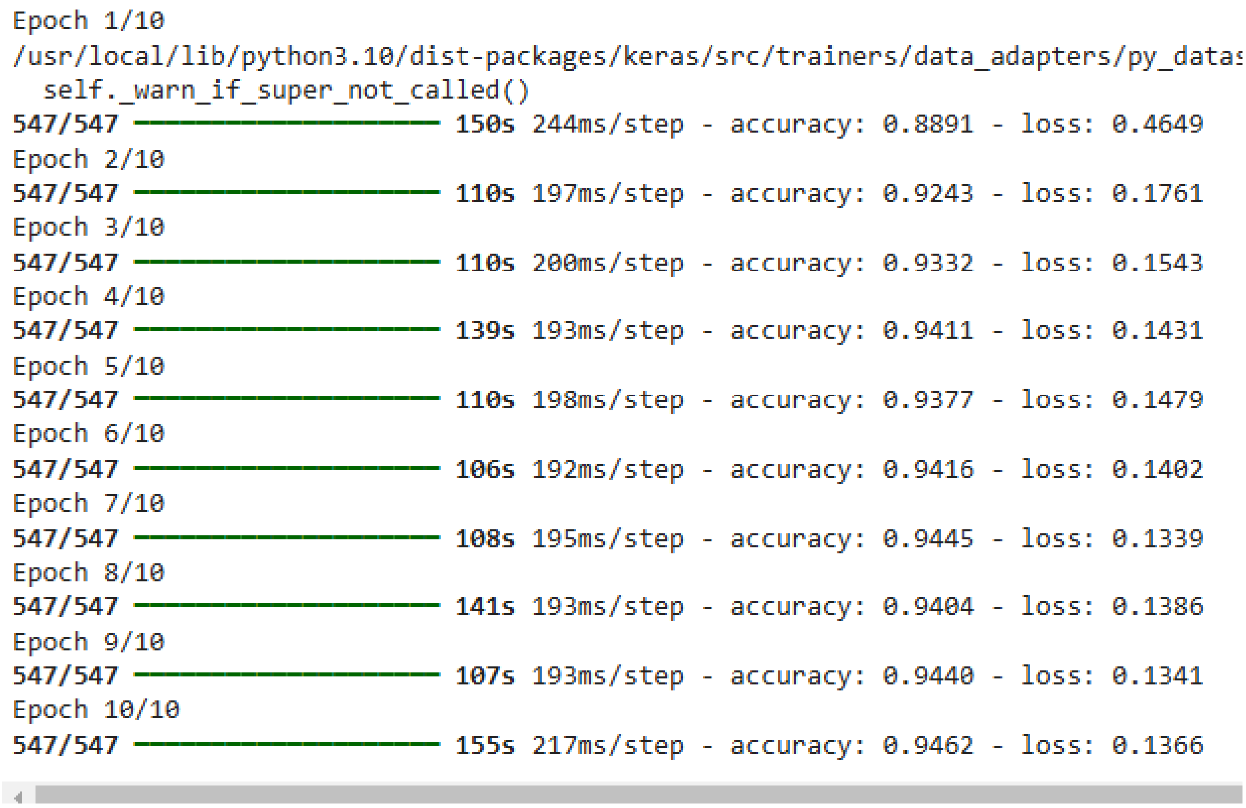
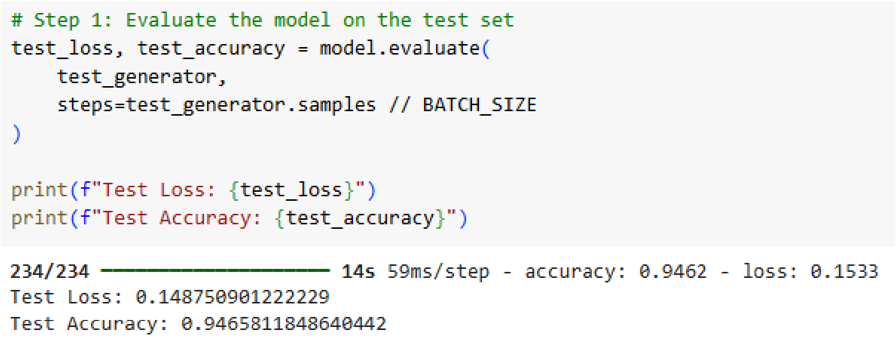
ECGR 8119 – Applied AI Midterm Report

