

Preface

Biometrics in modern computer science is defined as the automated use of biological properties to identify individuals. The early use of biometrics can be dated back to nearly 4000 years ago when the Babylon Empire legislated the use of fingerprints to protect a legal contract against forgery and falsification by having the fingerprints impressed into the clay tablet on which the contract had been written. Nowadays, the wide use of the Internet and mobile devices has brought out the booming of the biometric applications, and research on biometrics has been drastically expanded into many new domains.

The research trends in biometric research may be categorized into three directions. The first direction is toward the broader Internet and mobile applications. This brings out a number of new topics to utilize biometrics in mobile banking, health care, medical archiving, cybersecurity, and privacy as a service, etc. These new applications have created a huge market of billion dollars for biometric technologies and the industry needs comes back to push the research further and vigorously. The second direction is towards algorithmic development, which includes the investigation of many new AI techniques in biometrics, such as fuzzy approaches, ensemble learning, and deep learning. These new approaches can often help improve the accuracy of automated recognition, making many new applications available for business. Especially, with the vast amount of data coming from billions of users on internet/mobile, biometrics now becomes a new Big Data challenge in its streaming, processing, classification and storage. The third research direction aims at discovering more types of biometrics for various uses. Besides the conventional fingerprints and signatures, other types of biometrics (such as iris, vein pattern, gait, and touch dynamics) have been investigated in recent biometric research. Their combination as multimodal biometrics is another popular way to exploit these types of biometrics in research.

This book includes 16 chapters highlighting recent research advances in biometric security. Chapters 1–3 present new research developments using various biometric modalities including Fingerprints, Vein Patterns and Palmprints. New tools and techniques such as Deep Learning are investigated and presented. Chapter 4 reports a new biometric recognition approach based on the acoustic

features of human ears. Chapters 5–9 discuss new research works relating to a number of dynamic behavioural biometric traits. Chapters 10–13 focus on face recognition, which is the most popular topic in biometrics. Chapter 14 carries out a survey of biometric template protection, a very important topic in biometric privacy and security. Chapter 15 investigates the use of biometrics for better security in cloud computing and Internet of Things. Chapter 16 reports the new EU legislation on biometrics, which should help technology developers be aware of the legal aspects of biometric technologies.

The target audience for this book includes graduate students, engineers, researchers, scholars, forensic scientists, police force, criminal solicitors, IT practitioners and developers who are interested in security and privacy related issues on biometrics. The editors would like to express their sincere gratitude to all distinguished contributors who have made this book possible, and the group of reviewers who have offered insightful comments to improve the quality of each chapter. A dedicated team at Springer Publishing has offered professional assistances to the editors from inception to final production of the book. We thank them for their painstaking efforts at all stages of production.

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