Class Project

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1 Dataset

Data collection was done using a mobile application developed for the same purpose. The Application had a rectangular marker for appropriate positioning and alignment of the teeth. A subject had to capture a total of 10 pictures throughout two sessions, 5 pictures in each session. There was a gap of at least 12 hours between the two sessions.

2 Preprocessing

The images were subjected to gray scale conversion and then Gaussian blur was applied on the images. The images were further enhanced by applying contrast limited adaptive histogram equalization (CLAHE), which takes care of over-amplification of contrast and enhances the edge definitions in every region of the images. Now the images are more suitable for feature extraction and matching as the enhancement compensated for dim lighting or other reflections in the images if any.

3 Feature Extraction and Matching

A popular feature extraction algorithm known as SIFT, which stands for scale invariant feature transform, was used for feature extraction of the images. Matching was done between two images that were captured in different sessions i.e. we are matching an image that was captured in one session with all the images of all the subjects captured in the other session.

4 Results

4.1 Performance Measure

We have used parameters such as CRR, EER, etc. for comparing the system. CRR (Correct Recognition Rate) is the ratio of the number of matches correctly recognized to the total number of matches. EER (Equal Error Rate) is the point in the ROC curve at which the false acceptance rate is equal to the false rejection rate. The lower the value of EER, the better the system is. Accuracy is the maximum value of (100 - (FAR + FRR)/2) across all threshold values.

4.2 Result and Discussion

The total number of comparison scores obtained is 44700, out of which 1490 are genuine and 43210 are imposter scores. Genuine/imposter score histogram is plotted in figure 1. The receiver operating characteristic curve

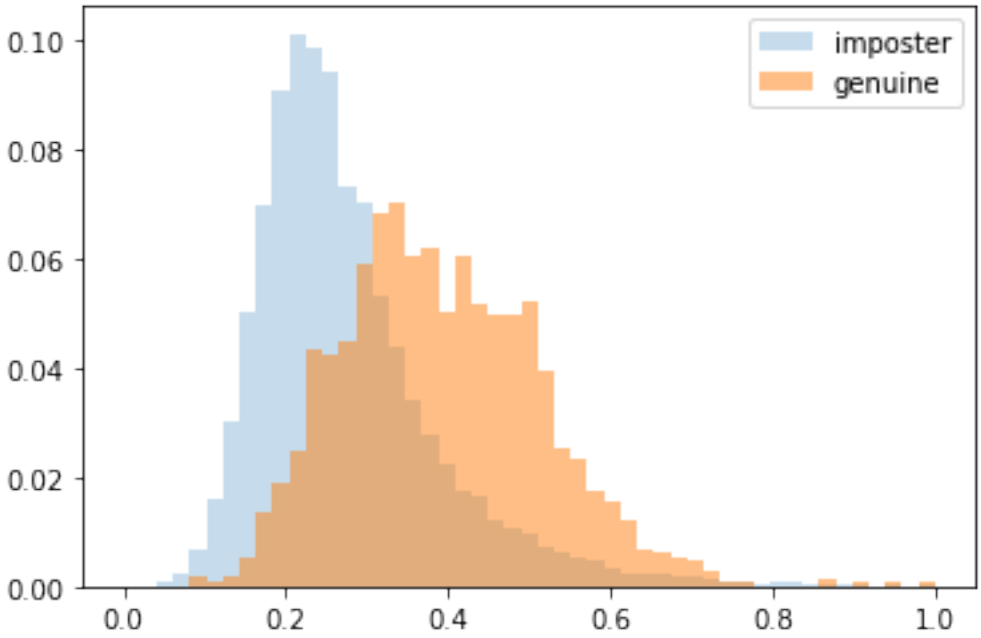

Figure 1: Genuine/imposter histogram

(ROC) is shown in figure 2. The EER was found to be 0.26 and the corresponding threshold was reported as 0.32. While the CRR was reported as 0.69. Finally, we are getting 99.72% accuracy.

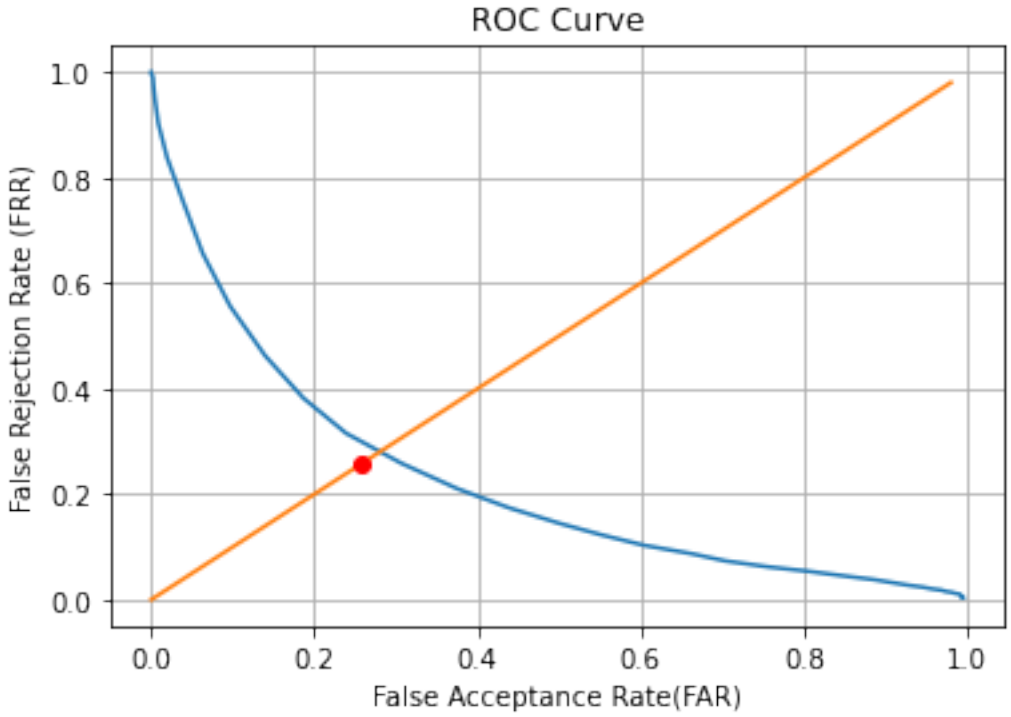
ROC Curve
False Rejection Rate (FRR)
False Acceptance Rate(FAR)
0.0
0.2
0.4
0.6
0.8
1.0

Figure 2: ROC