3D Face Recognition Evaluation Report

1. Overview

### Model Details

Parameter	Value
Model Type	PointNet with ArcFace
Embedding Size	512
Number of Classes	60
Test Accuracy	0.9502
Evaluation Date	2025-03-21 06:41:45

2. Classification Evaluation

Overall Classification Accuracy: 0.9734

Confusion Matrix

The confusion matrix shows the counts of correct and incorrect classifications for each class:
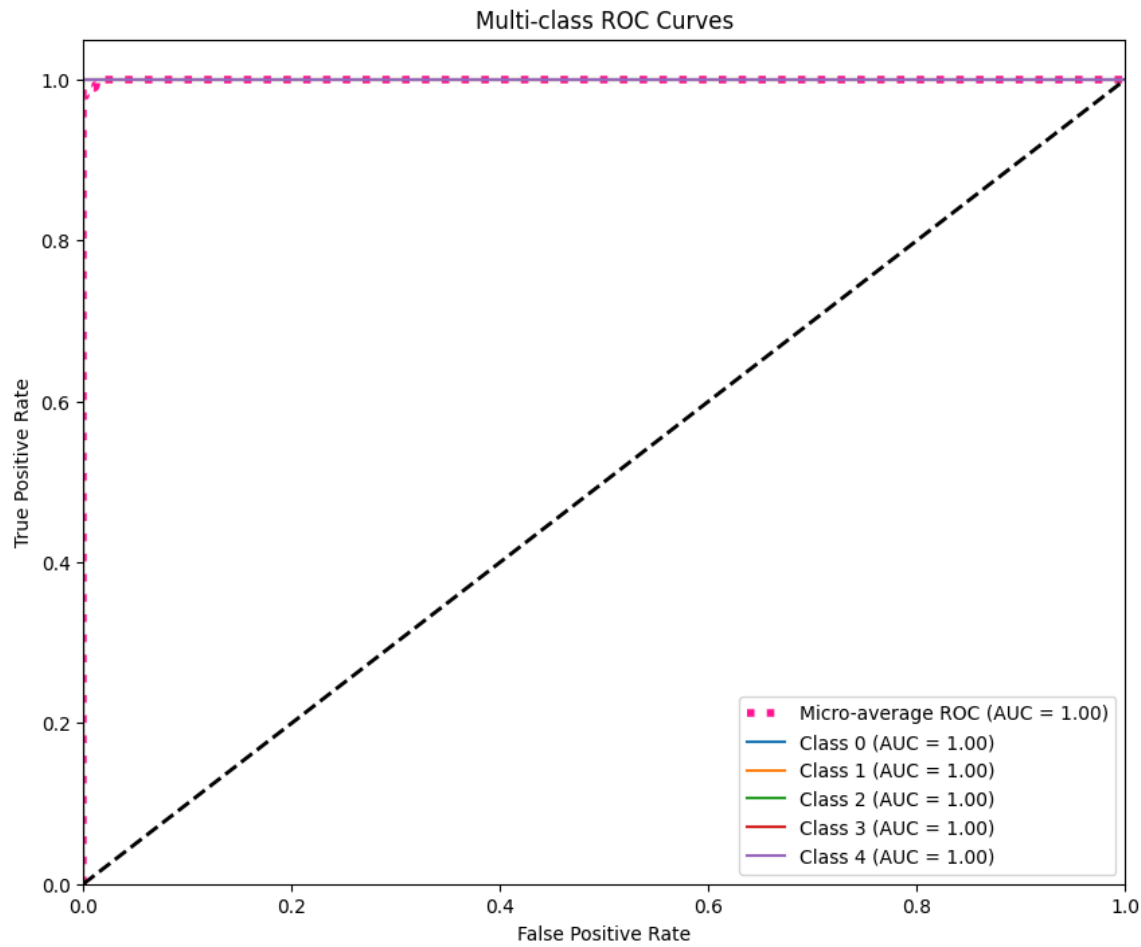
Confusion Matrix
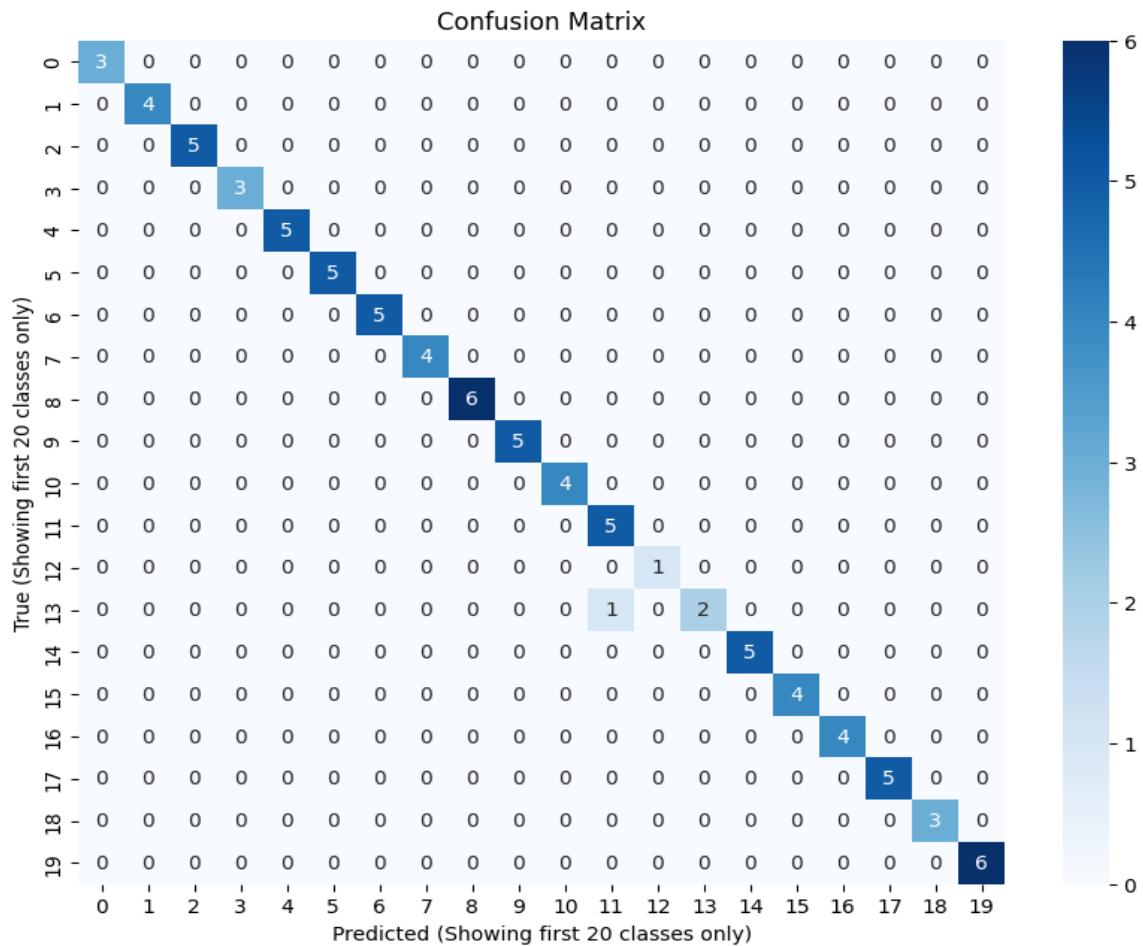
Per-Class Performance

