2. Questions

2.1. As explained in class, the provided third-party iris recognition library can extract the binary code from a given NIR iris image, as well as calculate the distance between two computed iris binary codes. The expected behavior of the software is to produce small distances for two iris images depicting the same eye (genuine pair) and large distances for two iris images depicting 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 12 genuine pairs, which are pairs of images depicting the same eye, and 264 impostor pairs, chosen from all possible impostor pair combinations. Using the library, I computed the distances between binary iris codes for all pairs, with smaller distances indicating genuine pairs and larger distances indicating 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 dataset was 0.3048505815220732, at which the system has equal probability of making both false match and false non-match errors.

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. On the occasion of being possible to get 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)

Using the distance threshold above (0.304851), I compared each query image to all reference images for its claimed ID. When multiple distances were available, I used the minimum distance to make the decision.

Out of the five total queries, three were classified as genuine (correct claims), and two were classified as impostors (incorrect claims).

Query Image	Claimed ID	Min Distance	Threshold	Classification	Decision
0311.png	0311	0.183485	0.304851	Genuine	ACCEPT
0983.png	0983	0.198289	0.304851	Genuine	ACCEPT
2888.png	2888	0.419891	0.304851	Impostor	REJECT
5896.png	5896	0.252983	0.304851	Genuine	ACCEPT
6628.png	6628	0.441785	0.304851	Impostor	REJECT