



# Multi-Biometric system

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# Outline

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- Why is it important ?
- Biometric System Functional Processes.
- Properties of Biometric Characteristics.
- Challenges in Biometric Systems.
- Multimodal Biometric Type.
- Fusion by Biometrics.
- Fusion methodology.

# Overview

❖ The word biometrics is a combination of the Greek words bio and metric. When combined, it means “life measurement.” (Xiao, 2007).

**Bio + metric=life measurement**

- A *biometric system* is essentially a *pattern recognition system*.

# Overview

- Biometric systems perform recognition of individuals on the basis of their physical and/or behavioral traits.



Face



Fingerprint



Iris



Hand geometry



Palmprint



Signature



Voice



Gait

# Overview

- Traditional means of automatic identification (before biometrics)
  - Knowledge-based
    - Use “something that you know”
    - Examples: password, PIN
  - Token-based
    - Use “something that you have”
    - Examples: credit card, smart card, keys

# Why is it important ?

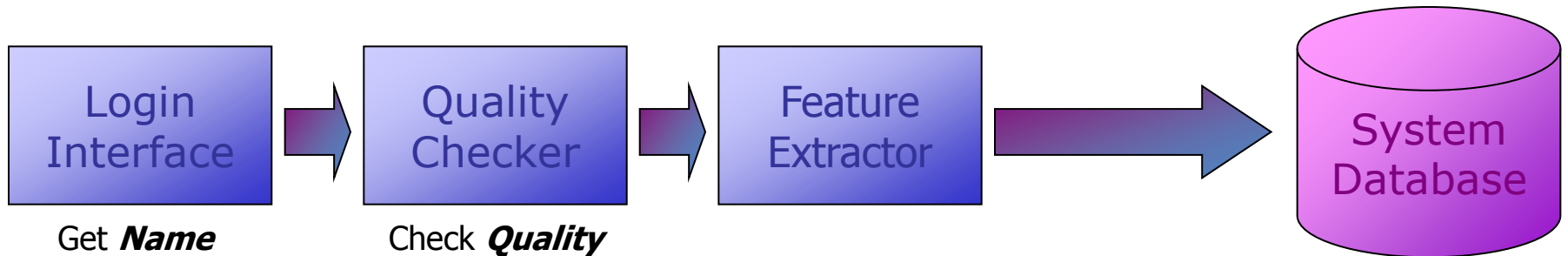
- Biometric systems provide several advantages over the traditional methods.
- Unlike passwords and tokens,
- Biometric traits cannot be lost, forgotten or manipulated.
- Biometric traits cannot be easily copied, shared, distributed or forged.

# Why is it important ?

- Most biometric systems will serve one of the two purposes:
- identification or
- verification/authentication.

# Biometric System Functional Processes

- Enrollment Process.

