

Software Engineering Conference Russia  
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# Lions, Swans, Monkeys – A New Approach to Biometric Menagerie

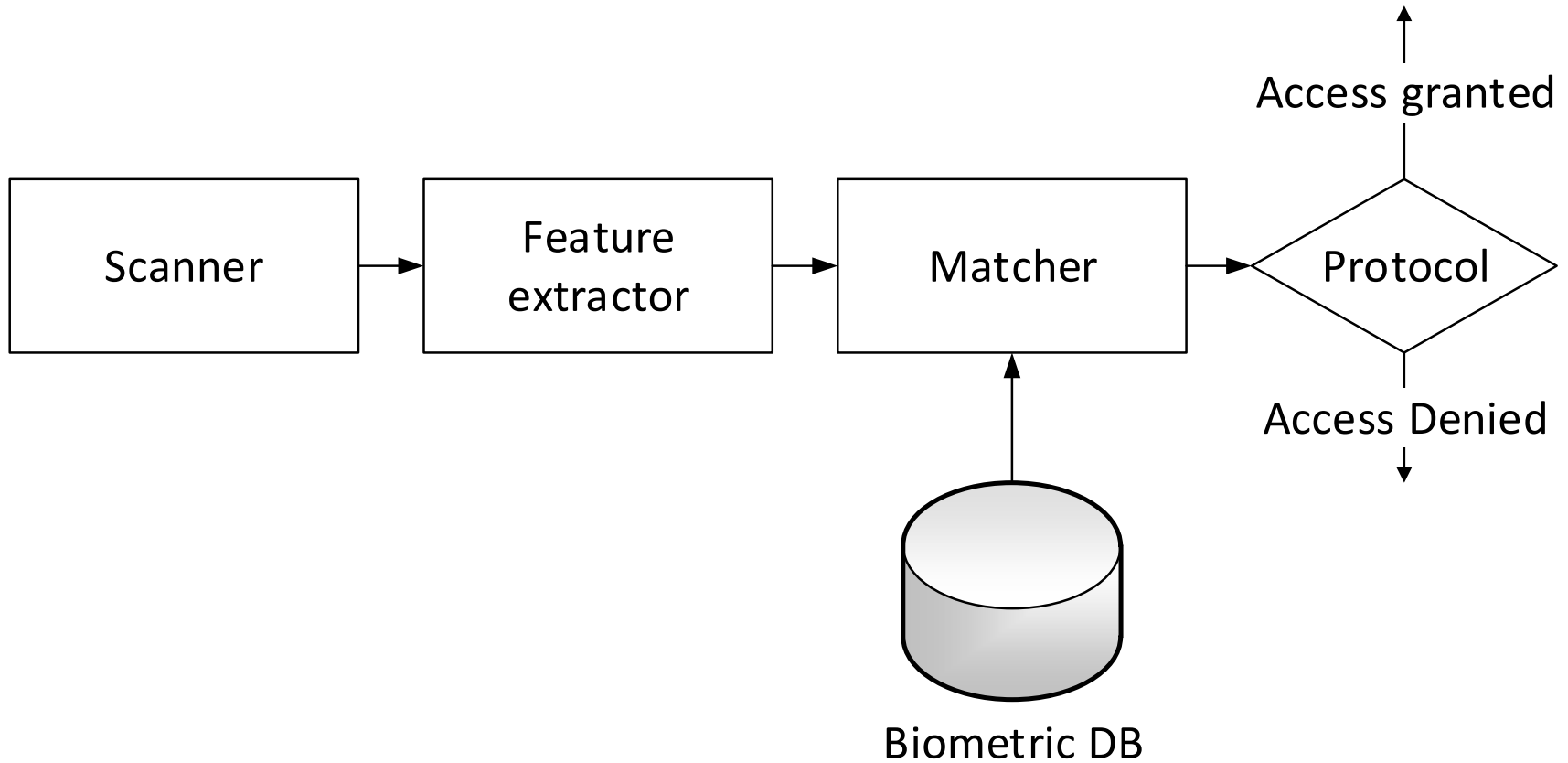
Stanislav Sartasov, SPSU

# What is biometric system?

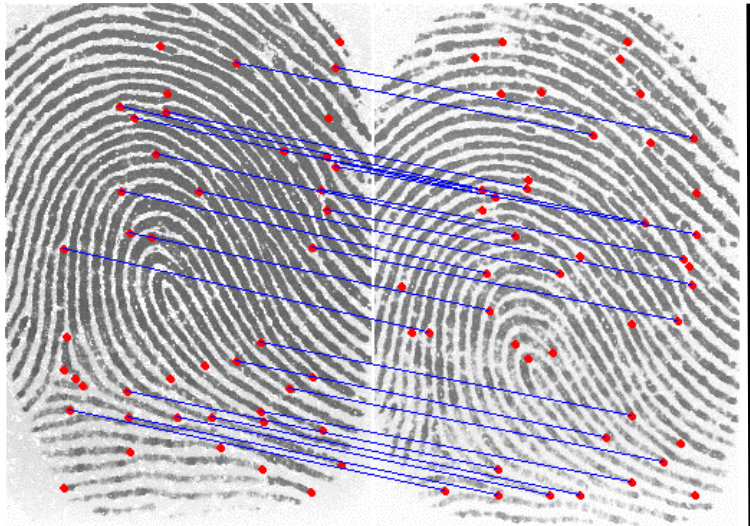


 **SECR**

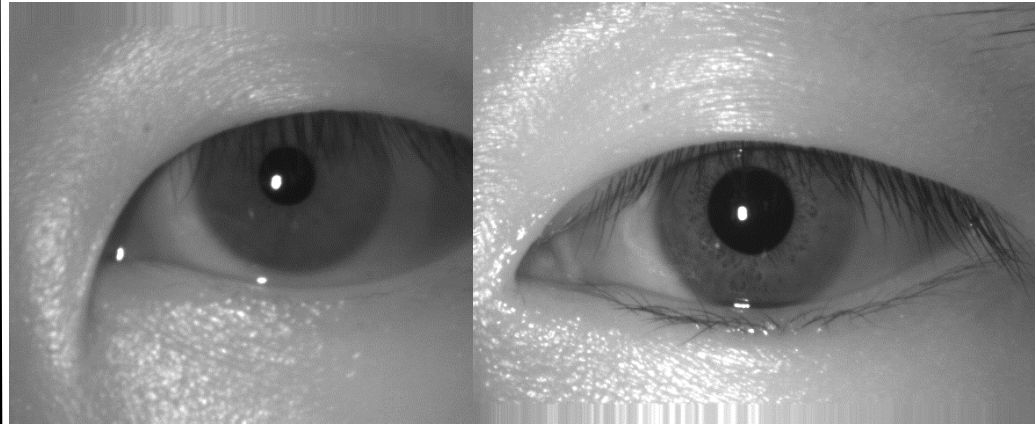
# What is biometric system?



