Appendix B
Definition of Terms and Notations

A. Definition of Terms

Commonly used definitions of terms in the text of this thesis are described below.

Artificial Neural Networks

These are parallel computational models comprised of densely interconnected adaptive processing units.

Biometrics

An authentication technique that rely on measurable physical characteristics that can be automatically checked. There are several types of biometric identification schemes: face: the analysis of facial characteristics.

Biometric Cryptosystems

Biometrics-based key generation refers to extracting/generating a *cryptographic* key from a *biometric* template or construct.

Cancelable Biometric

Cancelable biometrics refers to the intentional and systematically repeatable distortion of biometric features in order to protect sensitive user-specific data. If a cancelable feature is compromised, the distortion characteristics are changed, and the same biometrics is mapped to a new template, which is used subsequently. Cancelable biometrics is one of the major categories for biometric template protection purpose besides biometric cryptosystems.

Classification

A process of decision making based on observed parameters obtained by combining several observations or measurements.

False Rejection Rate (FRR)

In biometrics, false rejection rate is the instance of a security system failing to verify or identify an authorized person.

False Acceptance Rate (FAR)

It refers to the instance of a security system failing to verify or identify an unauthorized person.

Fuzzy measure

Fuzzy measure (*μ*) is defined by the function μ: $P(X) \rightarrow [0, 1]$ satisfying the conditions: $\mu(\emptyset) = 0$, $\mu(X) = 1$ and $\mu(A) \leq \mu(B)$, if $A \subset B$ and $A, B \in P(X)$ where, X is a finite set. $\mu(A)$ represents the importance or the power of coalition A for the fusion problem.

Fuzzy integral

Fuzzy integral (Sugeno) $S(g_i)$ of a function g: $P(X) \rightarrow [0, 1]$ with respect to μ is defined by $S(g_i) = \max_{i=1}^{N}(\min(g(x_i), \mu(A_i))$ where, $g(x_i)$ is the indices to be permuted so the $0 \leq g(x_1) \leq \ldots \leq g(x_n) \leq 1$ and $A_i = \{x_i, x_{i+1}, \ldots, x_N\}$, $A_1 = \emptyset$.

Fuzzy set theory

Fuzzy set theory is the extension of classical (crisp) set theory, which allows degrees of membership of elements to sets. Fuzzy set theory allows memberships to take values anywhere in the range [0, 1].

Equal Error Rate (EER)

It is the location where the FAR equals the FRR on ROC curve. The system having a lower EER value indicates better performance.

Multibiometrics

The fusion of different types of biometric information and is, therefore, much broader in scope than biometrics.

Receiver Operating Characteristic

A receiver operating characteristic (ROC), or ROC curve, is a graphical plot that illustrates the performance of a binary classifier system as its discrimination threshold is varied. The curve is created by plotting the FRR against FAR at various threshold settings.

Score Normalization

Score normalization refers to the process of changing the location and scale parameters of the match score distributions so that the match scores of different matchers are transformed into a common domain

Support Vector Machine

A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane. In other words, given labeled training data (supervised learning), the algorithm outputs an optimal hyperplane which categorizes new examples.

Type-2 Fuzzy Set

The type-2 fuzzy set is a generalization of the concept of classical fuzzy set theory. Each membership functions in type-1 fuzzy set are always a crisp set into real numbers in [0, 1] whereas the membership functions of type-2 fuzzy set are ordinary fuzzy sets i.e., ‘fuzzy-fuzzy set’. Thus, the type-2 fuzzy set can be defined as a generalized fuzzy set by allowing their intervals to be fuzzy i.e., fuzziness of a fuzzy set.