# Computational Intelligence
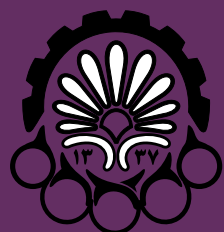
# Image Processing Project

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# Data Training (Phase1)

- We started processing the CIFAR-10 dataset using a standard ResNet-20 network.

- The ResNet-20 Base network was written with our own design and no ready-made networks were used.

- The test, training, and validation data were divided as follows:

45000 train samples

5000 validation samples
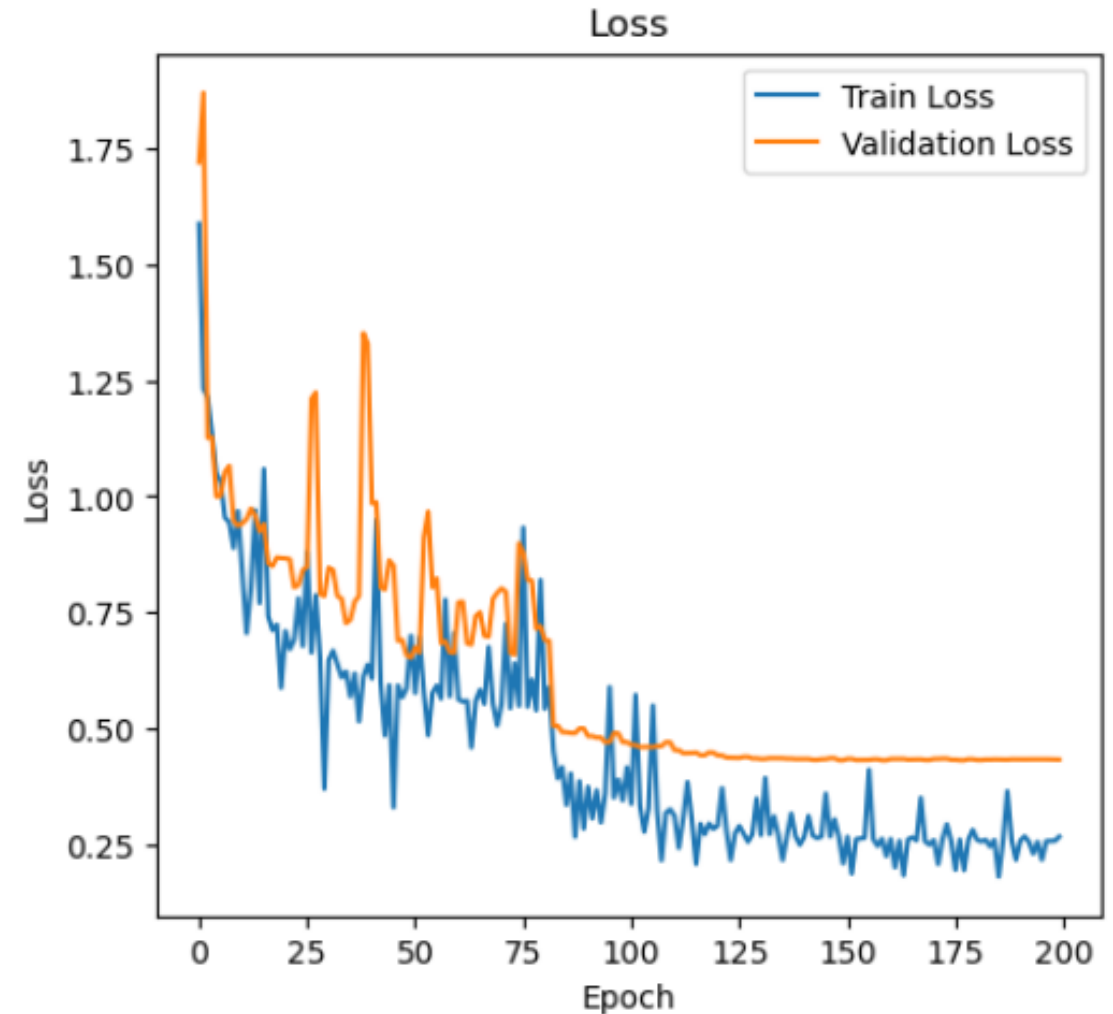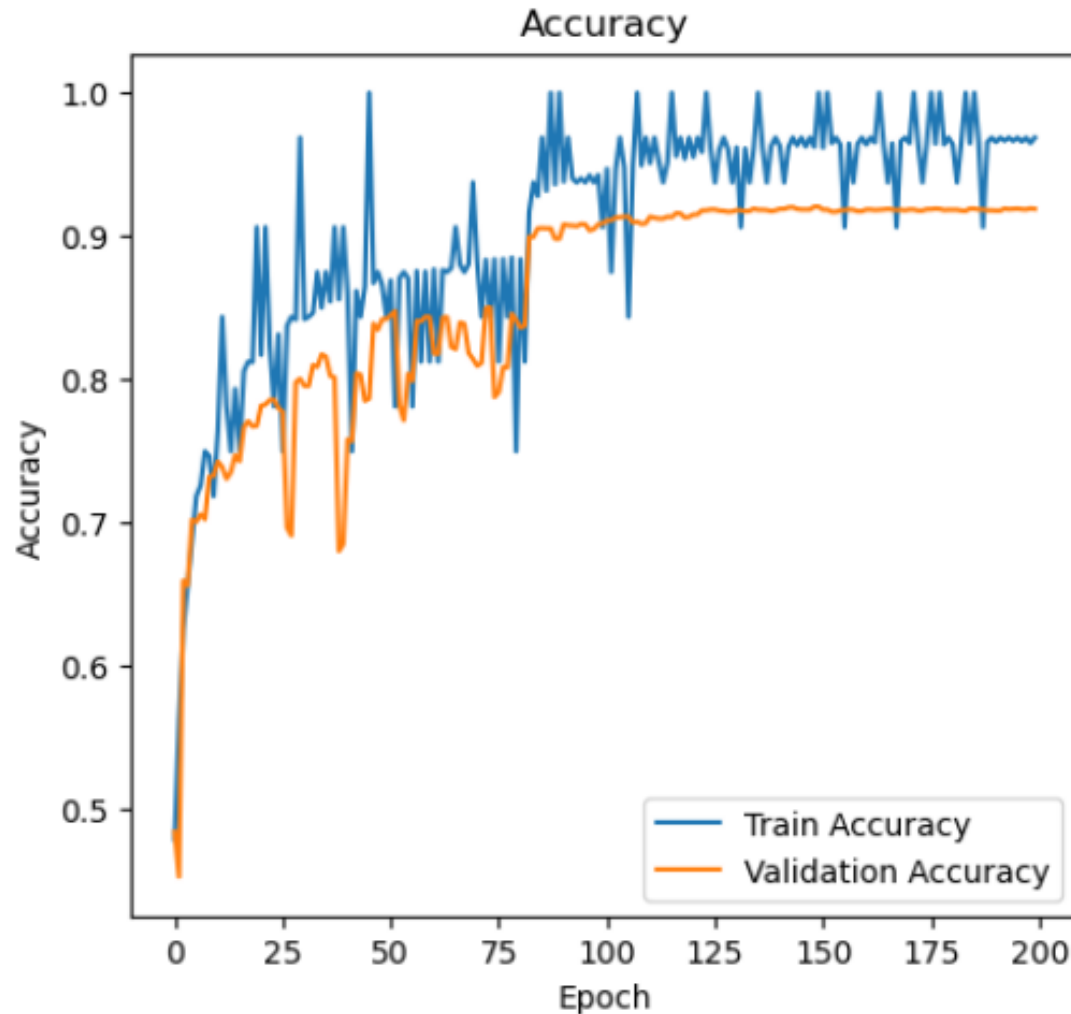
10000 test samples