# Genuine and impostor scores



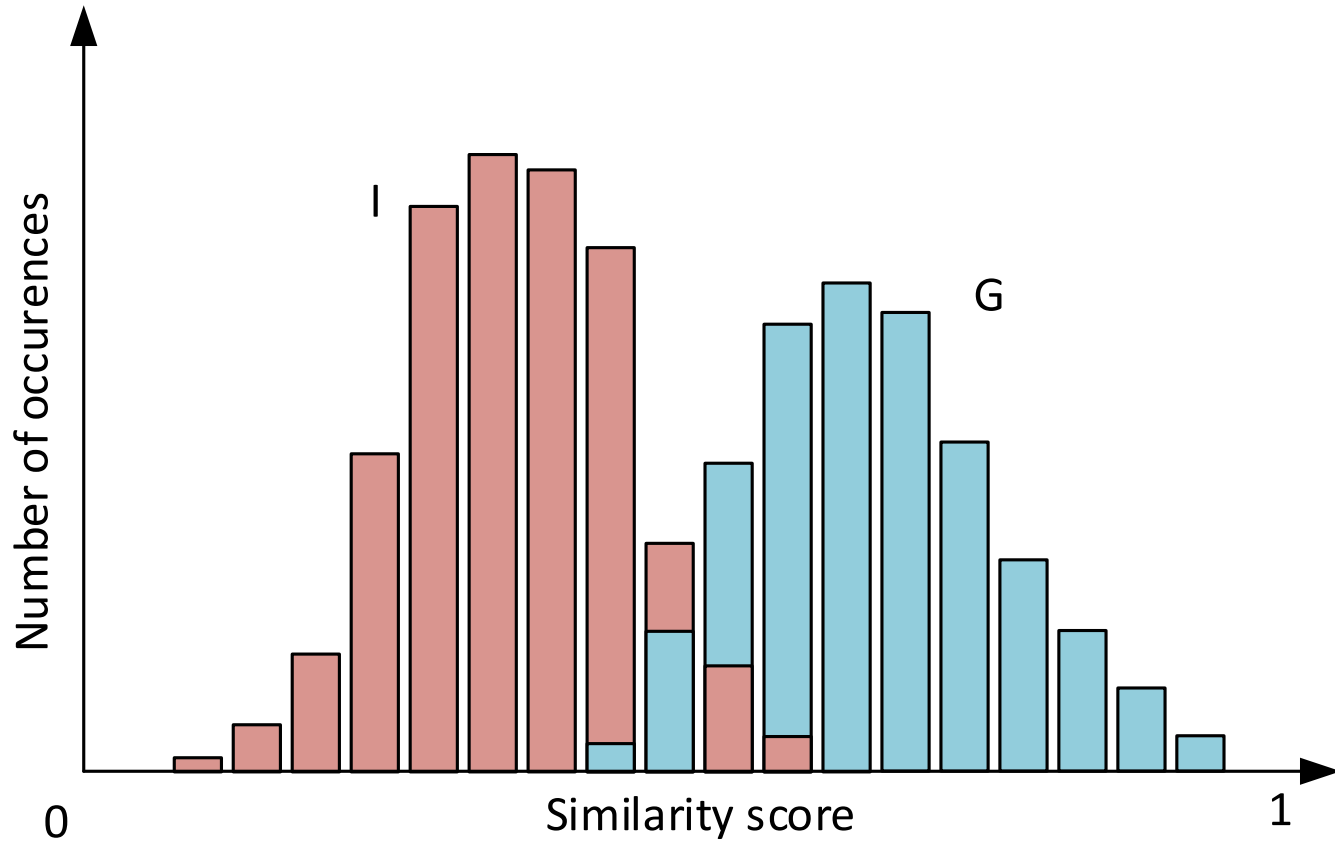
G-score



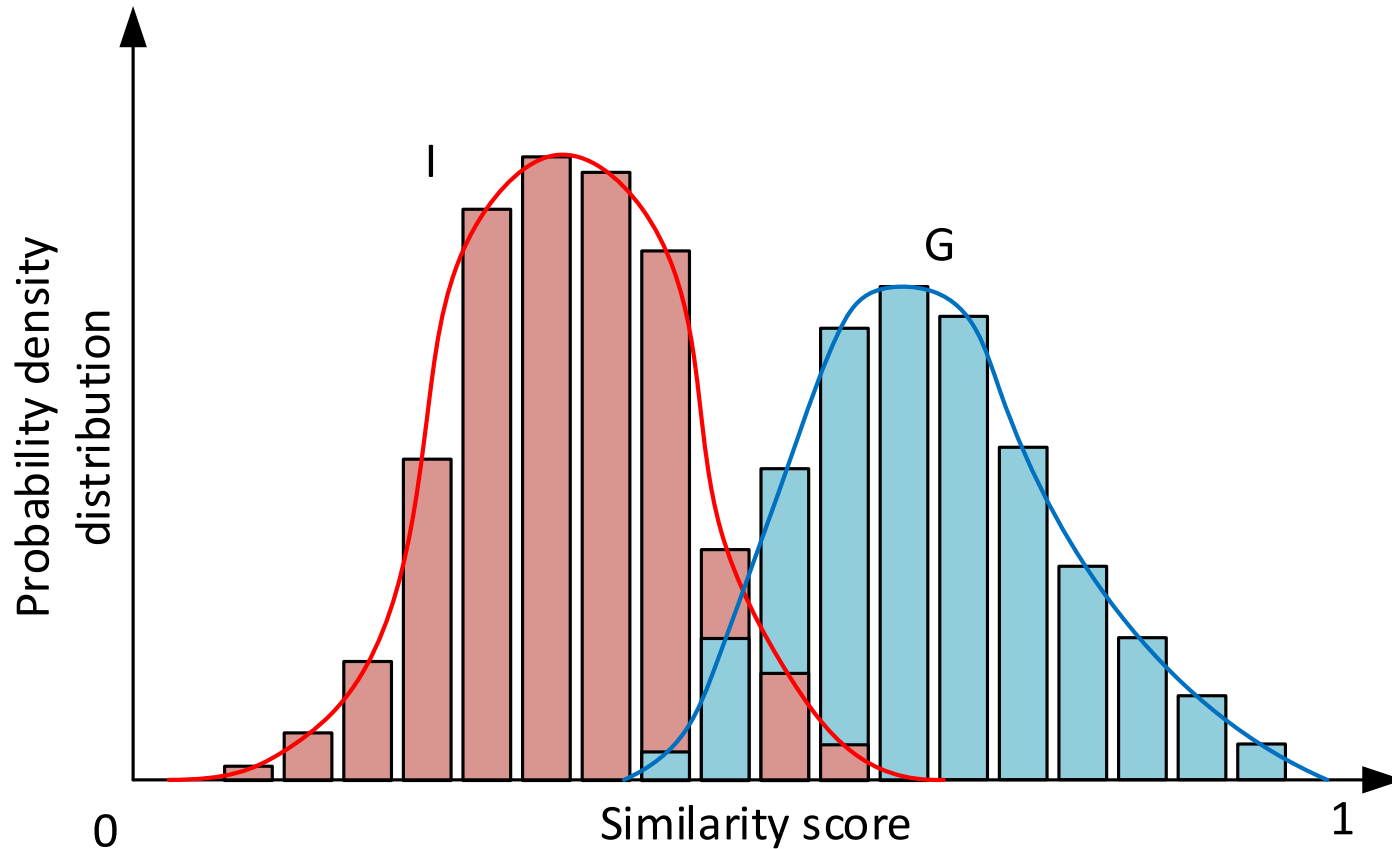
I-score

 **SECURITY**

