

# Arun Abraham Ross

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ASSISTANT PROFESSOR  
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## 1 Current Appointment

Assistant Professor  
Lane Department of Computer Science and Electrical Engineering  
West Virginia University  
August 2003 - present

## 2 Objective

To conduct innovative research and impart quality education in the field of Computer Science and Engineering.

## 3 Research Interests

Biometrics, pattern recognition, image processing, computer vision, data mining, machine learning.

## 4 Education

- **PhD Computer Science and Engineering (2003)**,  
Michigan State University, East Lansing.  
Thesis: Information Fusion in Fingerprint Authentication
- **M.S. Computer Science and Engineering (1999)**,  
Michigan State University, East Lansing.  
Project: A Prototype Hand Geometry-based Verification System
- **B.E. (Hons.) Computer Science (1996)**,  
Birla Institute of Technology and Science, Pilani, India.  
Project: Image Processing Using Neural Networks

## 5 Previous Appointments

- **Graduate Research Assistant (Dr. Anil K. Jain)**  
**Pattern Recognition and Image Processing Lab,**  
**Michigan State University**  
**May 1998 - December 2002**
  - Deformable Model for Fingerprint Matching: Developed a deformation model for fingerprint matching. The technique utilizes the minutiae points to establish correspondences between pairs of fingerprint images and thin plate splines (TPS) to model the non-linear distortions present in these images.

- Multibiometrics: It was demonstrated that the performance of a multibiometric system could be improved by learning user-specific parameters. Two types of parameters were considered: (i) Thresholds used to decide if a matching score indicates a genuine user or an impostor, and (ii) weights used to indicate the importance of matching scores output by each biometric trait.
  - Fingerprint Mosaicking: The iterative control point (ICP) algorithm was used to stitch multiple impressions of a fingerprint to obtain an elaborate template containing more information in terms of the number of minutiae points and ridge flow characteristics. This resulted in improved performance of the fingerprint matcher.
  - Studying User Access Patterns in High-Volume Web Sites: Work focused on clustering a web site into groups of documents that were predictive of future user accesses. The clustering was based on examining the semantic content of the web documents and the user trails indicated by the web logs.
  - Hand Geometry-based Verification System: Designed and developed a prototype biometric verification system that used the lengths and widths of the fingers and the width of the palm to validate a user's identity. This system was also applied to the problem of secure website access.
  - Fingerprint Matching - Data Acquisition and Performance Evaluation: Fingerprint data was collected from 160 subjects in a laboratory environment using four different sensors. Experiments on sensor evaluation, image quality assessment, user habituation, and performance improvement using multiple fingers and impressions were conducted.
- **Summer Intern,  
Imaging and Visualization Group,  
Siemens Corporate Research, Princeton, NJ  
May 2002 - August 2002**
    - Minutiae Triplets: Implemented a fingerprint alignment method that utilized minutiae triplets to compute the rotation and translation parameters relating the query and template images. It was shown that the minutiae set of a fingerprint could not be constructed from the minutiae triplets thereby enhancing the privacy of the stored minutiae template.
- **Summer Intern,  
Imaging and Visualization Group,  
Siemens Corporate Research, Princeton, NJ  
May 2001 - August 2001**
    - Hybrid Fingerprint Matcher: Developed a novel high-speed fingerprint matcher that utilized both minutiae and texture information to compare images. The hybrid matcher was shown to significantly improve the matching performance of the fingerprint system.
    - Fingerprint Matching Using Feature Space Correlation: A novel fingerprint alignment and matching scheme was proposed and implemented. The technique utilized ridge feature maps to represent, align and match fingerprint images, thereby obviating the need for extracting minutiae points or the core point to align or match fingerprint images.
- **Summer Intern,  
Imaging and Visualization Group,  
Siemens Corporate Research, Princeton, NJ  
May 2000 - July 2000**
    - Quality Indices for Fingerprints: A system to rate fingerprint images based on image quality was developed.
    - Core Detection: A simple technique to detect core points in fingerprint images was implemented. The method used the orientation flow of the fingerprint image to generate a hypothesis map for the core point.
- **Senior Engineer, Design and Development,  
Tata Elxsi (India) Ltd., Bangalore, India  
July 1996 - December 1997**

- The Intelligent Scanner Project: Project involved developing a system that could scan documents and automatically send them by fax or email to the specified recipients.
  - Medical Image Viewer: Project involved developing and implementing algorithms for diagnostic imaging purposes.
- **Intern,**  
**Tata Elxsi (India) Ltd., Bangalore, India**  
**January 1996 - June 1996**
    - Offline Cursive Script Recognizer: A rudimentary cursive-script recognizer that used a back-propagation neural network (one-hidden layer) and a linear vector quantizer was implemented.

