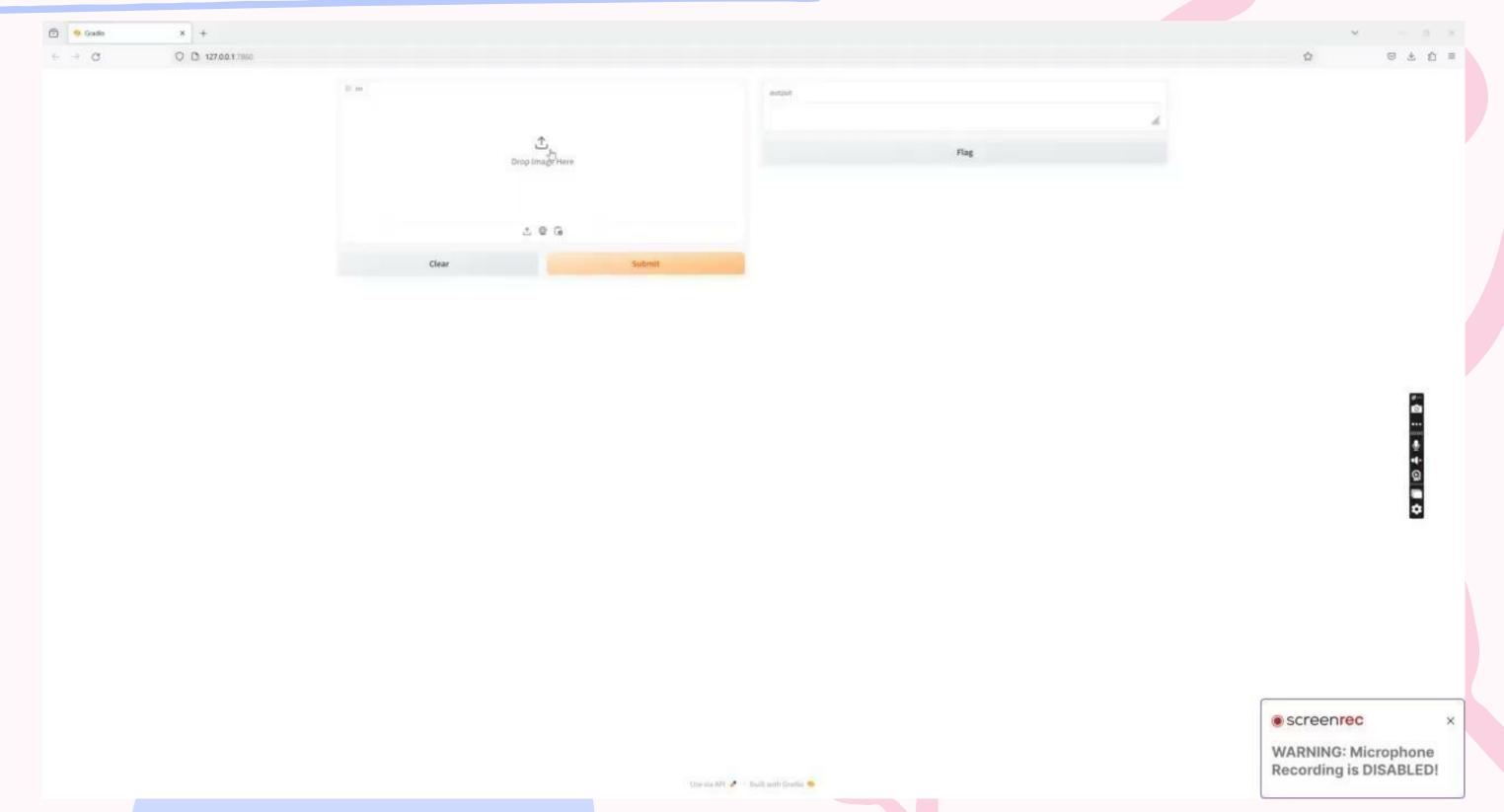


```
[[54557 16738]
[ 2670 25778]]
```

acc: 0.8054

sensitivity: 0.7652

Live DEMO



Conclusion and future work

- Overall, since the dataset is pretty large, the accuracy does not fluctuate intensely.
- Removing 3 Convolutional layers of 128 filters with their pooling layer had the best overall accuracy for the model at 87%.
- Optimal performance can be achieved by running the model on a local machine equipped with a GPU.
- Validating the model on diverse datasets could contribute to its applicability in real-world clinical settings

Contribution

Fatemah:

- Trying to use SHAP
- Presentation
- Poster
- Website

Youssef:

- Making sure for the best training result
- Demo
- Getting model weights