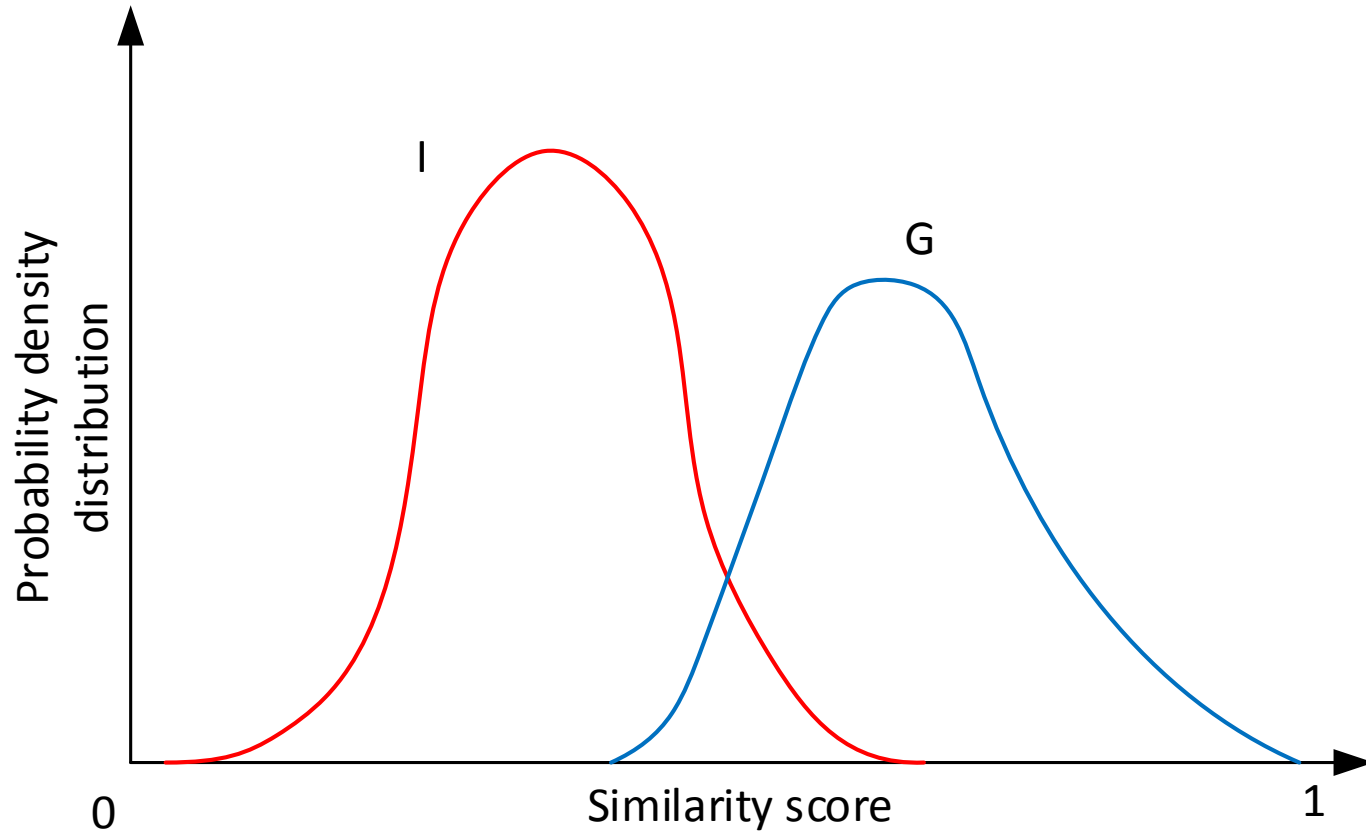
# Genuine and impostor scores



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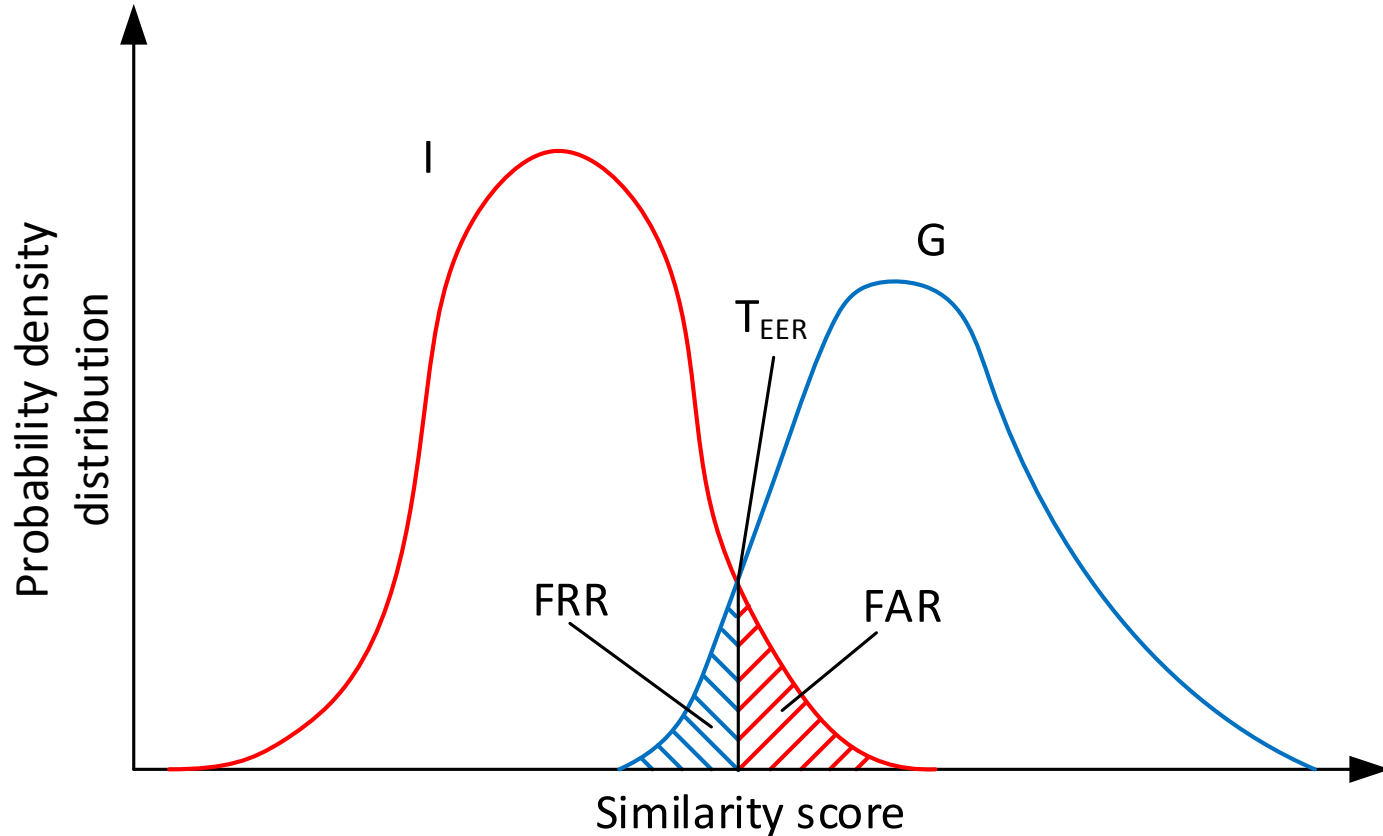