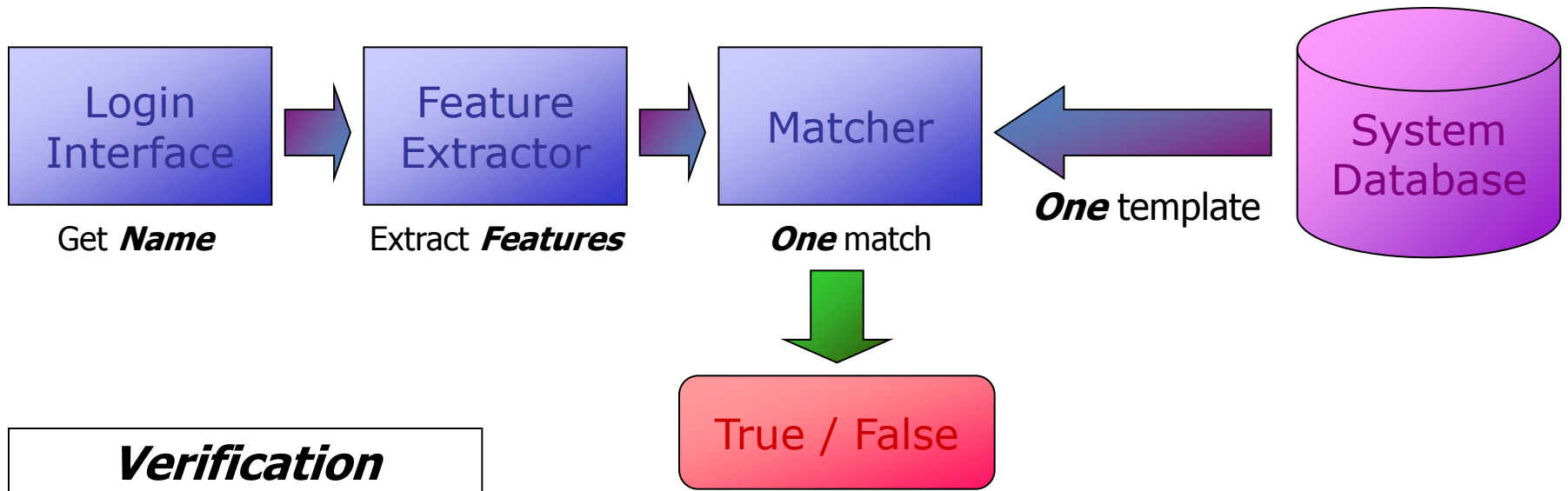


***Enrollment***



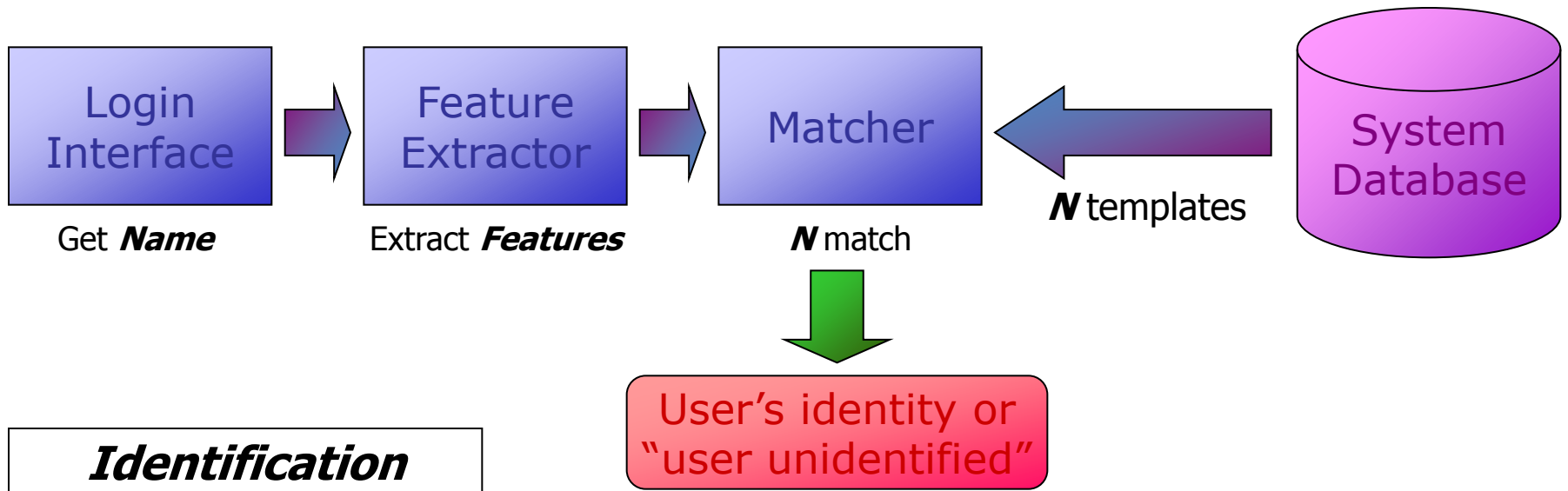
# Biometric System Functional Processes

- Verification Process.



# Biometric System Functional Processes

- Identification Process.



