Artificial Intelligence for Biometric Technologies and Systems

Biometrics concerns the study of automated methods for identifying an individual by measuring one or more physical or behavioral features of him. Certain physical human features or behaviors are characteristics that are specific and can be uniquely associated to one person. Retinas, iris, DNA, fingerprint, palm print, or pattern of finger lengths are typical physical features that are specific to individuals. Also the voice print, gait, or handwriting can be used to this purpose.

Nowadays biometrics is rapidly evolving. This science is getting more and more accurate in identifying persons and behaviors. Consequently, these technologies become more and more attractive and effective in critical applications, such as to create safe personal IDs, to control the access to personal information or physical areas, to recognize terrorists or criminals, to study the movements of people, and to monitor the human behavior.

The use of biometrics in the real life often requires very complex signal and image processing and scene analysis, for example encompassing biometric feature extraction and identification, individual tracking, face tracking, eye tracking, liveness/anti-spoofing tests, and facial expression recognition.

Artificial intelligence techniques (including neural networks, fuzzy logic, evolutionary computing, and multi-agent systems) have been proved to be useful and effective in addressing this kind of data processing, especially when it is difficult to identify an algorithm while sufficiently descriptive examples are available, or when fuzzy descriptions are more natural to capture the essence of the problem, or when complex non-linear optimization is needed, or when multiple agents cooperate in solving the application problem.

This talk will review the domain of biometrics, its applications in various domains and the relevance of artificial intelligence, in particular neural networks and deep learning to effectively solve various problems in these applications.