# Biometric system performance – classic approach

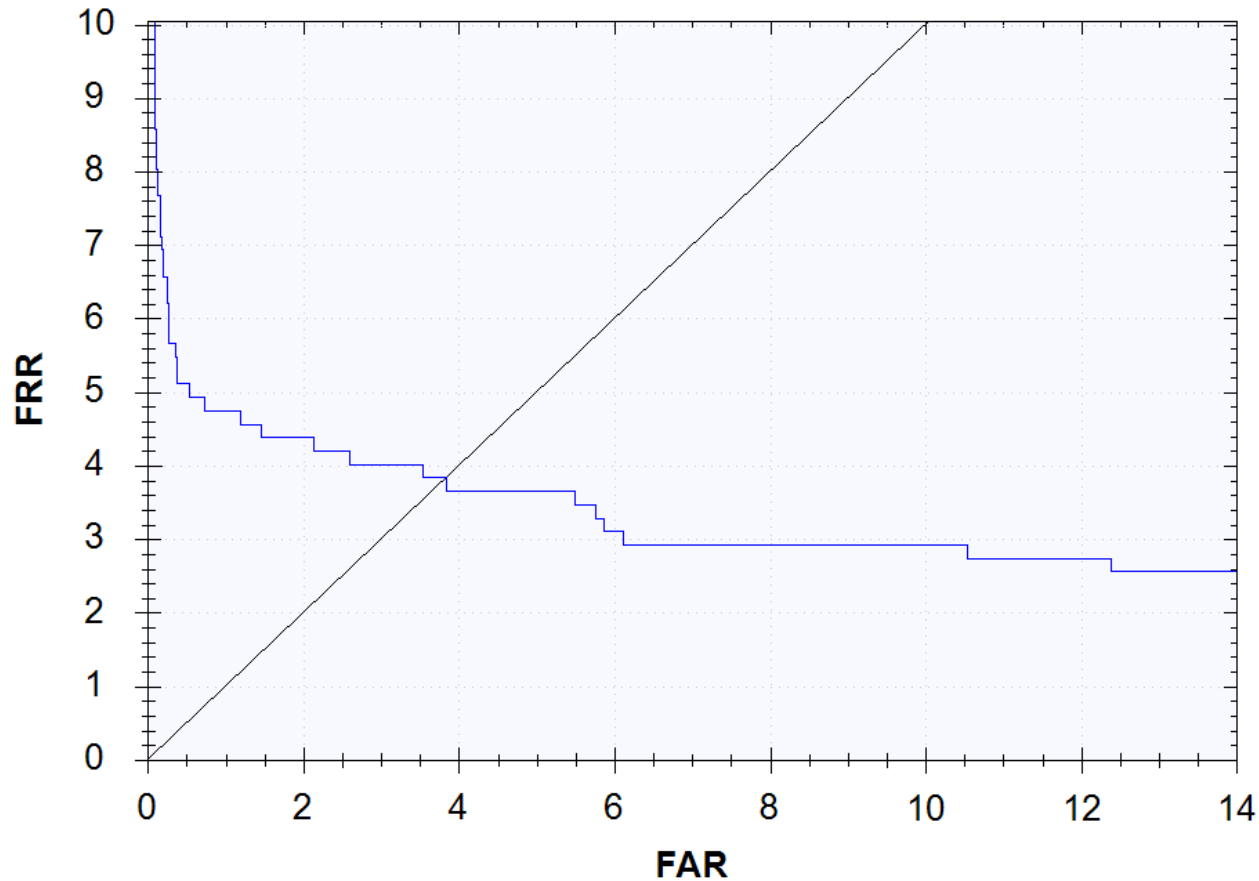
- Single threshold
- All available values
- Users are equiprobable