# Properties of Biometric Characteristics

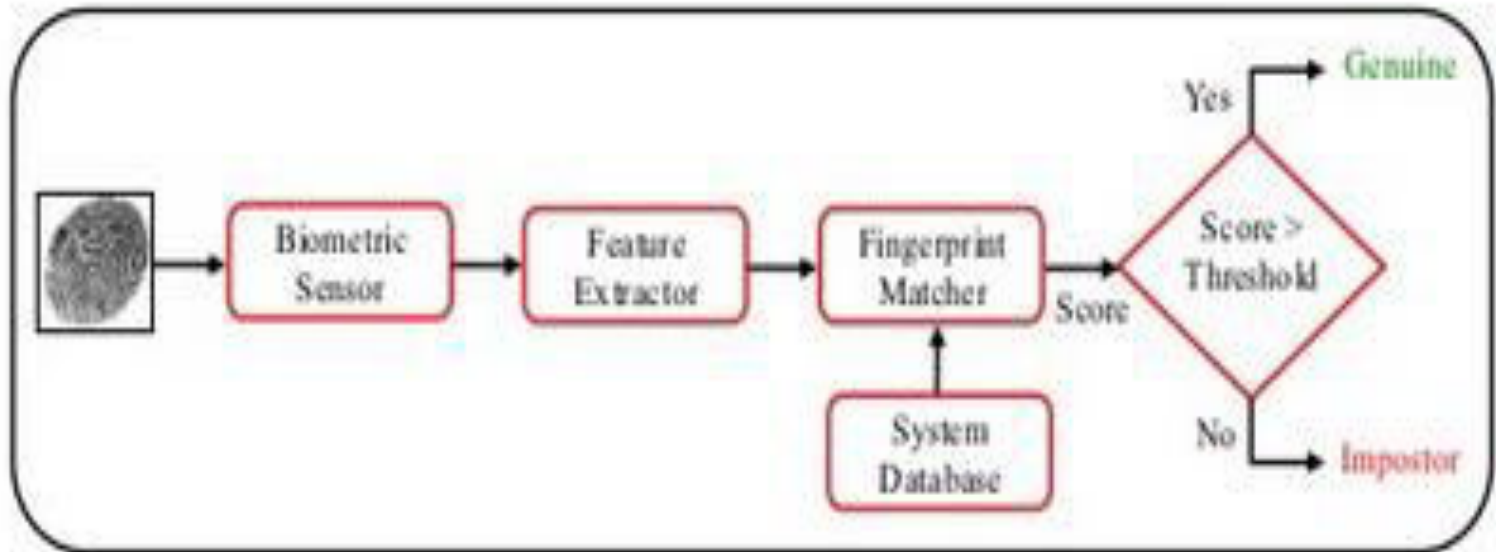
- (1) **universality**, all members of population being identified should possess the biometric;
- (2) **uniqueness**, biometric signature should be different for all members of the population;
- (3) **invariance**, the signature should be invariant under the conditions that it will be collected.

# Challenges in Biometric Systems

- Noise in sensed data.
- Intra-class variations.
- Inter-class similarities.