Class	Accuracy	Samples
Top Performing Classes		
18	1.0000	3
59	1.0000	6
54	1.0000	6
49	1.0000	6
20	1.0000	6
Bottom Performing Classes		
26	0.0000	1
28	0.5000	4
22	0.6667	3
13	0.6667	3

| 29 | 0.6667 | 6 |

ROC Curves (Classification)

Multi-class ROC Curves

3. Verification Evaluation

Verification is the task of determining whether two face images belong to the same identity.

Verification Metrics

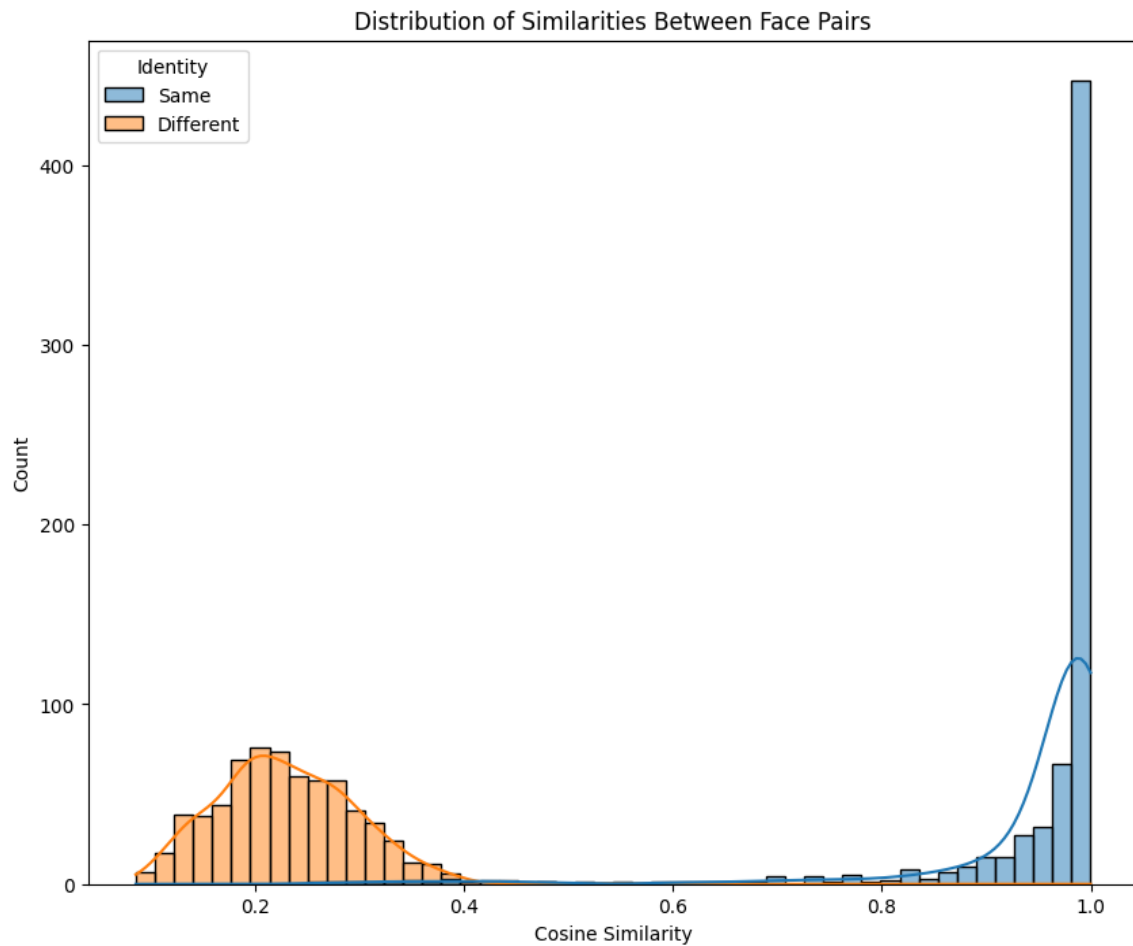| Metric	Value
Best Threshold	0.4040
Accuracy at Best Threshold	0.9821
Precision	0.9807
Recall	0.9836

F1 Score	0.9822
False Accept Rate (FAR)	0.0193
False Reject Rate (FRR)	0.0164
Equal Error Rate (EER)	0.0126
EER Threshold	0.3838

ROC Curve (Verification)