Model A – Training Model (MobileNetV2) on Original Cats and Dogs Dataset



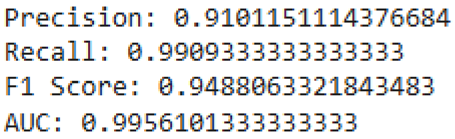
```
Epoch 1/10
/usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_datas
  self._warn_if_super_not_called()
547/547 ━━━━━━━━━━━━━━━━━━━━ 150s 244ms/step - accuracy: 0.8891 - loss: 0.4649
Epoch 2/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 110s 197ms/step - accuracy: 0.9243 - loss: 0.1761
Epoch 3/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 110s 200ms/step - accuracy: 0.9332 - loss: 0.1543
Epoch 4/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 139s 193ms/step - accuracy: 0.9411 - loss: 0.1431
Epoch 5/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 110s 198ms/step - accuracy: 0.9377 - loss: 0.1479
Epoch 6/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 106s 192ms/step - accuracy: 0.9416 - loss: 0.1402
Epoch 7/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 108s 195ms/step - accuracy: 0.9445 - loss: 0.1339
Epoch 8/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 141s 193ms/step - accuracy: 0.9404 - loss: 0.1386
Epoch 9/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 107s 193ms/step - accuracy: 0.9440 - loss: 0.1341
Epoch 10/10
547/547 ━━━━━━━━━━━━━━━━━━━━ 155s 217ms/step - accuracy: 0.9462 - loss: 0.1366
```

Figure: Accuracy and Loss Results of Model A Training



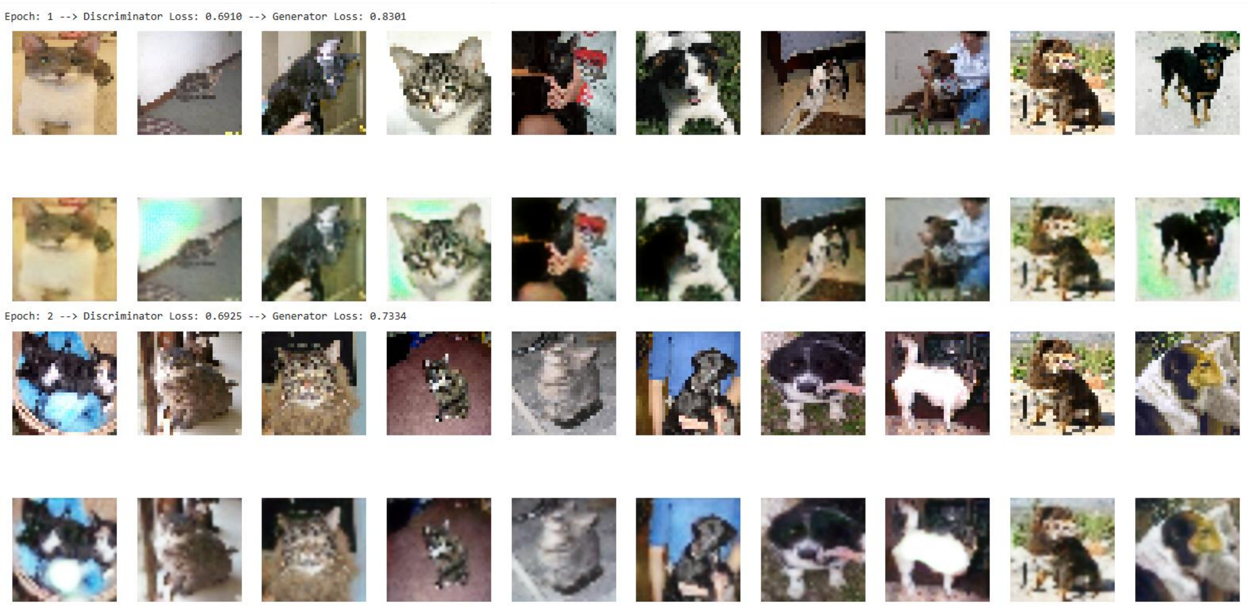
```python
# Step 1: Evaluate the model on the test set
test_loss, test_accuracy = model.evaluate(
    test_generator,
    steps=test_generator.samples // BATCH_SIZE
)

print(f"Test Loss: {test_loss}")
print(f"Test Accuracy: {test_accuracy}")
```

```
234/234 ━━━━━━━━━━━━━━━━━━━━ 14s 59ms/step - accuracy: 0.9462 - loss: 0.1533
Test Loss: 0.148750901222229
Test Accuracy: 0.9465811848640442
```



```
Precision: 0.9101151114376684
Recall: 0.9909333333333333
F1 Score: 0.9488063321843483
AUC: 0.9956101333333333
```