## 6 Honors and Awards

- NSF CAREER Award, 2007.
- Kavli Frontier Fellow (2006), National Academy of Sciences.
- Outstanding Researcher Award (2005-2006, 2006-2007), College of Engineering and Mineral Resources, West Virginia University.
- Outstanding Teacher Award (2004-2005), College of Engineering and Mineral Resources, West Virginia University.
- Young Researcher of the Year (2003-2004), College of Engineering and Mineral Resources, West Virginia University.
- Dissertation Completion Fellowship (Spring 2003), Graduate School, Michigan State University.
- Outstanding Graduate Student Award (2001 - 2002), Department of Computer Science and Engineering, Michigan State University.
- Graduate Poster Award (1999), Department of Computer Science and Engineering, Michigan State University.
- Best Outgoing Student Award (1992), SBOA School and Junior College.
- School Pupil Leader (1991-1992), SBOA School and Junior College.

## 7 Teaching Experience

Course	Role	Level	Enrollment
CS 220 Discrete Mathematics (F'07)	Instructor	UG	31
CS 791A Machine Learning (F'07)	Instructor	UG	25
CS 591Q/791V Pattern Recognition (S'07)	Instructor	G	31
CS 220 Discrete Mathematics (F'06)	Instructor	UG	26
BIOM 426 Biometric Systems (F'06)	Instructor	UG	29
BIOM 693 Advanced Biometrics (S'06)	Instructor	G	12
CS591U/791V Pattern Recognition (F'05)	Instructor	G	24
BIOM 693 Advanced Biometrics (S'05)	Instructor	G	25
BIOM 426 Biometric Systems (F'04)	Instructor	UG	18
5-day Biometrics Course (Mar'04)	Instructor (team taught)	-	21
CS 591U Pattern Recognition (S'04)	Instructor	G	29
CS 320 Analysis of Algorithms (F'03)	Instructor	UG	36
EE 426 Biometrics (F'03)	Project (team taught)	UG	40

## 8 Graduate Student Mentoring

### M.S. Thesis Advisees

1. Nikhil Burri, M.S. Electrical Engineering, Fall 2007. Thesis: Exploring the Use of Human Metrology for Biometric Recognition. Currently with L-1 Identity Solutions, NJ.
2. Matthew Monaco, M.S. Electrical Engineering, Fall 2007. Thesis: Color Space Analysis for Iris Recognition. Noblis.
3. Kelly Smith, M.S. Electrical Engineering, Spring 2007. Thesis: Analysis of Pigmentation and Wavefront Coding Acquisition in Iris Recognition. United States Government.
4. Rajiv Mukherjee, M.S. Electrical Engineering, Spring 2007. Thesis: Indexing Techniques for Fingerprint and Iris Databases. Securimetrics, CA.
5. Christopher Boyce (Co-advised with Dr. L. Hornak), M.S. Electrical Engineering, Fall 2006. Thesis: Multi-spectral Iris Recognition Analysis: Techniques and Evaluation. vIdentity, WV.
6. Samir Shah, M.S. Electrical Engineering, Fall 2006. Thesis: Enhanced Iris Recognition: Algorithms for Segmentation, Matching and Fusion. LG Iris, NJ.
7. Rohan Nadgir, M.S. Electrical Engineering, Summer 2006. Thesis: Facilitating Sensor Interoperability and Incorporating Quality in Fingerprint Matching Systems. Bio-Key, MN.
8. Nevena Samoska (Co-advised with Dr. B. Cukic), M.S. Computer Science, Summer 2006. Thesis: Evaluation and Performance Prediction of Multimodal Biometric Systems. TBS, Switzerland.
9. Brian Masney, M.S. Computer Science, Spring 2006. Thesis: Long-Term Bandwidth Estimation. Ntelos, WV.
10. Jidnya Shah, M.S. Electrical Engineering, Fall 2005. Thesis: Reconstructing Fingerprints From Minutiae Templates. L-1 Identity Solutions, NJ.
11. Sruti Ramnath, M.S. Electrical Engineering, Fall 2005. Thesis: A Study on The Role of Visual Stimulus on Initial Saccades. Indian Institute of Science.
12. Sarvesh Makthal, M.S. Electrical Engineering, Spring 2005. Thesis: Analysis and Synthesis of Iris Images. L-1 Identity Solutions, NJ.
13. Rohin Govindarajan, M.S. Computer Science, Fall 2004. Thesis: Feature Level Fusion in Multimodal Biometrics. Motorola, CA (upon graduation); now with Prudent Rx.

