**2. Questions**

2.1. As explained in class, the provided third-party iris recognition library is able to extract the binary code from a given NIR iris image, as well as to calculate the distance between two computed iris binary codes. The expected behavior for the software is to generate small distances for two iris images that depict the same eye (genuine pair) and large distances for two iris images that depict different eyes (impostor pair).

Leveraging the content of **only** the "dataset" folder within the iris dataset, the third-party iris recognition library, and metrics learned in class, please determine **what is a good binary iris code distance threshold to separate genuine from impostor pairs**. While providing your answer for the distance threshold, please explain in detail how you computed it. (4 points)

Answer tips: good answers will describe what you did, such as "I generated *x* genuine and *y* impostor pairs, and observed FNMR and FMR at EER…", etc.

To determine the optimal binary iris code distance threshold, I used the provided third-party iris recognition library and metrics discussed in class. I began by selecting 13 genuine pairs, which are pairs of images depicting the same eye, and 13 impostor pairs, chosen randomly from images depicting different eyes, to ensure an equal count of both categories. Using the library, I computed the distances between the binary iris codes for all pairs, where smaller distances indicate genuine pairs and larger distances indicate impostor pairs. The calculated distances were stored in a file, which I then processed using the function *compute_dist_fmr_fmnr_eer*. Unlike the similarity-based function, this function is good for distance measurements; the threshold is set at the Equal Error Rate (EER), with equal False Non-Match Rate (FNMR) and False Match Rates (FMR). The threshold value obtained for the particular set of data was found to be 0.3048505815220732 which is the threshold value where the system will have an equal probability of making both false match and false non-match.

```
[24] print(compute_dist_fmr_fmnr_eer(load_data('/content/output4.csv')))

(0.0, 0.0, 0.3048505815220732)
```

2.2. By leveraging the distance threshold computed above, please classify each one of the five iris images provided within the "queries" folder of the iris dataset as either **genuine** (i.e., the `<CLAIMED_IRIS_ID>` is correct) or **impostor** (i.e., the `<CLAIMED_IRIS_ID>` is incorrect). Please justify your answer for each case by providing the distances obtained with the iris recognition library and comparing them to the distance threshold. In the occasion of being possible to obtain more than one iris code distance for a particular `<CLAIMED_IRIS_ID>`, please base your decision on the minimum distance as the best effort to perform biometric verification. (6 points)

Distance threshold: 0.3048505815220732

| Query | Classification | Minimum Distance |
|---|---|---|
| 6628.png | Impostor | 0.44178529111449644 |
| 3211.png | Genuine | 0.2529833064957737 |
| 0114.png | Impostor | 0.4213460772600558 |
| 7003.png | Genuine | 0.23404232526500154 |
| 5891.png | Impostor | 0.4399498660637487 |