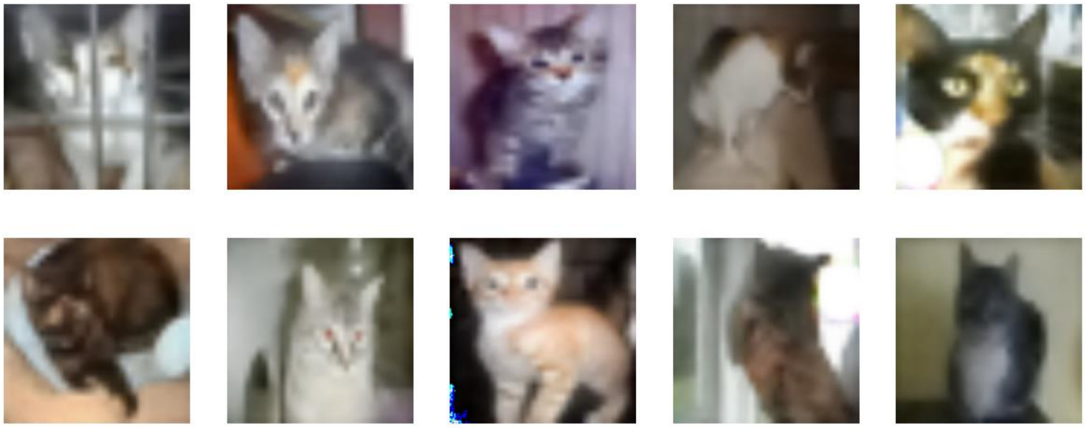
Figure: Test Accuracy, Loss Precision, Recall, F1 Score, and AUC Results



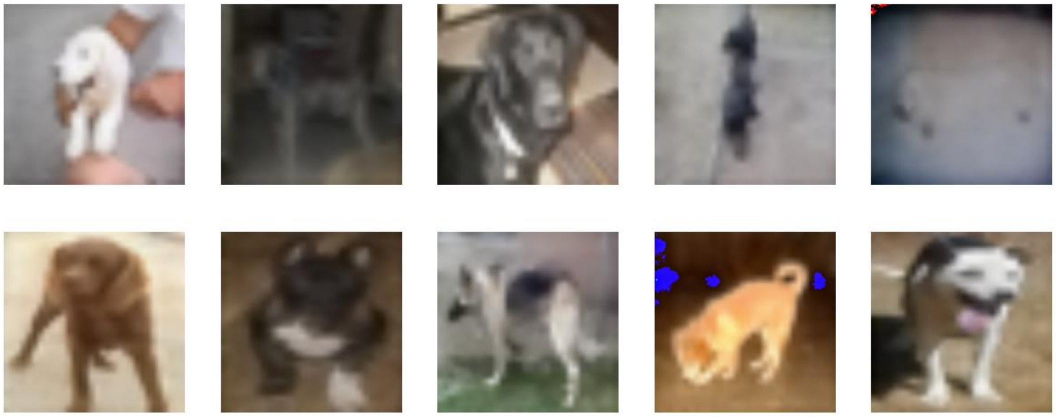
```
Epoch: 1 --> Discriminator Loss: 0.6910 --> Generator Loss: 0.8301
Epoch: 2 --> Discriminator Loss: 0.6925 --> Generator Loss: 0.7334
```