# Data Training (Phase1)

- The first model we used resulted in an overfit:
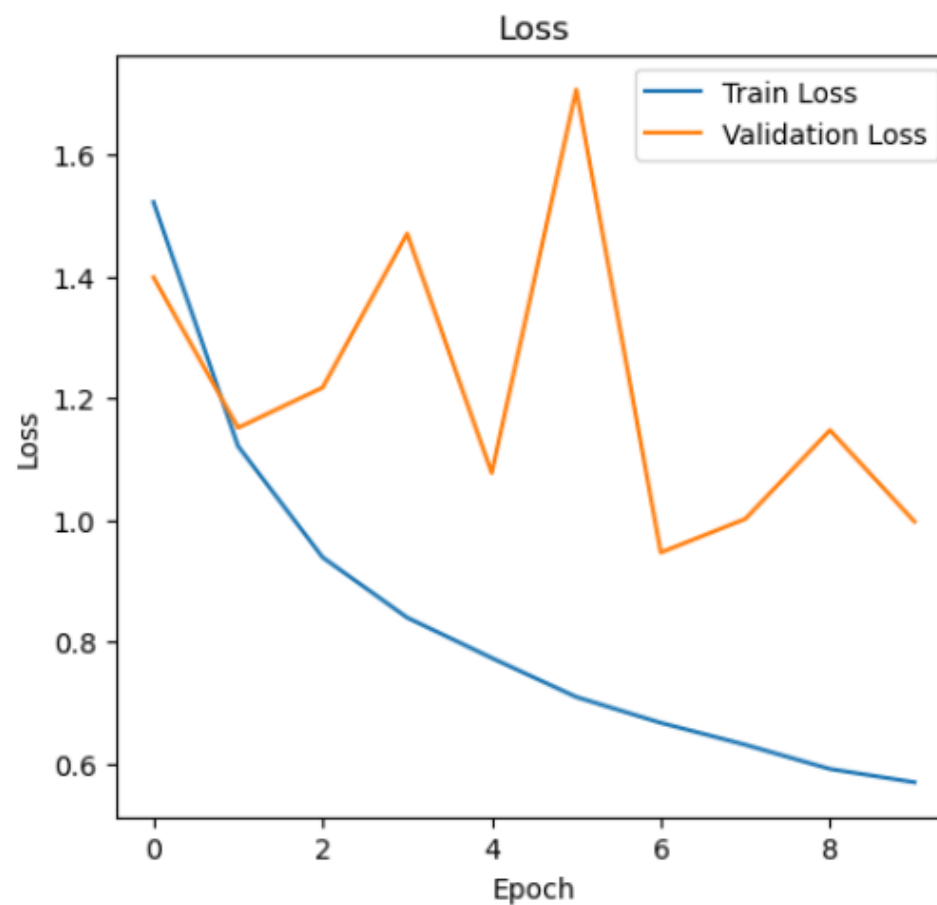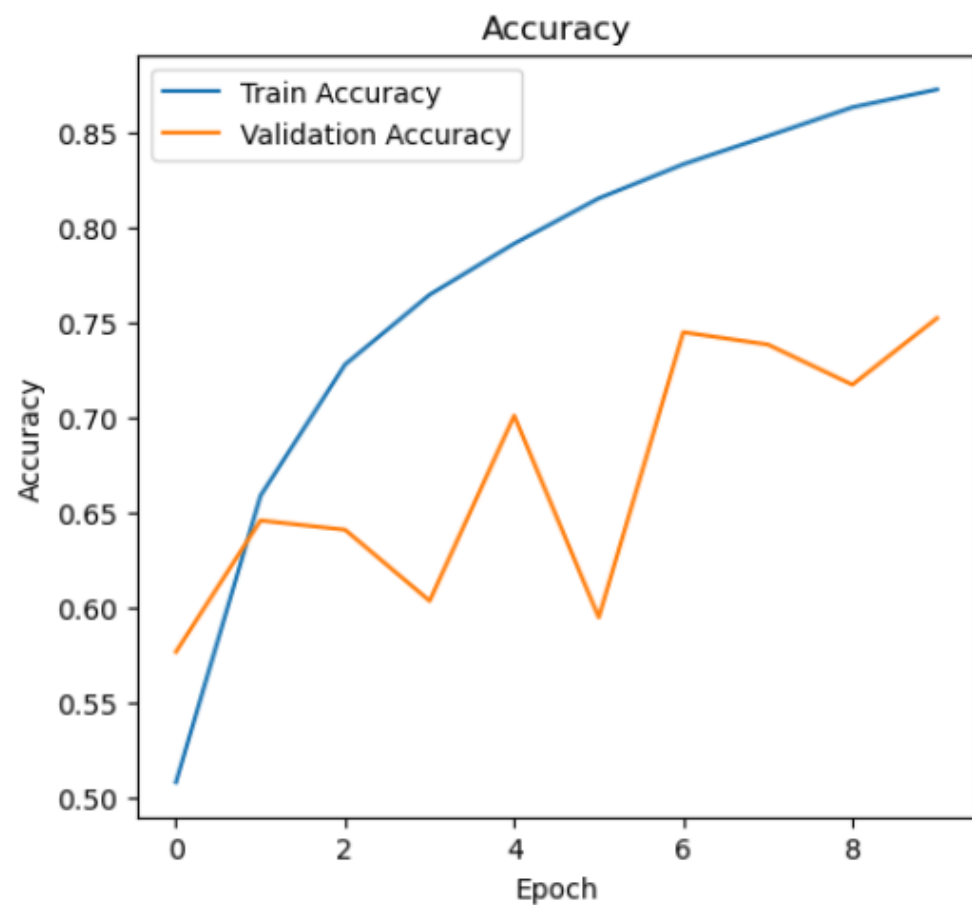
# Data Training (Phase1)