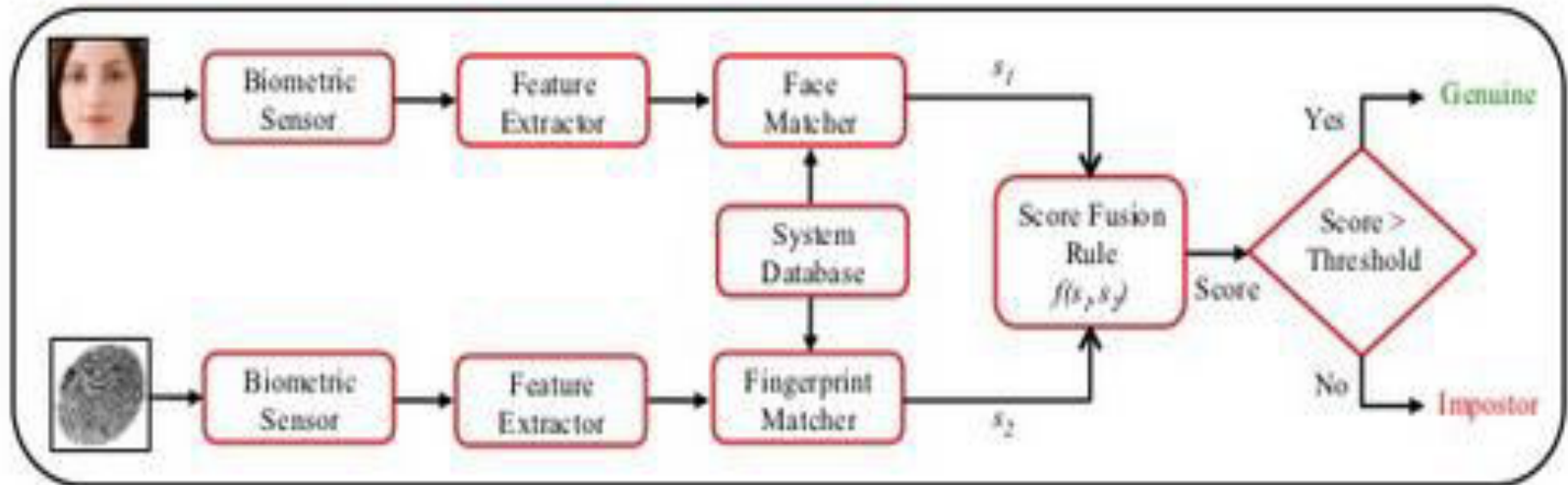
# Biometric System

- **Unimodal Biometric System**

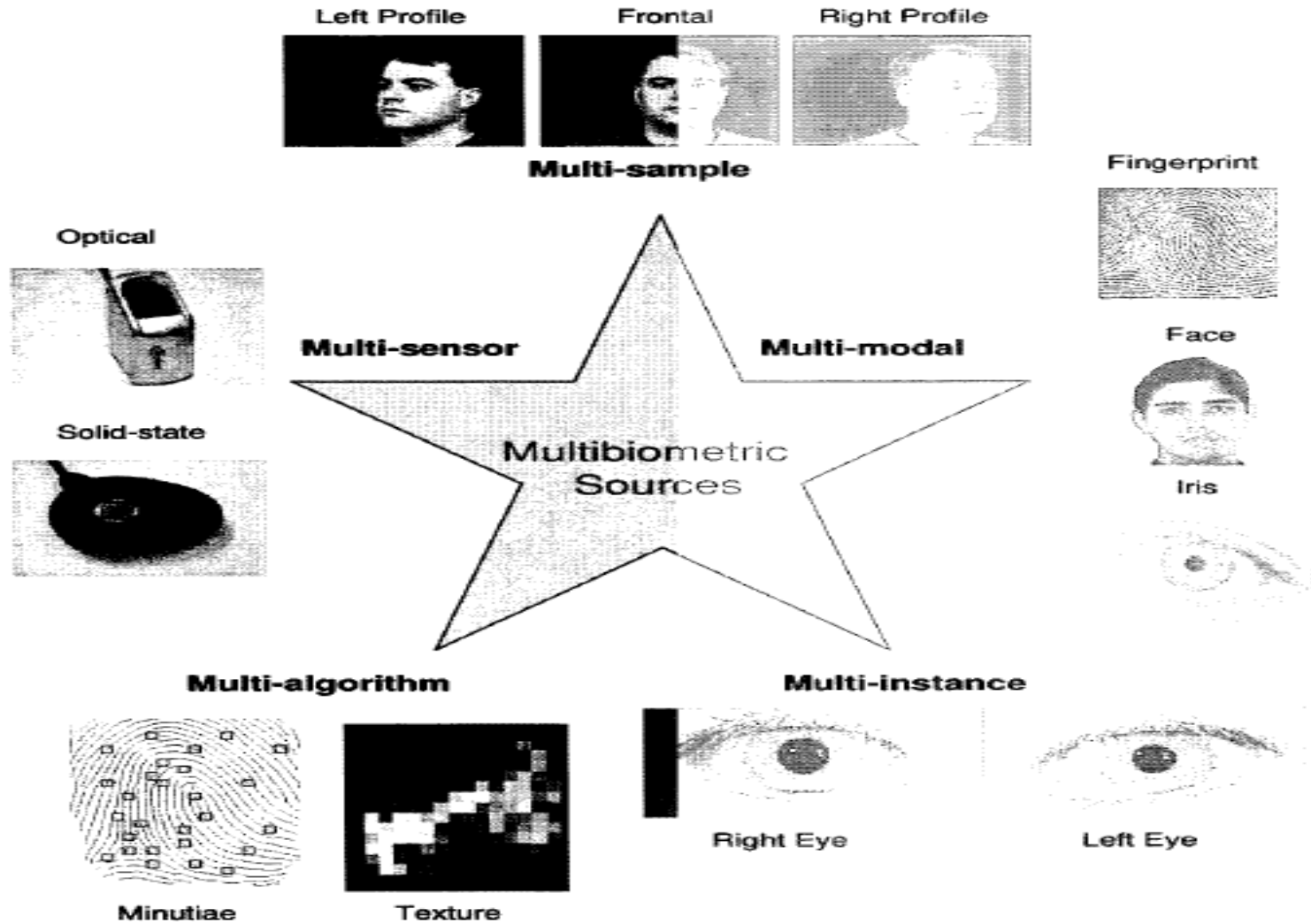


# Biometric System

- **Multimodal Biometric System**



