4 Main Components of a Biometric System

1. Sensor - to acquire biometric data from an individual.
2. Feature extractor - to extract a set of discriminative features from the data set.
3. Comparator (matcher) : to compare two extracted feature sets.
   1. Output is the match score
4. Database - to store biometric templates of individuals.
   1. Templates : biometric feature set that is associated with an identity

Similarity Score - how similar two biometric samples are.

Dissimilarity Score - how different two biometric samples are.

The higher the score(similarity score), the more certain is the system that the two biometric samples come from the same person.

Genuine Score: match score obtained when two biometric samples from the same source (e.g. same finger) are compared.

Imposter Score: match score obtained when two biometric samples originating from different sources (e.g. different fingers) are compared.

A **genuine similarity** score should be greater than an imposter score in value.

A threshold (classifier) is used to determine if a score is genuine or imposter.

**Error Rates (Verification)**

False match rate(FMR) / False Accept Rate(FAR)

1. The proportion of **imposter scores** greater than the threshold.
2. Probability that an **imposter** will be incorrectly matched.
3. Low FMR required in high secure systems.
4. Ex: someone else’s face unlocks your phone.

False Non-Match Rate(FNMR) / False Reject Rate(FRR)

1. Proportion of **genuine scores** lower than the threshold..
2. Probability that a **genuine user** will be incorrectly non-matched.
3. Low FNMR required in systems focusing on user convenience.
4. Your own face does not unlock our own phone.

Detection Error Tradeoff (DET) Curve:

plot FNMR against FMR at various thresholds.

1 FMNR- true match.

Receiver Operating Characteristics (ROC) Curve:

1. Plot (1-FNMR) against FMR at various thresholds.

1 - FNMR = True Match Rate

Equal Error Rate ( FMR = FNMR)

\*\*\*Intro to Biometrics —> slide 37\*\*\*

Step size is proportionate to range.

Ex. Sample from 0 to 100. Plot 1,2,3,4,5….etc.

Sample from 0 to 10,000. Plot 0,100,200,300,400… etc

\*\*\*\*Be able to write a program that plots points given a set of genuine or imposter scores.

\*\*\*Matlab

Choosing Thresholds

1. High security. Choose a high false non-match rate. Prevents imposters but denies normal user access.
2. Forensics. Choose a threshold with a high false match rate. This casts a wider net. But prevents skipping over potential matches.

* “N” distinct identities
* “M” face samples per identity
* Biometric matcher provided
  + How many genuine scores can be generated?
    - N\*m\_choose2
    - N(m) = #gen scores

(2) matcher is symmetric

* + - If matcher is asymmetric ->>
      * 2xN\*(m)

(2)

* + How many imposter scores can be generated?
    - 1—> m
    - 2—> m
    - ….
    - …..
    - …..
    - .N—>m
    - How many scores can be generated total?
      * m\*m
    - N\_choose2
    - (N) \* m^2 —> number of imposter scores for symmetric matcher
    - (2)
    - If Assymetric —> multiply by 2
    - 2x (N) \*m^2
    - (2)
* Total # of scores = genuine scores + imposter scores
* (Nm) = (m)N
* (2)