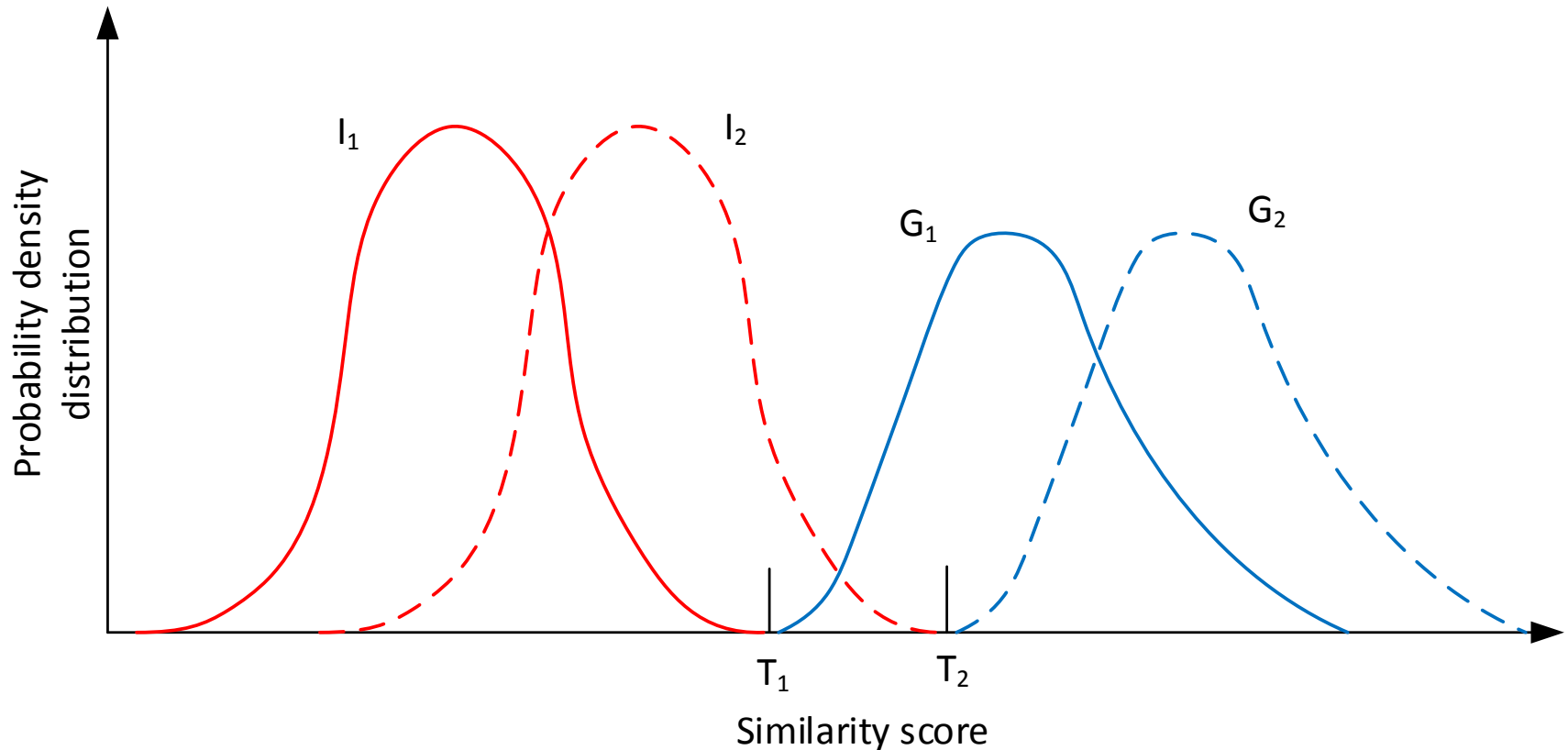
# Biometric system performance – classic approach