### M.S. Problem Report Advisees

1. Prasad Ghude, M.S. Electrical Engineering, Fall 2005. Problem Report: Human Response to Different Adaptive Optic Flow Stimuli.
2. Ashwin Tanugula, M.S. Electrical Engineering, Fall 2005. Problem Report: Porting User Mode Linux to PowerPC Architecture.
3. Kiran Tadaka, M.S. Electrical Engineering, Fall 2005. Problem Report: A J2EE-driven Test-bed for Evaluating Biometric Template Storage Scenarios.

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<sup>1</sup>Michigan State University

4. Arun George, M.S. Electrical Engineering, Fall 2005. Problem Report: An Interactive Tool for Feature Labeling and Algorithm Evaluation of Face Databases.
5. Phani Ivatury, M.S. Electrical Engineering, Fall 2005. Problem Report: A Study on the Diversity Metrics for Biometric Fusion.

## 9 Publications and Patents

### Patents Issued

1. R. Derakhshani and **A. Ross**, “Conjunctival Scans for Personal Identification”, United States Patent#7327860, February 5, 2008.
2. J. Reisman and **A. Ross**, “Fingerprint Matching Using Ridge Feature Maps”, United States Patent#7142699, November 28, 2006.

### Authored Books

1. **A. Ross**, K. Nandakumar and A. K. Jain. Handbook of Multibiometrics. Springer Publishers, 1st edition, 2006. ISBN: 0-3872-2296-0.

### Edited Books

1. A. K. Jain, P. J. Flynn and **A. Ross** (Eds.). Handbook of Biometrics. Springer Publishers, 2007. ISBN: 978-0-387-71040-2.

### Journal Articles

1. R. Singh, M. Vatsa, **A. Ross** and A. Noore, “A Mosaicing Scheme for Pose Invariant Face Recognition,” *IEEE Transactions on Systems, Mans and Cybernetics - B, Special Issue on Biometrics*, Vol. 37, No. 5, pp. 1212-1225, October 2007.
2. **A. Ross**, J. Shah and A. K. Jain, “From Template to Image: Reconstructing Fingerprints From Minutiae Points,” *IEEE Transactions on Pattern Analysis and Machine Intelligence, Special Issue on Biometrics*, Vol. 29, No. 4, pp. 544-560, April 2007.
3. **A. Ross** and A. K. Jain, “Human Recognition Using Biometrics: An Overview,” *Annals of Telecommunications*, Vol. 62, No. 1/2, pp. 11-35, January/February 2007.
4. A. K. Jain, **A. Ross** and S. Pankanti, “Biometrics: A Tool For Information Security”, *IEEE Transactions on Information Forensics and Security*, Vol 1, No. 2, pp. 125-143, June 2006.
5. **A. Ross**, S. Dass and A. K. Jain, “Fingerprint Warping Using Ridge Curve Correspondences,” *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 28, No. 1, pp. 19-30, January 2006.
6. A. K. Jain, K. Nandakumar and **A. Ross**, “Score Normalization in Multimodal Biometric Systems”, *Pattern Recognition Journal*, Vol. 38, No. 12, pp. 2270-2285, December 2005.
7. V. Manian and **A. Ross**, “Face Detection Using Statistical and Multiresolution Texture Features”, *Multimedia Cyberscape Journal, Special Issue on Pattern Recognition in Biometrics and Bioinformatics*, Vol. 3, No. 3, pp. 1-9, 2005.
8. **A. Ross**, S. Dass and A. K. Jain, “A Deformable Model for Fingerprint Matching”, *Pattern Recognition Journal*, Vol. 38, No. 1, pp. 95-103, January 2005.
9. U. Uludag, **A. Ross** and A. K. Jain, “Biometric Template Selection and Update: A Case Study in Fingerprints”, *Pattern Recognition Journal*, Vol. 37, No. 7, pp. 1533-1542, July 2004.

