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Date of birth: 9th May, 1988

Education

Ph.D. in Computer Science, IIIT-Delhi, India (Aug 2009 - Exp. August 2014)
Thesis Title: *New Methods to Improve Inclusion in Biometrics*
Advisors: Dr. Mayank Vatsa and Dr. Richa Singh

Bachelor of Information Technology (2005 - 2009)
Jaypee Institute of Information Technology University (JIIT), India

Research Interests

Primary interest in Machine Learning, Computer Vision, Information Retrieval with applications in Face Recognition.

Research Experience

Research Scholar at Image Analysis and Biometrics (IAB) Lab, IIIT Delhi

Project Title: Face Recognition in Unconstrained Environment
Sponsored by Dept. of Information Technology, Government of India

Project Title: Analysis of Fingerprints of Indian Masses for Universal Identification
The studies lead to quality standards of the Unique Identification Authority of India (UIDAI), Government of India

Visiting Scholar at West Virginia University (WVU), USA (Summers of 2010 and 2011)

Co-Advisors: Dr. Afzel Noore and Dr. Arun Ross
Project Title: An Evolutionary Approach to Adaptive Fusion in Multi-modal Biometrics
Sponsored by Dept. of Defense, USA

Research Summary

Face Spoofing Detection: Face biometric systems are vulnerable to print and replay spoofing attacks that may be detrimental to their reliability. In this ongoing study, a novel approach to spoof detection is proposed based on motion enhancement and estimation. Initial results show state-of-the-art performance in spoofing detection on two publicly available datasets.

Biometric Quality Assessment: Biometric quality indicates the usability of a biometric to uniquely identify a person. Understanding the quality of an input sample may be critical to the proper functioning of a biometric system. We find holistic orientation representations of face images to be able to encode biometric usability of a sample. This work has several practical applications in large scale biometrics.

Face Recognition via Derived Social Context: Humans are very efficient at recognizing familiar face images even in challenging conditions. One reason for such capabilities is the ability to understand social context between individuals. Sometimes the identity of the person in a photo can be inferred based on the identity of other persons in the same photo, when some social context between them is known. This research presents an algorithm to utilize co-occurrence of individuals as the social context to improve face recognition.

Newborn Face Recognition: A robust face recognition system for newborns will help stem the high number of swapping and abduction cases, prevalent in many parts of the world, including India. It is faster and cheaper than other alternatives such as DNA testing and is more reliable than RFID bracelets. We use learning based representation techniques built over deep learning architectures to learn encoding and matching schemes.

Applications of Texture Recognition in Ocular Biometrics: For real time on-the-move and at-a-distance personal identification, iris and face recognition must be supplemented with texture based Periocular region recognition. We propose a recognition technique that is resilient over large capture distances of up to 8 meters.

Analysis of Fingerprints of Indian Masses for Universal Identification: The feasibility of using fingerprints as a biometric modality despite challenges such as capture inaccuracies etc. were analyzed. The studies lead to quality standards of the Unique Identification Authority of India (UIDAI), Government of India.

Awards and Recognition

Doctoral Colloquium award at Inst. for Development and Research of Banking Technologies, 2012.

Co-PI of NVIDIA academic alliance grant, 2011.

Doctoral Consortium and travel grant at IAPR/IEEE Int Joint Conf of Biometrics, 2011.

Best Poster Award at IAPR/IEEE Int Joint Conf of Biometrics, 2011.

Best Poster Awards at IEEE Int Conf on Biometrics: Theory, Applications and Systems, 2010, 2013.

A⁺ grade in Bachelor term project, 2009.

Publications

Book Chapter and Technical Reports

1. **S. Bharadwaj**, T.I. Dhamecha, M. Vatsa, and R. Singh, *Face Anti-spoofing via Motion Magnification and Multifeature Videolet Aggregation*, *IIITD-TR-2014-002*, 2014. In submission at IEEE Transactions on Information Forensics and Security (TIFS).
2. H.S. Bhatt, **S. Bharadwaj**, R. Singh, and M. Vatsa, *Recognizing Surgically Altered Face Images using Multi-objective Evolutionary Algorithm*, *IIITD-TR-2011-006*, 2013.
3. H.S. Bhatt, **S. Bharadwaj**, R. Singh, and M. Vatsa, *Plastic Surgery and Face Recognition*, Encyclopedia of Biometrics, 2nd Edition.

Referred Journals

1. **S. Bharadwaj**, M. Vatsa, and R. Singh, *Biometric Quality: A Review of Fingerprint, Iris, and Face*, EURASIP Journal on Image and Video Processing, 2014.
2. H.S. Bhatt, **S. Bharadwaj**, R. Singh, and M. Vatsa, *Recognizing Surgically Altered Face Images using Multi-objective Evolutionary Algorithm*, IEEE Transactions on Information Forensics and Security (TIFS), Vol. 8, No. 1, pp. 89-100, 2013.
3. H.S. Bhatt, **S. Bharadwaj**, R. Singh, and M. Vatsa, *Memetic Approach for Matching Sketches with Digital Face Images*, IEEE Transactions on Information Forensics and Security (TIFS), Vol. 5, No. 5, pp. 1522-1535, 2012.
4. R. Singh, M. Vatsa, H.S. Bhatt, **S. Bharadwaj**, A. Noore and S.S. Nooreydzan, *Plastic Surgery: A New Dimension to Face Recognition*, IEEE Transactions on Information Forensics and Security (TIFS), Vol. 5, No. 3, pp. 441-448, 2010.
5. **S. Bharadwaj**, H.S. Bhatt, R. Singh, and M. Vatsa, *Online Context Switching Algorithm for Adaptive Biometric System*, submitted to Elsevier Pattern Recognition (PR). (currently 2nd round).
6. **S. Bharadwaj**, H.S. Bhatt, R. Singh, and M. Vatsa, *Face Recognition for Newborns based on Learning based Representations and Distance Metrics*, submitting to IEEE Transactions on Information Forensics and Security (TIFS).