Distribution of Similarities
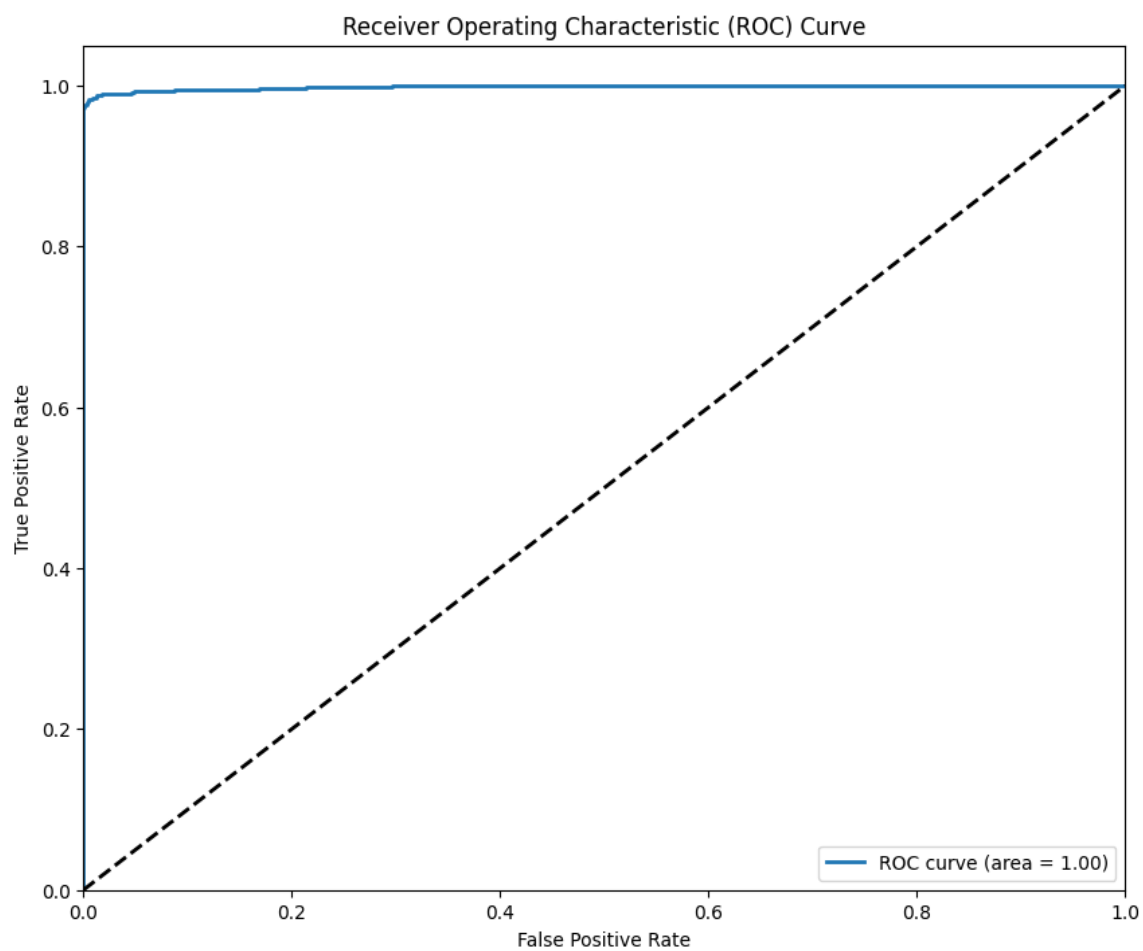
Distribution of Similarities Between Face Pairs