10. A. K. Jain, **A. Ross** and S. Prabhakar, "An Introduction to Biometric Recognition", *IEEE Transactions on Circuits and Systems for Video Technology, Special Issue on Image- and Video-Based Biometrics*, Vol. 14, No. 1, pp. 4-20, January 2004.
11. **A. Ross** and A. K. Jain, "Information Fusion in Biometrics", *Pattern Recognition Letters*, Vol. 24, Issue 13, pp. 2115-2125, September 2003.
12. **A. Ross**, A. K. Jain and J. Reisman, "A Hybrid Fingerprint Matcher", *Pattern Recognition*, Vol. 36, No. 7, pp. 1661-1673, July 2003.

## Magazine Article

1. A. K. Jain and **A. Ross**, "Multibiometric Systems", *Communications of the ACM, Special Issue on Multimodal Interfaces*, Vol. 47, No. 1, pp. 34 - 40, January 2004.

## Conference/Workshop Proceedings

1. K. Smith, P. Pauca, **A. Ross**, T. Torgersen and M. King, "Extended Evaluation of Simulated Wavefront Coding Technology for Iris Recognition," *Proc. of the First IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS)*, (Washington DC, USA), September 2007.
2. **A. Ross**, "An Introduction to Multibiometrics," *Proc. of the 15th European Signal Processing Conference (EUSIPCO)*, (Poznan, Poland), September 2007.
3. R. Derakhshani and **A. Ross**, "A Texture-Based Neural Network Classifier for Biometric Identification using Ocular Surface Vasculature," *Proc. of International Joint Conference on Neural Networks (IJCNN)*, (Orlando, USA), August 2007.
4. F. Li, K. Goseva-Popstojanova and **A. Ross**, "Discovering Web Workload Characteristics through Cluster Analysis," *Proc. of IEEE International Symposium on Network Computing and Applications (NCA)*, pp. 61-68, (Cambridge, USA), July 2007.
5. U. Park, A. K. Jain and **A. Ross**, "Face Recognition in Video: Adaptive Fusion of Multiple Matchers," *Proc. of IEEE Computer Society Workshop on Biometrics*, (Minneapolis, USA), June 2007.
6. N. Bartlow, N. Kalka, B. Cukic and **A. Ross**, "Protecting Iris Images through Asymmetric Digital Watermarking," *Proc. of 5th IEEE Workshop on Automatic Identification Advanced Technologies (AutoID)*, pp. 192-197, (Alghero, Italy), June 2007.
7. **A. Ross** and R. Mukherjee, "Augmenting Ridge Curves With Minutiae Triplets for Fingerprint Indexing," *Proc. of SPIE Conference on Biometric Technology for Human Identification IV*, 65390C, (Orlando, USA), April 2007.
8. R. Derakhshani, **A. Ross** and S. Crihalmeanu, "A New Biometric Modality Based on Conjunctival Vasculature," *Proc. of Artificial Neural Networks in Engineering (ANNIE)*, (St. Louis, USA), November 2006.
9. S. Shah and **A. Ross**, "Generating Synthetic Irises By Feature Agglomeration," *Proc. of IEEE International Conference on Image Processing (ICIP)*, (Atlanta, USA), October 2006.
10. **A. Ross** and S. Shah, "Segmenting Non-ideal Irises Using Geodesic Active Contours," *Proc. of Biometrics Symposium (BSYM)*, (Baltimore, USA), September 2006.
11. S. Shah, A. Abaza, **A. Ross** and H. Ammar, "Automatic Tooth Segmentation Using Active Contour Without Edges," *Proc. of Biometrics Symposium (BSYM)*, (Baltimore, USA), September 2006.
12. C. Boyce, **A. Ross**, M. Monaco, L. Hornak and X. Li, "Multispectral Iris Analysis: A Preliminary Study," *Proc. of IEEE Computer Society Workshop on Biometrics*, (New York, USA), June 2006.