# Multimodal Biometric Type

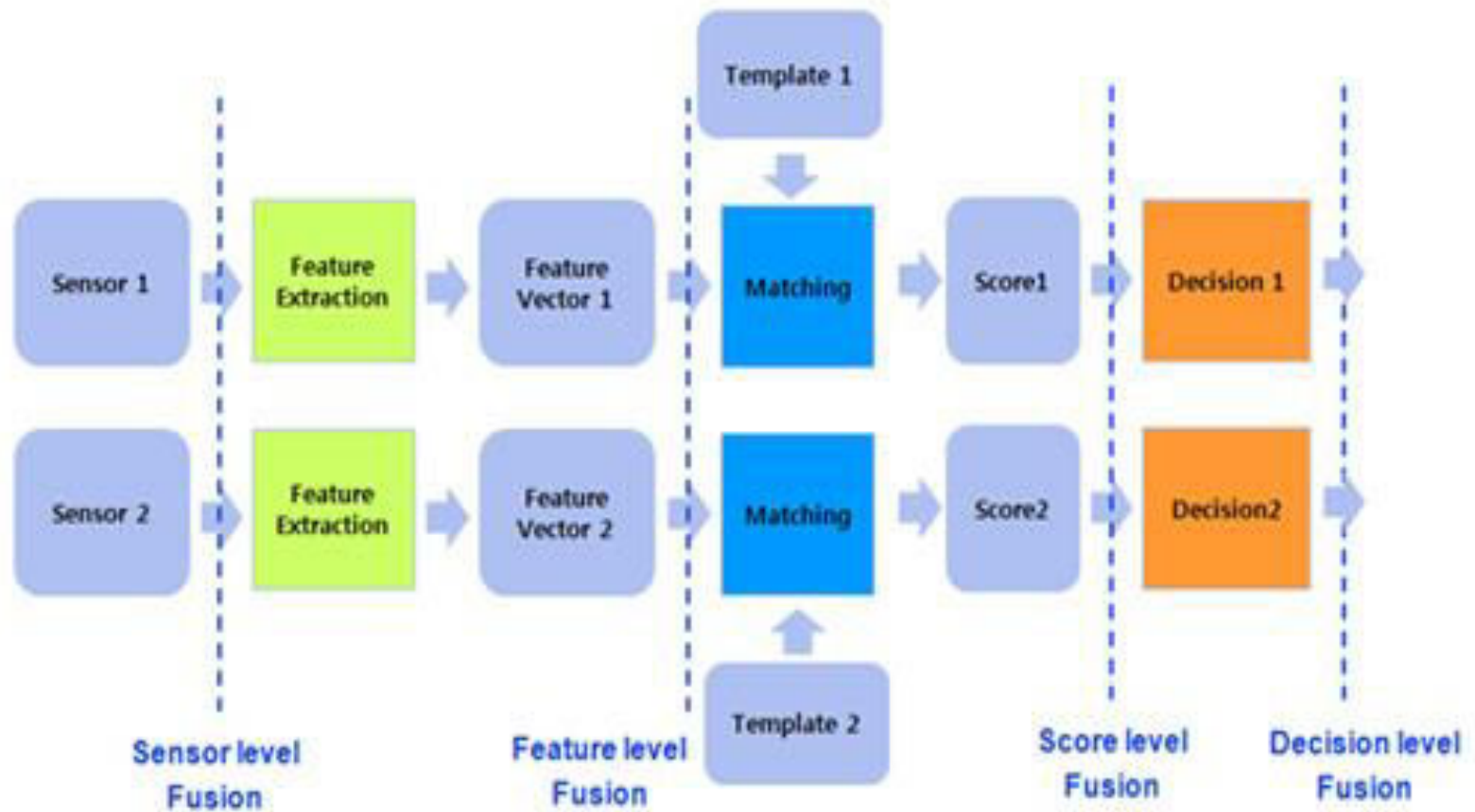


# Fusion methodology

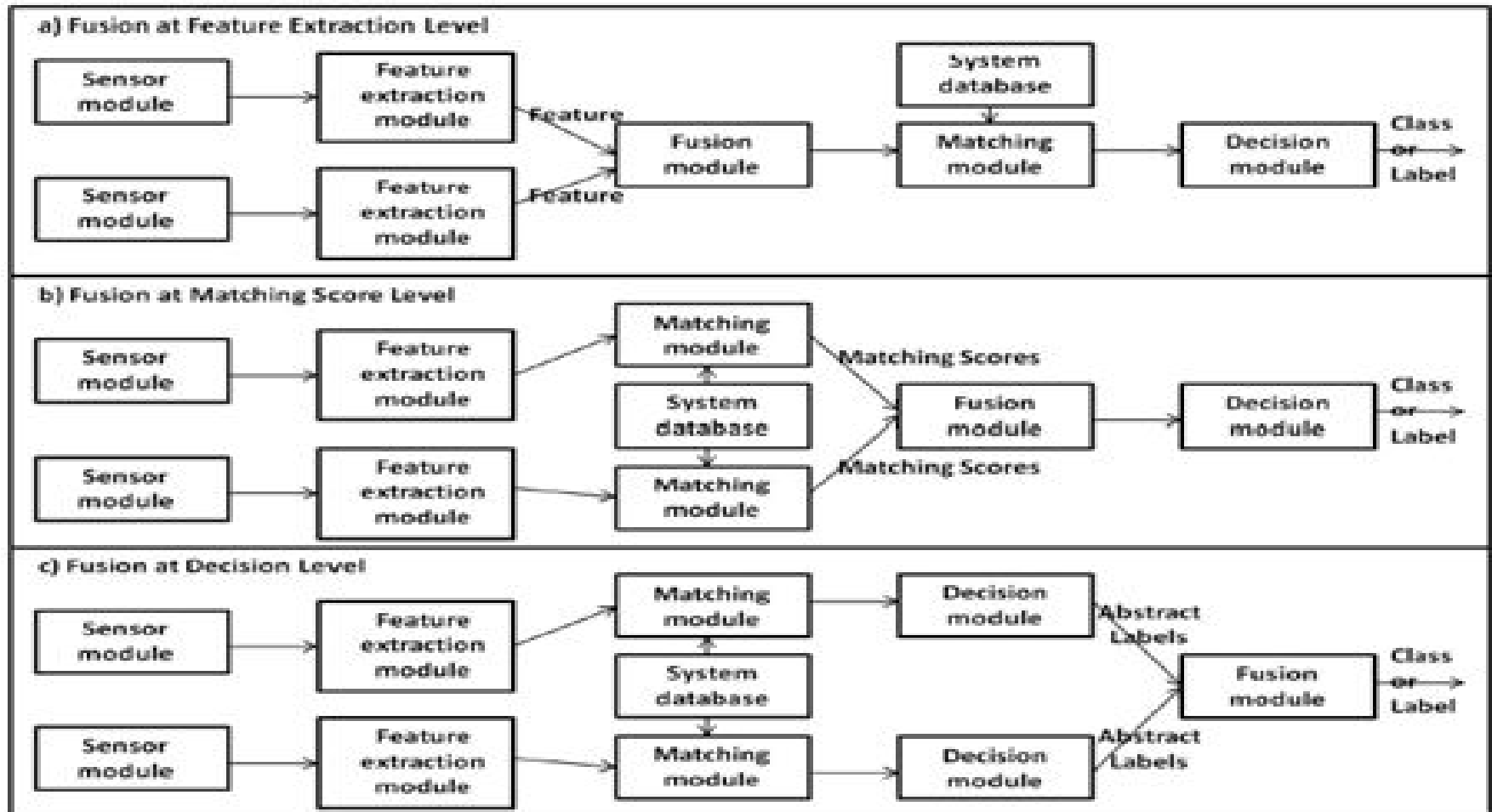
- *Biometric fusion is the use of multiple biometric inputs or methods of processing to improve performance.*
- *The key purposes for biometric fusion are to improve system accuracy, efficiency, applicability, and*
- *robustness.*