FAR-FRR Curve and Equal Error Rate

FAR-FRR Curve
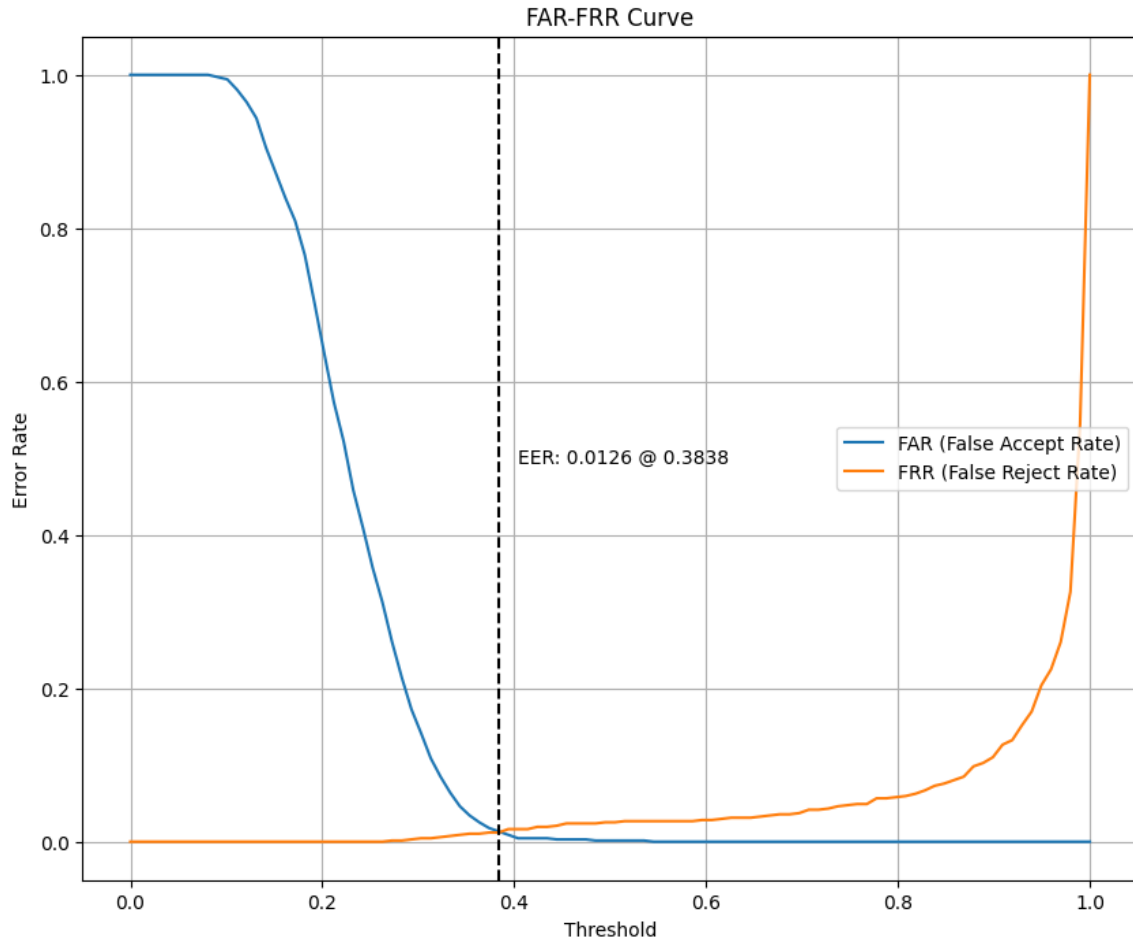
4. Conclusion

This report presents a comprehensive evaluation of the 3D Face Recognition model based on PointNet architecture with ArcFace loss. The model achieved an Equal Error Rate (EER) of 0.0126 at a threshold of 0.3838, which indicates the point where the false acceptance rate equals the false rejection rate. For verification tasks, the optimal threshold was found to be 0.4040, which yields an accuracy of 0.9821, with a false acceptance rate of 0.0193 and a false rejection rate of 0.0164.

Recommendations for improvement: 1. If the EER is above 0.05, consider collecting more training data or applying data augmentation techniques. 2. If there's a large gap between same-identity and different-identity similarity distributions, the model is performing well at separating identities. If the distributions overlap significantly, consider increasing the margin in ArcFace loss. 3. For classes with low accuracy, examine the training samples to ensure sufficient quality and quantity. 4. Consider fine-tuning the model architecture or hyperparameters based on these evaluation results.