Figure: Sample Output for Every Epoch of SRGAN Model Training

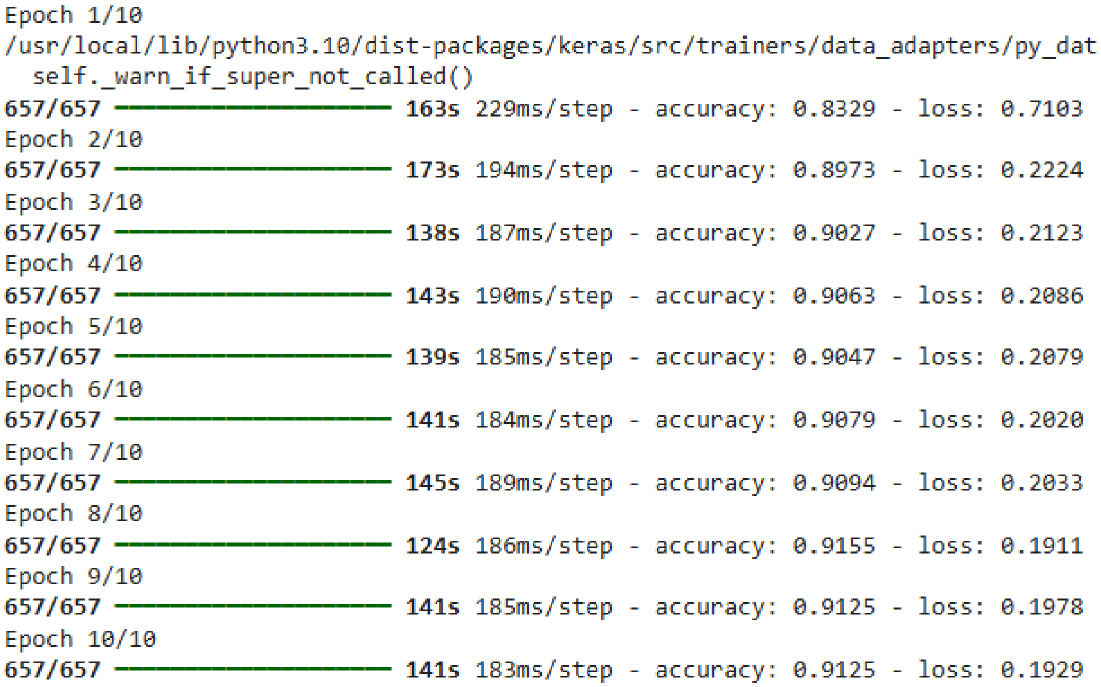
Cat Images



Dog Images

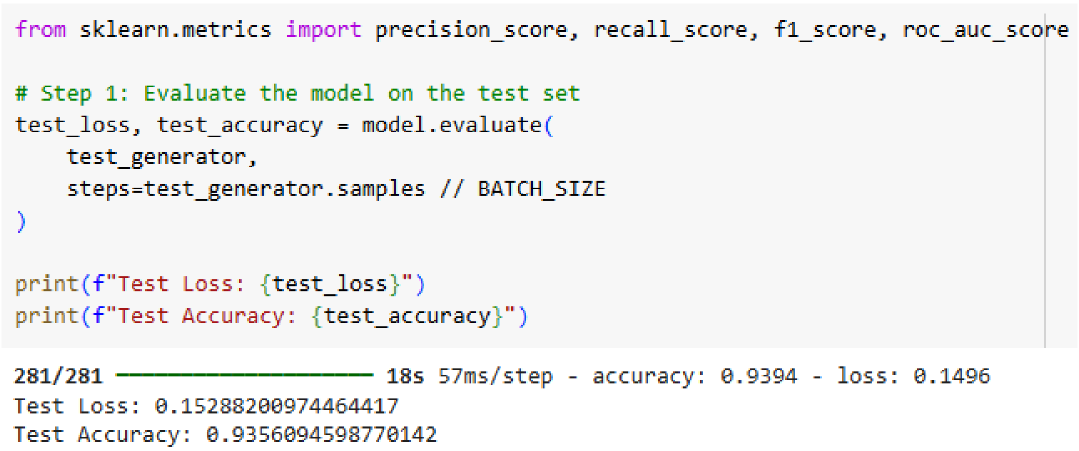


Model B – Training Model (MobileNetV2) on Original Cats and Dogs Dataset + Super Resoluted 128x128 SRGAN Generated Images