# Receiver Operating Characteristic

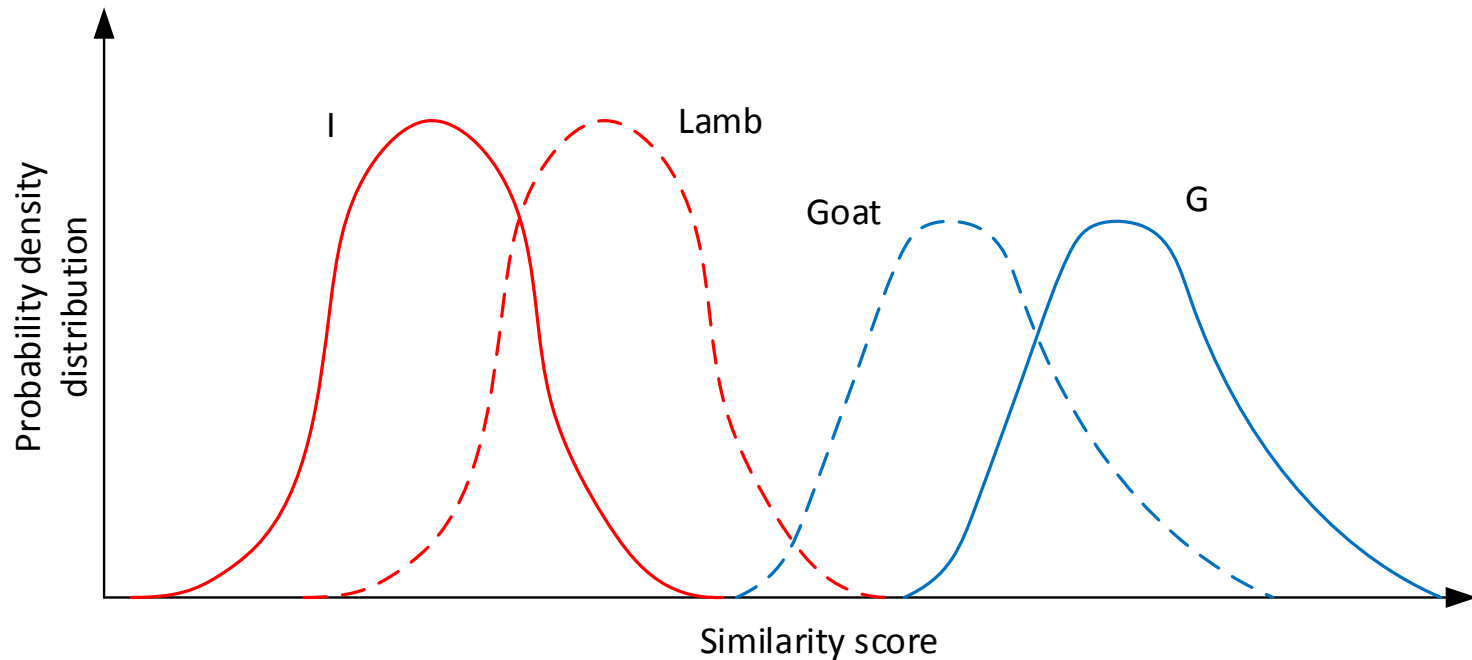


# Biometric system performance – classic approach



# Biometric menagerie - related works

- G. Doddington et al., 1998
- Users with high I-scores or low G-scores exist



# Biometric menagerie - related works

N. Yager, T. Dunstone, 2007, 2010

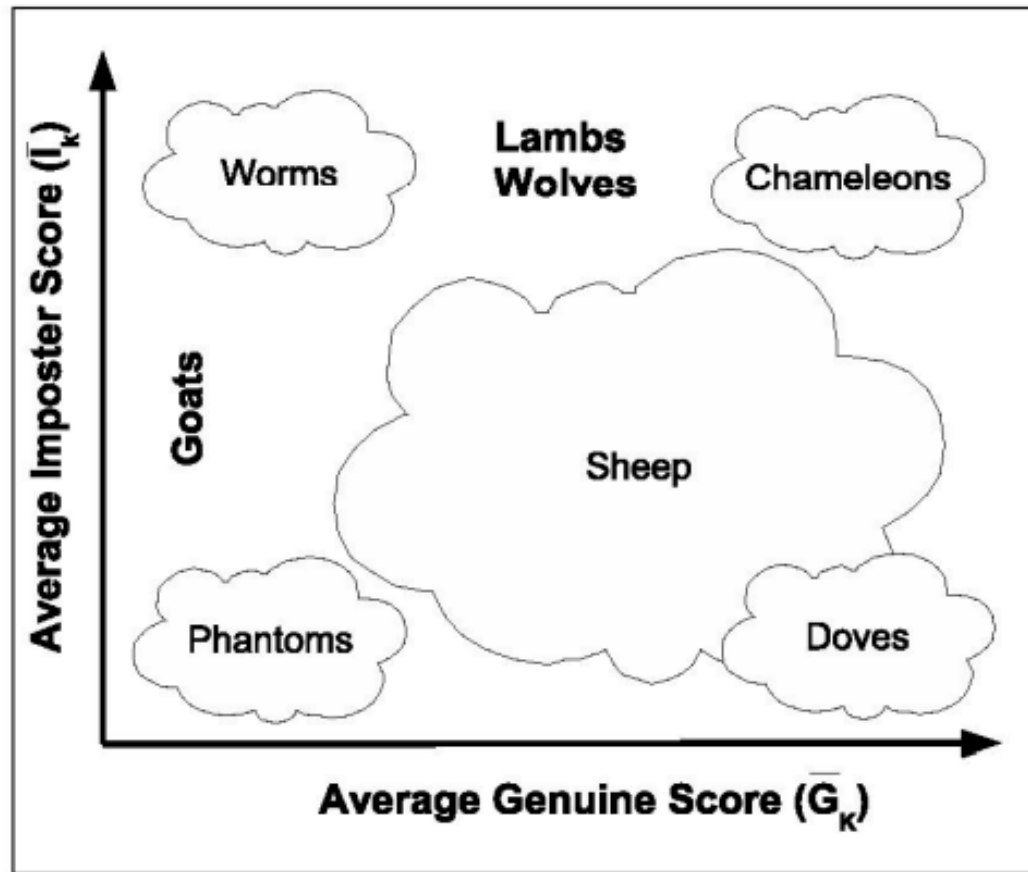


Image from N. Yager and T. Dunstone. 2010. The Biometric Menagerie. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 32, 2 (2010), 220–230. DOI: <http://dx.doi.org/10.1109/tpami.2008.291>