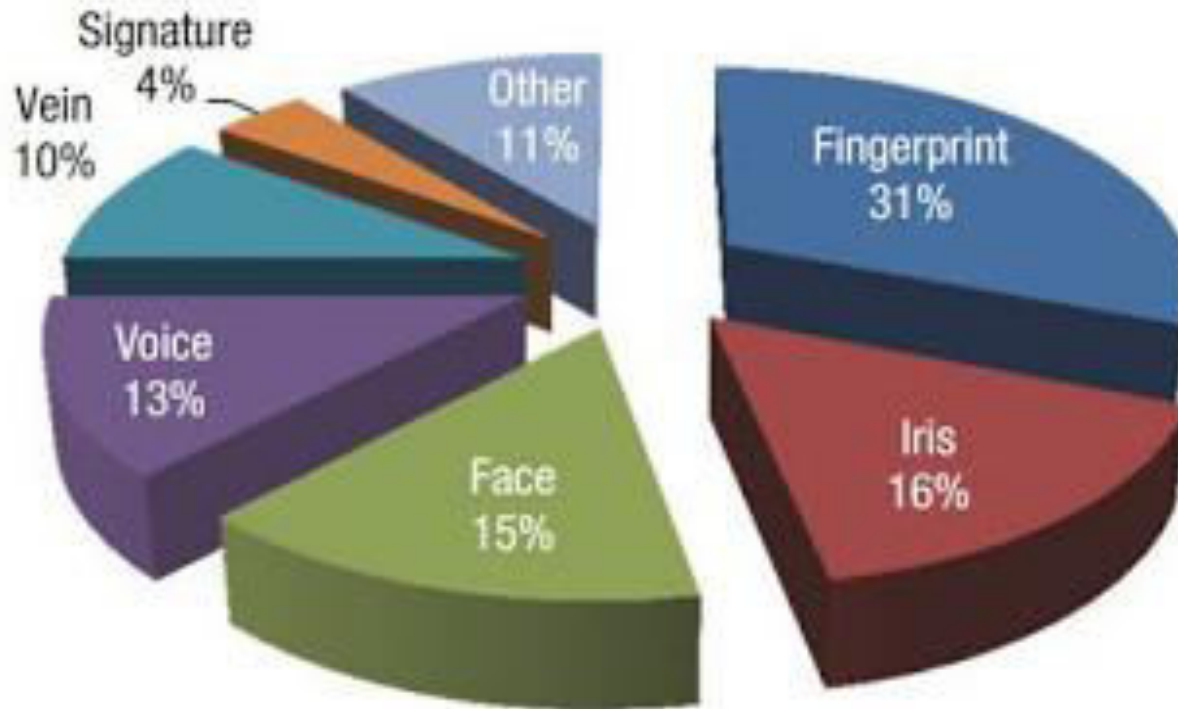
# Fusion methodology



# Fusion in Multi biometric Systems



# Biometrics Systems



**International biometric group  
2016**

# Conclusion

Multimodal biometric systems provide better recognition performance.

Thank you for your  
attention