Peer Reviewed Conferences

1. **S. Bharadwaj**, M. Vatsa, and R. Singh, *Aiding Face Recognition via Social Context Association*, IEEE/IAPR Joint Conference on Biometrics (IJCB).
2. G. Goswami, **S. Bharadwaj**, M. Vatsa, and R. Singh, *On RGB-D Face Recognition using Kinect*, BTAS, 2013. (**Best Poster Award**)
3. **S. Bharadwaj**, M. Vatsa, and R. Singh, *Can Holistic Representations be used for Face Biometric Quality Assessment?*, ICIP, 2013. (*Oral paper*).
4. **S. Bharadwaj**, T. Dhamecha, M. Vatsa, and R. Singh, *Computationally Efficient Face Spoofing Detection with Motion Magnification*, CVPR Workshops, 2013.
5. H.S. Bhatt, **S. Bharadwaj**, R. Singh, M. Vatsa, A. Noore and A. Ross, *Quality Driven Biometric Classifier Selection Framework for Improved Performance*, In Proceedings of IEEE International Joint Conference on Biometrics (IJCB), 2011.
6. H.S. Bhatt, **S. Bharadwaj**, R. Singh, M. Vatsa, A. Noore and A. Ross, *On Co-training Online Biometric Classifiers*, IJCB, 2011 (**Best Poster Award**).
7. **S. Bharadwaj**, H.S. Bhatt, M. Vatsa, and R. Singh, *Quality Assessment based Denoising to Improve Face Recognition Performance*, CVPR Workshops, 2011.
8. H.S. Bhatt, **S. Bharadwaj**, R. Singh and M. Vatsa, *Evolutionary Granular Computing Approach for Recognizing Face Images Altered due to Plastic Surgery*, Face & Gesture, pp.720 - 725, 2011.
9. H.S. Bhatt, **S. Bharadwaj**, R. Singh and M. Vatsa, *On Matching Sketches with Digital Face Images*, BTAS, pp.1-6, 2010.
10. **S. Bharadwaj**, H.S. Bhatt, R. Singh, M. Vatsa, and S.K. Singh, *Face Recognition for Newborns: A Preliminary Study*, BTAS, pp.1-6, 2010 (**Best Poster Award**).
11. M. Vatsa, R. Singh, **S. Bharadwaj**, H.S. Bhatt, and A. Noore, *Matching Digital and Scanned Face Images with Age Variation*, BTAS, pp.1-6, 2010.
12. **S. Bharadwaj**, H.S. Bhatt, M. Vatsa, and R. Singh, *Periocular Biometrics: When Iris Recognition Fails*, BTAS, pp.1-6, 2010.
13. M. Vatsa, R. Singh, A. Tiwari, **S. Bharadwaj**, and H.S. Bhatt, *Analyzing Fingerprint of Indian Population using Image Quality: A UIDAI Case Study*, International Workshop on Emerging Techniques and Challenges for Hand-Based Biometrics (ETCHB), pp.1-5, Aug. 2010.
14. H.S. Bhatt, **S. Bharadwaj**, R. Singh, and M. Vatsa, *Face Recognition and Plastic Surgery: Social, Ethical and Engineering Challenges*, In Proceedings of International Conference on Ethics and Policy of Biometrics and International Data Sharing (ICEB), pp.70-75, 2010.

Professional Activities

Academic Service:

Demo chair, IAPR Int’ntl Conference of Biometrics (ICB), 2012

General chair, IIIT-Delhi and MSR Research Showcase, 2012

A two-day event sponsored by Microsoft Research and Google

Reviewing: IEEE Transactions on Image Processing, Elsevier Information Fusion, Elsevier Signal Processing, IEEE Int’ntl Conference on Multimedia & Expo, Conference on Automatic Face and Gesture Recognition, IAPR Int’ntl Conference of Biometrics

Selected Development Projects

Face Recognition Toolkit (.NET and OpenCV), Quality Assessment based Multi-Modal Biometric System (C#.NET and OpenCV), N-gram Language Model based Retrieval System (Galago Engine, Java).

Relevant Courses

Probability and Statistics, Pattern Recognition, Machine Learning, Data Mining, Image Analysis, Privacy and Security, Computer Vision, Information Retrieval, CUDA programming.

Technical Skills: C# (.NET), C/C++ with OpenCV, Matlab, Java, CUDA, Python (numpy, scipy, Theano)

References: Available on request.