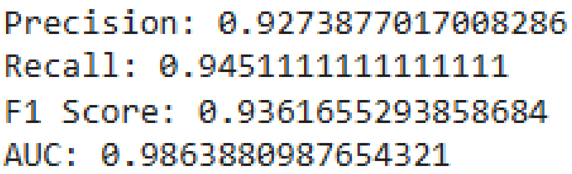
```
Epoch 1/10
/usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_dat
  self._warn_if_super_not_called()
657/657 ━━━━━━━━━━━━━━━━━━━━ 163s 229ms/step - accuracy: 0.8329 - loss: 0.7103
Epoch 2/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 173s 194ms/step - accuracy: 0.8973 - loss: 0.2224
Epoch 3/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 138s 187ms/step - accuracy: 0.9027 - loss: 0.2123
Epoch 4/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 143s 190ms/step - accuracy: 0.9063 - loss: 0.2086
Epoch 5/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 139s 185ms/step - accuracy: 0.9047 - loss: 0.2079
Epoch 6/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 141s 184ms/step - accuracy: 0.9079 - loss: 0.2020
Epoch 7/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 145s 189ms/step - accuracy: 0.9094 - loss: 0.2033
Epoch 8/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 124s 186ms/step - accuracy: 0.9155 - loss: 0.1911
Epoch 9/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 141s 185ms/step - accuracy: 0.9125 - loss: 0.1978
Epoch 10/10
657/657 ━━━━━━━━━━━━━━━━━━━━ 141s 183ms/step - accuracy: 0.9125 - loss: 0.1929
```

Figure: Accuracy and Loss Results of Model A Training



```
from sklearn.metrics import precision_score, recall_score, f1_score, roc_auc_score

# Step 1: Evaluate the model on the test set
test_loss, test_accuracy = model.evaluate(
    test_generator,
    steps=test_generator.samples // BATCH_SIZE
)

print(f"Test Loss: {test_loss}")
print(f"Test Accuracy: {test_accuracy}")
```

```
281/281 ━━━━━━━━━━━━━━━━━━━━ 18s 57ms/step - accuracy: 0.9394 - loss: 0.1496
Test Loss: 0.15288200974464417
Test Accuracy: 0.9356094598770142
```



```
Precision: 0.9273877017008286
Recall: 0.9451111111111111
F1 Score: 0.9361655293858684
AUC: 0.9863880987654321
```