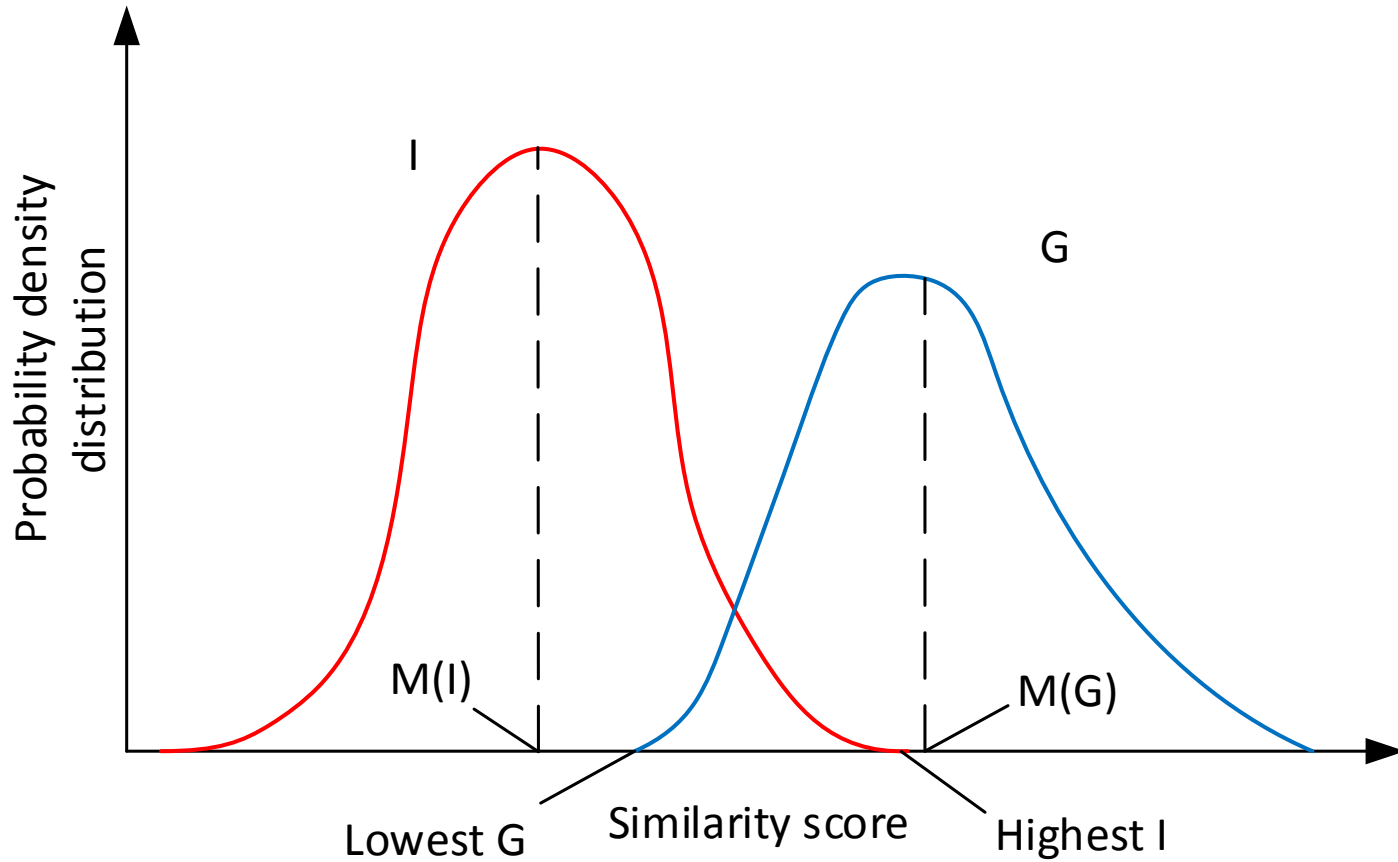


# Biometric menagerie - related works

- H. Zheng et al. 2015
- A database with EER=0%
- Both Doddington and Yager-Dunstone menageries found
- High I-scores and low G-score do not necessarily result in errors



# Proposed approach



# Proposed approach

$$K_i = \frac{M(G_i)}{M(I_i)}$$

$$\left\{ \begin{array}{l} K_i \geq T_l \rightarrow i - \textit{lion} \\ K_i \leq T_m \rightarrow i - \textit{monkey} \\ T_m < K_i < T_l \rightarrow i - \textit{swan} \end{array} \right.$$

$$T_l = \text{tg} \frac{2\pi}{5} \quad T_m = \text{tg} \frac{3\pi}{10}$$

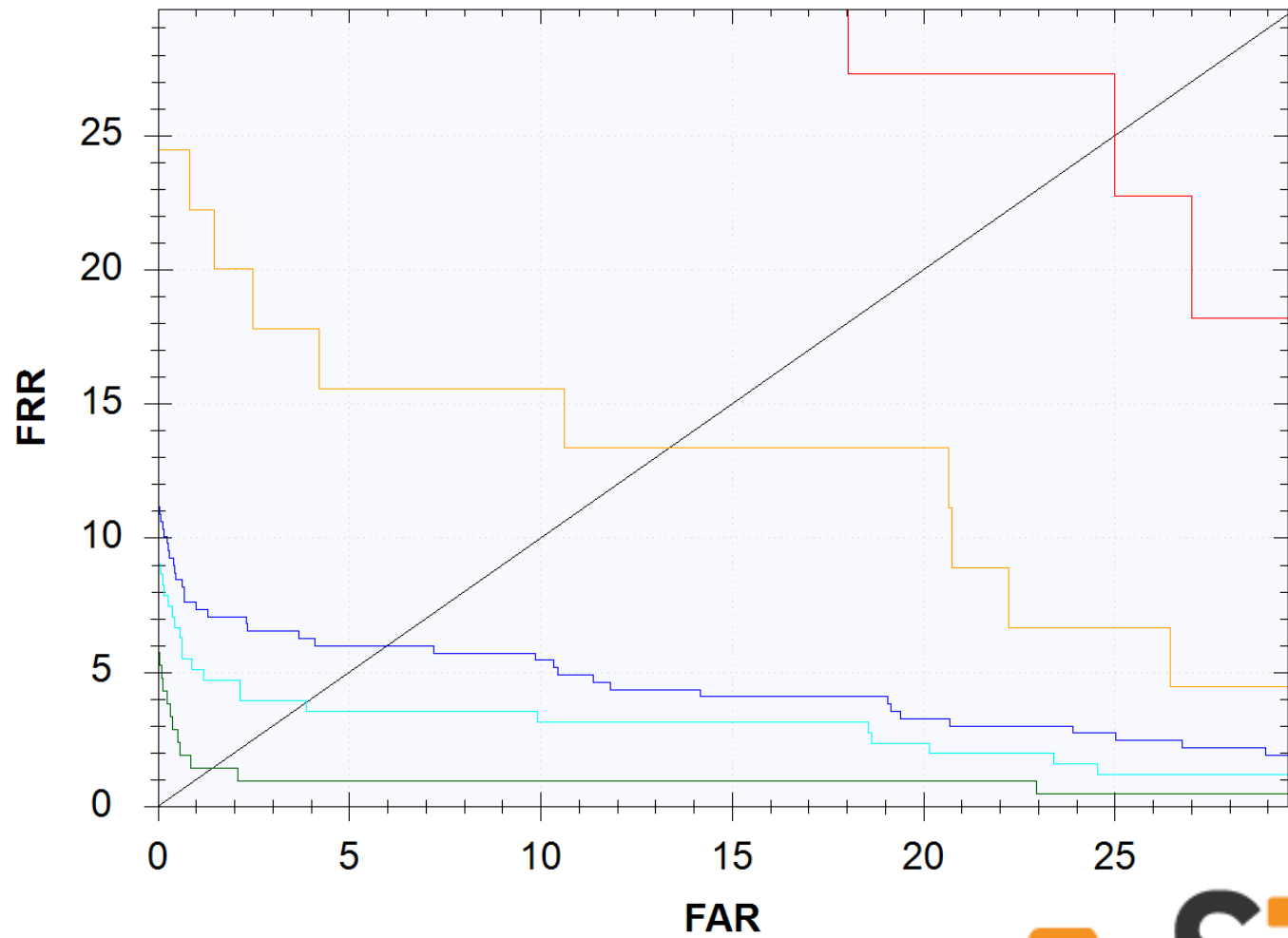
$$S_i = \text{sgn}(\max(I_i) - \min(G_i))$$

$$\left\{ \begin{array}{l} S_i < 0 \rightarrow i - \textit{white swan} \\ S_i \geq 0 \rightarrow i - \textit{black swan} \end{array} \right.$$