- After that, data augmentation was used and it was observed that the overfit was fixed and the model was working properly.

- In both models, subtract_pixel_mean was used.

# Data Training (Phase1)

- After all this, the accuracy was 92% for validation data and 90.7% for test data.

- The learning rate started at 0.001 but we used lr_schedule to optimize it.

- Loss value for the final model :

Test loss: 0.47134658694267273

Test accuracy: 0.9021999835968018

# Breast cancer data  (Phase2)

- Leveraging labeled datasets to classify IDC (Invasive Ductal Carcinoma).

Total number of images: 193811

Number of IDC(-) Images: 115025

Number of IDC(+) Images: 78786

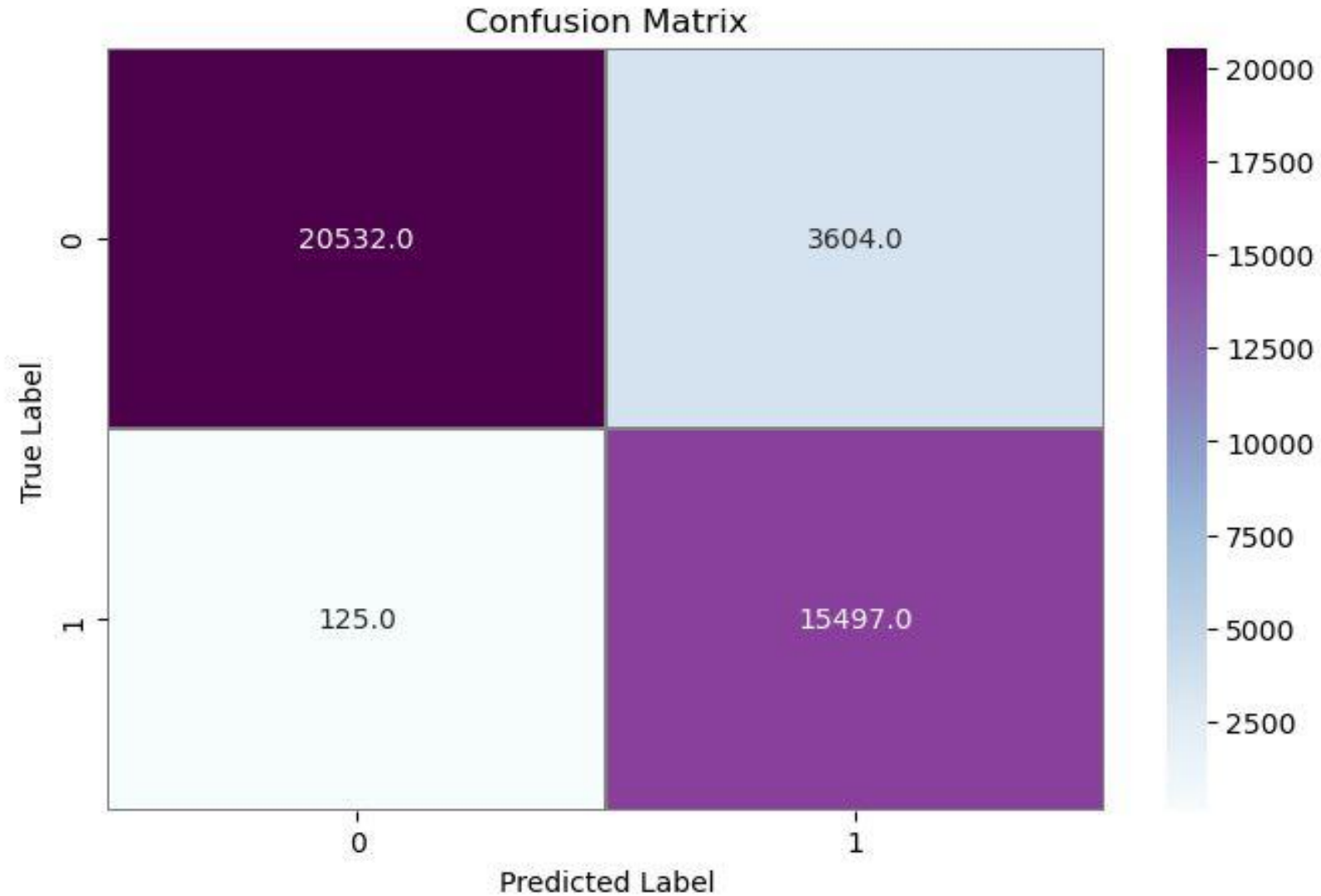- Key statistics on data distribution :  Stratification

