50 years of Biometric Research: Accomplishments, challenges, and opportunities

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Abstract: Biometric recognition refers to the automated recognition of individuals based on their biological and behavioral characteristics such as fingerprint, face, iris, and voice. The first scientific paper on automated fingerprint matching was published by Mitchell Trauring in the journal Nature in 1963. The first objective of this talk is to highlight the significant progress that has been achieved in the field of biometric recognition in the past 50 years since Trauring's landmark paper. This progress has enabled current state-of-the-art biometric systems to accurately recognize individuals based on biometric trait(s) acquired under controlled environmental conditions from cooperative users. Despite this progress, a number of challenging issues continue to inhibit the full potential of biometrics to automatically recognize humans. The second objective is to enlist such challenges, analyze the solutions proposed to overcome them, and highlight the research opportunities in this field. One of the foremost challenges is the design of robust algorithms for representing and matching biometric samples obtained from uncooperative subjects under unconstrained environmental conditions (e.g., recognizing faces in a crowd). In addition, fundamental questions such as the distinctiveness and persistence of biometric traits need greater attention. Problems related to the security of biometric data and robustness of the biometric system against spoofing and obfuscation attacks, also remain unsolved. Finally, larger system-level issues like usability, user privacy concerns, integration with the end application, and return on investment have not been adequately addressed. Unlocking the full potential of biometrics through inter-disciplinary research in the above areas will not only lead to widespread adoption of this promising technology, but will also result in wider user acceptance and societal impact.

Biography: Dr Anil K. Jain is a University Distinguished Professor in the Department of Computer Science & Engineering at Michigan State University. He was appointed an Honorary Professor at Tsinghua University and a WCU Distinguished Adjunct Professor at Korea University. He received B.Tech degree from the Indian Institute of Technology, Kanpur and M.S. and Ph.D. degrees from The Ohio State University. His research interests include pattern recognition, computer vision and biometric recognition.

He has been recognized with a Guggenheim Fellowship, Humboldt Research Award, Fulbright fellowship, IEEE Computer Society Technical Achievement award, IEEE W. Wallace McDowell award, IAPR King-Sun Fu Prize, IEEE ICDM Research Contribution award, IAPR Senior Biometric Investigator award, MSU Withrow Teaching Excellence award, and the MSU 2014 Innovator of the Year award. He served as the Editor-in-Chief of the IEEE Trans. Pattern Analysis and Machine Intelligence (1991-1994) and is a Fellow of the ACM, IEEE, AAAS, IAPR and SPIE. Anil Jain has been assigned six U.S. patents on fingerprint recognition (transferred to IBM in 1999) and two Korean patents on video surveillance. He has also licensed technologies of particular interest to forensics and law enforcement agencies to Safran Morpho and NEC Corp: (i) Tattoo-ID for matching tattoo images (2012), (ii) AltFinger-ID for detecting whether a fingerprint image has been altered (2013), (iii) FaceSketch-ID for matching facial sketches to mugshot images (2014), and (iv) Face-Search for locating a person of interest in databases with hundreds of millions of faces (2015).

He is the author of several popular books, including Introduction to Biometrics (2011), Handbook of Face Recognition (first edition: 2005; second edition 2011), Handbook of Fingerprint Recognition (first edition: 2003, second edition: 2009), Markov Random Fields: Theory and Applications (1993), and Algorithms For Clustering Data (1988). His list of publications is available at Google Scholar Anil Jain served as a member of the National Academies panels on Whither Biometrics and Improvised Explosive Devices (IED) and was appointed a member of the Defense Science Board. He also served as a member of the Forensic Science Standards Board (FSSB), co-organizer of Program on Forensics at the Statistical and Mathematical Sciences Institute (SAMSI) and a member of the AAAS Latent Fingerprint Working Group. He is a member of the National Academy of Engineering and a Foreign Fellow of the Indian National Academy of Engineering.