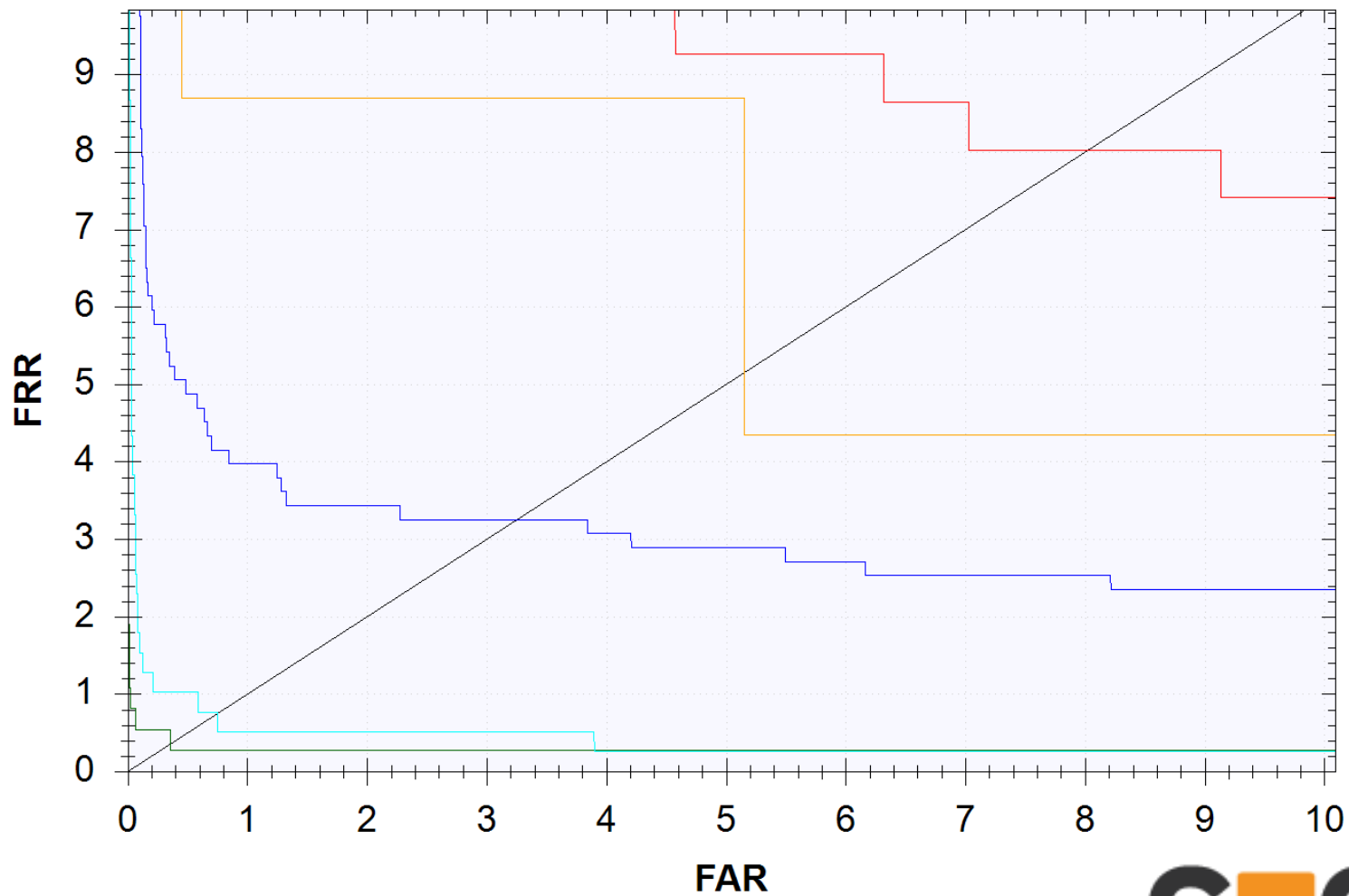




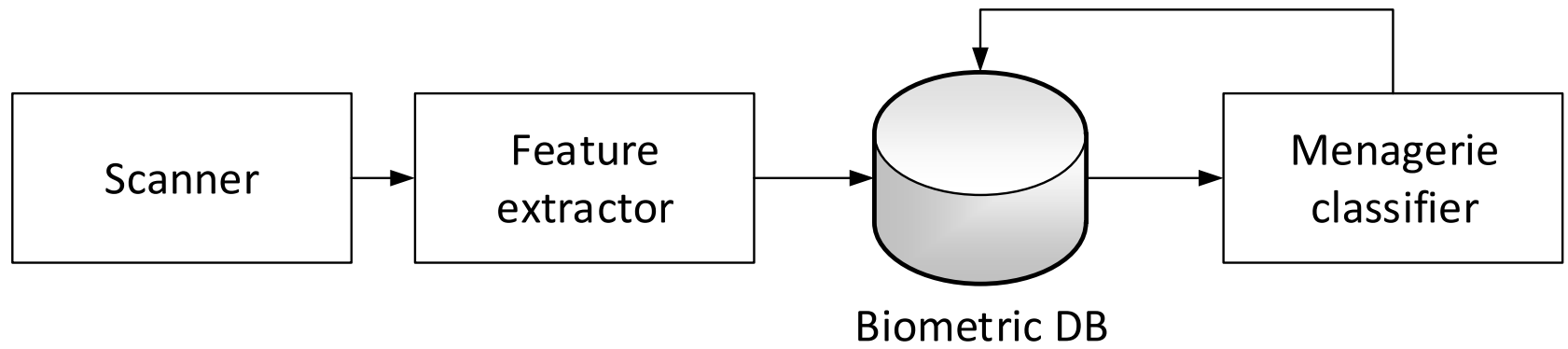
# Results



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# How to use it?



# Conclusions

- It works 😊
  - Users can be reliably separated into bins
  - Generic framework
- $K_i$  needs to be adjusted – WIP
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