Training class distribution: Counter({1: 60665, 0: 58202})

Validation class distribution: Counter({0: 28411, 1: 9060})

Testing class distribution: Counter({0: 28412, 1: 9061})
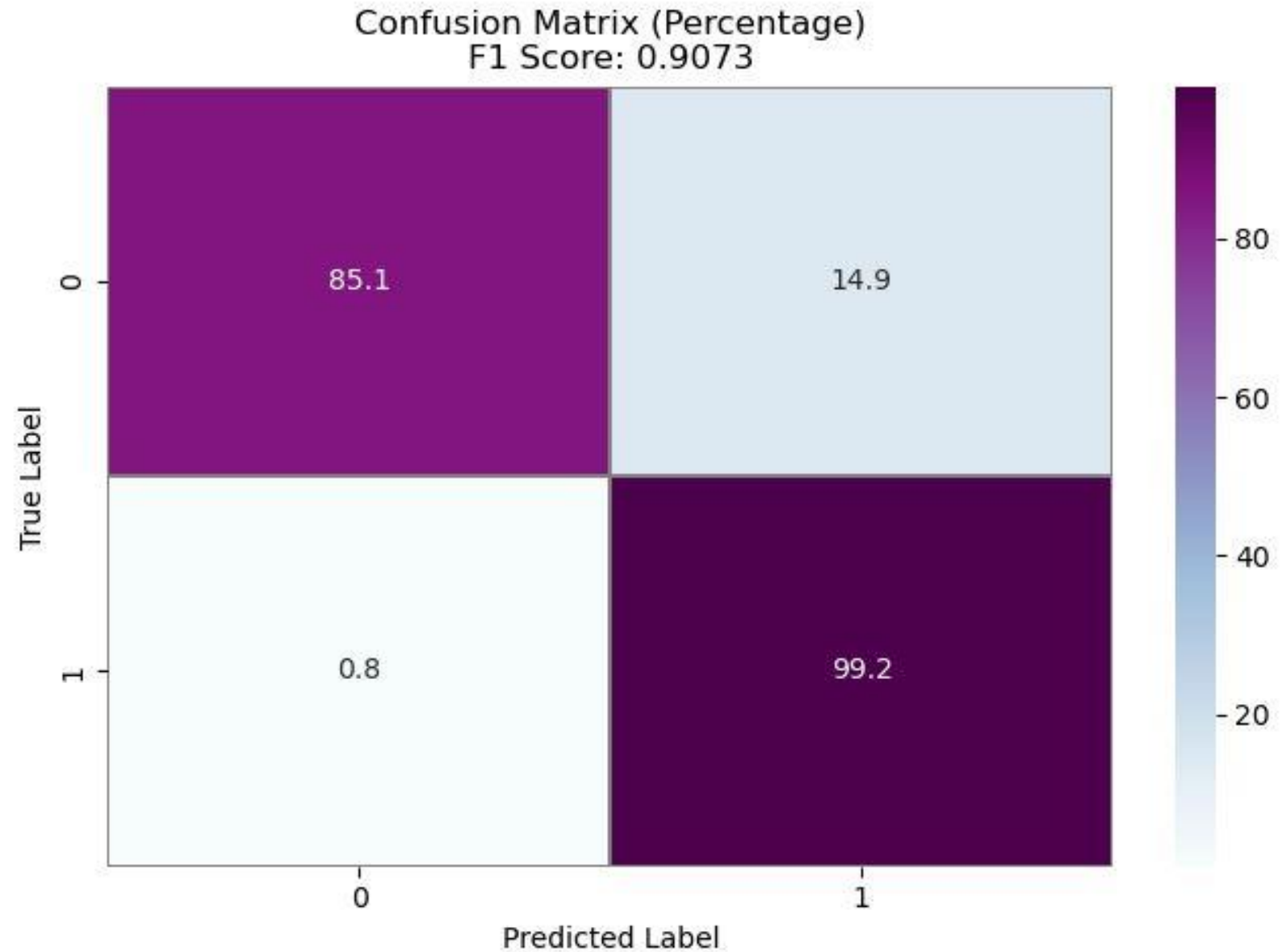
# Breast cancer data  (Phase2)