Figure: Test Accuracy, Loss Precision, Recall, F1 Score, and AUC Results

Comparing the Results Model A Vs. Model B

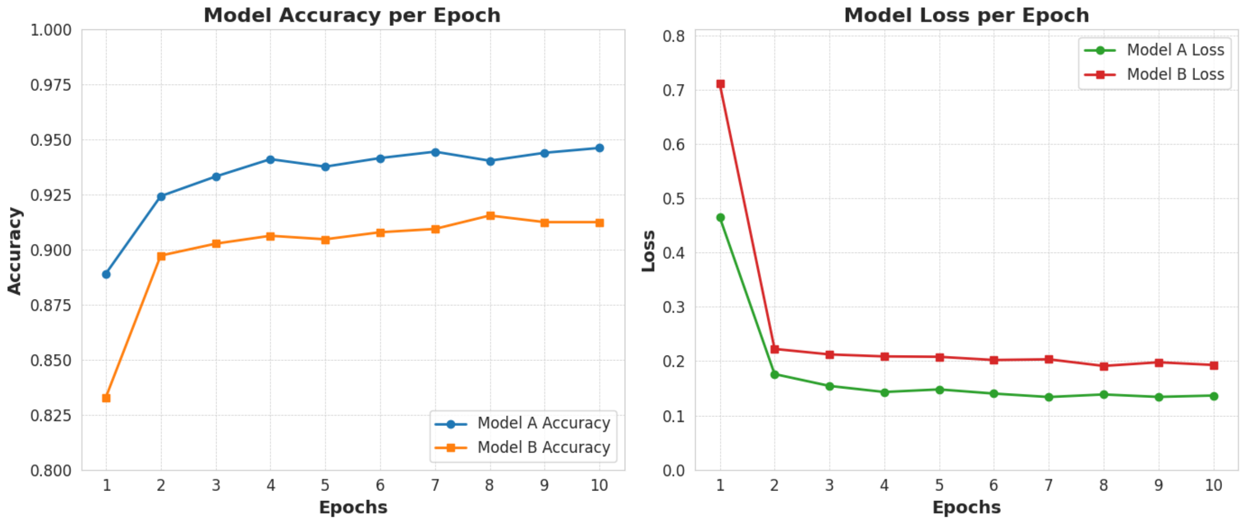


Figure: Model Accuracy and Loss for Model A Vs. Model B

1. Model B's final accuracy of around 91.2% is only slightly lower than Model A's 94.6%, showing it still performed well despite the blurry images.
2. Model B's accuracy steadily improves over epochs, indicating it learned effectively from both original and SRGAN-generated images.
3. Model B's loss quickly stabilizes, similar to Model A, suggesting it successfully adapted to the dataset's features.

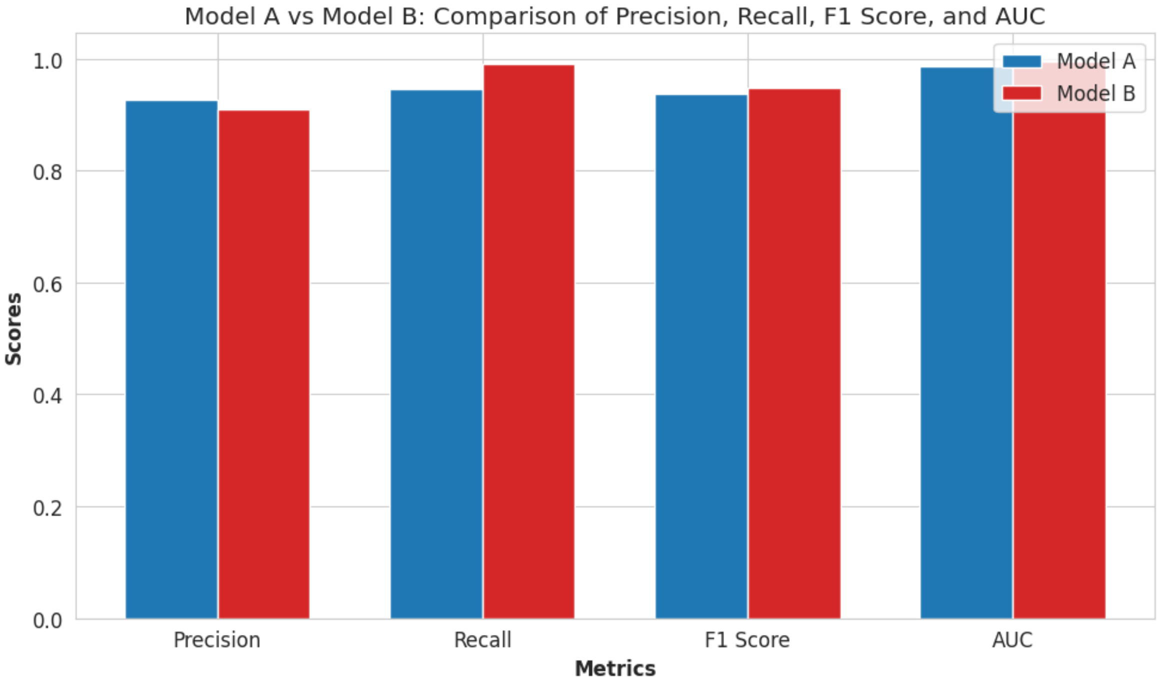


Figure: Model A Vs. Model B Metric Comparison

1. Model A and Model B have nearly identical precision scores, both just slightly below 1.0, indicating minimal difference in precision.
2. Model B shows a slightly higher recall score than Model A, reaching nearly 1.0, which suggests it has a better ability to capture all relevant instances.
3. Both models have very close AUC scores, close to 1.0, indicating that both models have similarly strong classification performance across different thresholds.