- For stratified data, the confusion matrix looks like this:



Confusion Matrix

# Breast cancer data (Phase2)

- And F-1 looks like this :

F1 Score: 0.9073

## Confusion Matrix (Percentage)
### F1 Score: 0.9073

|  | Predicted Label 0 | Predicted Label 1 |
|---|---|---|
| True Label 0 | 85.1 | 14.9 |
| True Label 1 | 0.8 | 99.2 |

# Breast cancer data  (Phase2)

- For the final model, Summery looked like this:

| Layer (type) | Output Shape | Param # |
|---|---|---|
| conv2d_5 (Conv2D) | (None, 50, 50, 32) | 896 |
| batch_normalization_6 (BatchNormalization) | (None, 50, 50, 32) | 128 |
| conv2d_6 (Conv2D) | (None, 50, 50, 32) | 9,248 |
| max_pooling2d_2 (MaxPooling2D) | (None, 25, 25, 32) | 0 |
| batch_normalization_7 (BatchNormalization) | (None, 25, 25, 32) | 128 |
| dropout_3 (Dropout) | (None, 25, 25, 32) | 0 |
| conv2d_7 (Conv2D) | (None, 25, 25, 64) | 18,496 |
| batch_normalization_8 (BatchNormalization) | (None, 25, 25, 64) | 256 |
| conv2d_8 (Conv2D) | (None, 25, 25, 64) | 36,928 |
| batch_normalization_9 (BatchNormalization) | (None, 25, 25, 64) | 256 |
| max_pooling2d_3 (MaxPooling2D) | (None, 12, 12, 64) | 0 |
| dropout_4 (Dropout) | (None, 12, 12, 64) | 0 |
| conv2d_9 (Conv2D) | (None, 12, 12, 128) | 73,856 |
| flatten_1 (Flatten) | (None, 18432) | 0 |
| dense_5 (Dense) | (None, 128) | 2,359,424 |
| batch_normalization_10 (BatchNormalization) | (None, 128) | 512 |
| dense_6 (Dense) | (None, 64) | 8,256 |
| batch_normalization_11 (BatchNormalization) | (None, 64) | 256 |
| dense_7 (Dense) | (None, 64) | 4,160 |
| dropout_5 (Dropout) | (None, 64) | 0 |
| dense_8 (Dense) | (None, 24) | 1,560 |
| dense_9 (Dense) | (None, 2) | 50 |

Total params: 2,514,410 (9.59 MB)

# Image Captioning (Phase3)

- Image captioning started with the Flickr-8k dataset.
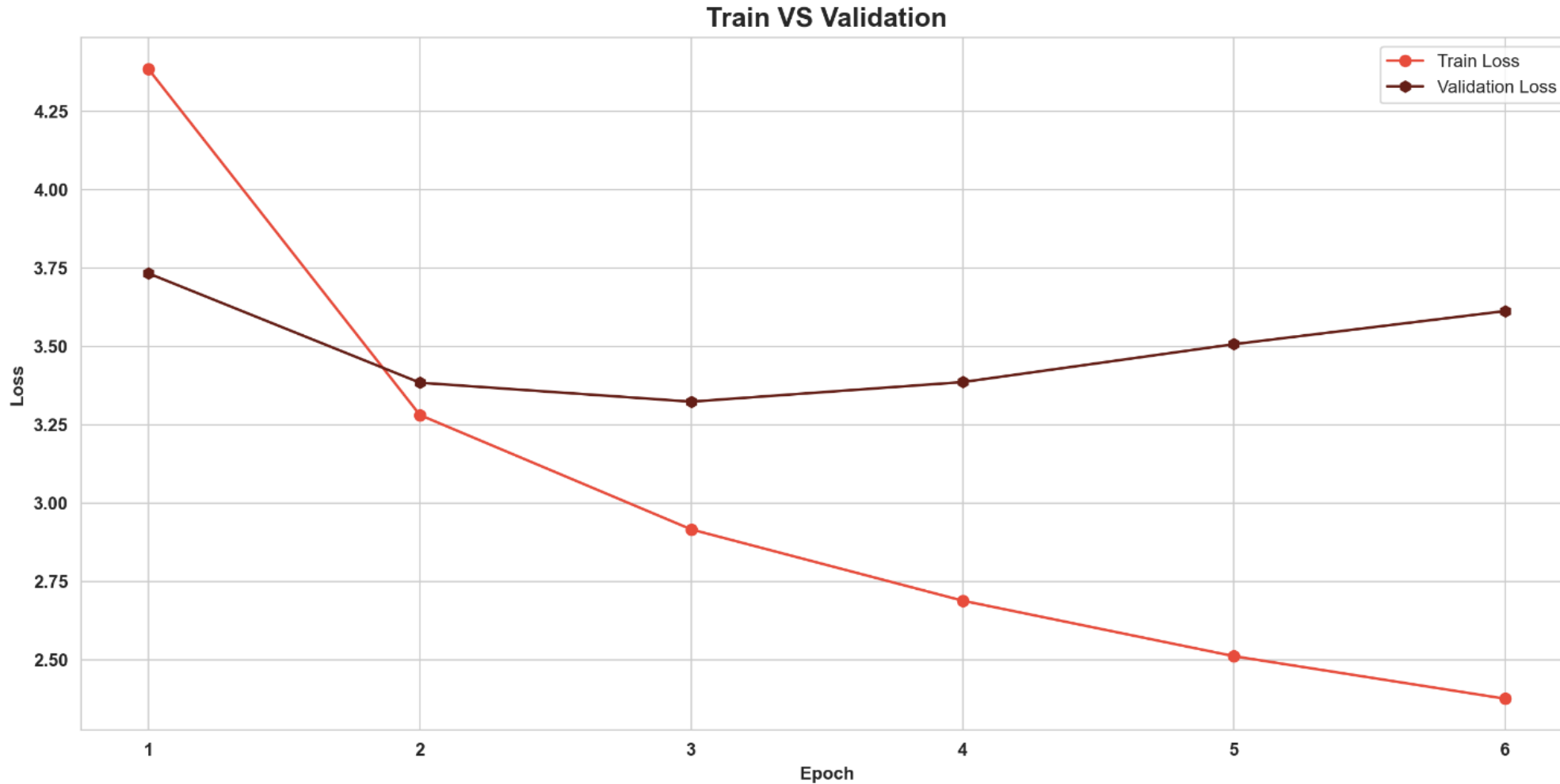
- We considered:

batch_size_train = 270

batch_size_val = 270

- After the trainig, the following was obtained:

loss: 2.3952 - val_loss: 3.6134

# Image Captioning (Phase3)

- For this model that we use ineception-v3, The test was as follows:

# Image Captioning (Phase3)

- For test set the results and captions for the photos were as follows. for example, we have:



a white dog is jumping over a stick



a little girl in a blue shirt is blowing from a slide
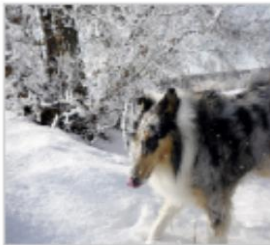


a man in a backpack is standing on top of a waterfall



a young boy in a pink shirt is sitting on a table



a white and white dog is jumping over a frisbee



a young boy in a yellow shirt is playing with a red ball



a brown and white dog runs through the snow



a black dog is standing on the beach

# Thank you for your attention and time

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