13. N. Poh, S. Bengio and **A. Ross**, "Revisiting Doddington's Zoo: A Systematic Method to Assess User-dependent Variabilities," *Proc. of Second Workshop on Multimodal User Authentication (MMUA)*, (Toulouse, France), May 2006.
14. **A. Ross**, S. Shah and J. Shah, "Image Versus Feature Mosaicing: A Case Study in Fingerprints," *Proc. of SPIE Conference on Biometric Technology for Human Identification III*, pp. 620208-1 - 620208-12, (Orlando, USA), April 2006.
15. **A. Ross** and R. Nadgir, "A Calibration Model for Fingerprint Sensor Interoperability," *Proc. of SPIE Conference on Biometric Technology for Human Identification III*, pp. 62020B-1 - 62020B-12, (Orlando, USA), April 2006.
16. R. Singh, M. Vatsa, **A. Ross** and A. Noore, "Performance Enhancement of 2D Face Recognition via Mosaicing", *Proc. of 4th IEEE Workshop on Automatic Identification Advanced Technologies (AuotID)*, (Buffalo, USA), pp. 63-68, October 2005. **Best Student Paper Award (Singh, Vatsa)**.
17. J. Odom, P. Ghude, **A. Ross**, H. Humble and F. Vanscoy, "Human Response to Different Adaptive Optic Flow Stimuli", *Proc. of the 11th International Conference on Virtual Systems and Multimedia (VSMM)*, (Ghent, Belgium), pp. 257-266, October 2005. **Best Paper Award (Technical)**.
18. S. Makthal and **A. Ross**, "Synthesis of Iris Images using Markov Random Fields", *Proc. of 13th European Signal Processing Conference (EUSIPCO)*, (Antalya, Turkey), September 2005.
19. A. K. Jain, **A. Ross** and U. Uludag, "Biometric Template Security: Challenges and Solutions", *Proc. of 13th European Signal Processing Conference (EUSIPCO)*, (Antalya, Turkey), September 2005.
20. J. Reisman, U. Uludag and **A. Ross**, "Secure Fingerprint Matching With External Registration", *Proc. of Audio- and Video-based Biometric Person Authentication (AVBPA)*, (Rye Brook, New York), pp. 720-729, July 2005.
21. **A. Ross**, J. Shah and A. K. Jain, "Towards Reconstructing Fingerprints From Minutiae Points", *Proc. of SPIE Conference on Biometric Technology for Human Identification II*, (Orlando, USA), pp. 68-80, March 2005.
22. **A. Ross** and R. Govindarajan, "Feature Level Fusion Using Hand and Face Biometrics", *Proc. of SPIE Conference on Biometric Technology for Human Identification II*, (Orlando, USA), pp. 196-204, March 2005.
23. Y. Chen, S. Dass, **A. Ross** and A. K. Jain, "Fingerprint Deformation Model Using Minutiae Location and Orientation", *Proc. Workshop on Applications of Computer Vision (WACV)*, (Colorado, USA), pp. 150-155, January 2005.
24. **A. Ross** and A. K. Jain, "Multimodal Biometrics: An Overview", *Invited paper in Proc. 12th European Signal Processing Conference (EUSIPCO)*, (Vienna, Austria), pp. 1221-1224, September 2004.
25. A. K. Jain, S. Pankanti, S. Prabhakar, L. Hong, **A. Ross**, and J. L. Wayman, "Biometrics: A Grand Challenge", *Proc. International Conference on Pattern Recognition (ICPR)*, (Cambridge, UK), Vol. 2, pp. 935-942, August 2004.
26. **A. Ross**, S. Dass and A. K. Jain, "Estimating Fingerprint Deformation", *Proc. International Conference on Biometric Authentication (ICBA)*, (Hong Kong), LNCS vol. 3072, pp. 249-255, Springer Publishers, July 2004.
27. **A. Ross** and A. K. Jain, "Biometric Sensor Interoperability: A Case Study In Fingerprints", *Proc. International ECCV Workshop on Biometric Authentication (BioAW)*, (Prague, Czech Republic), LNCS vol. 3087, pp. 134-145, Springer Publishers, May 2004.
28. A. K. Jain, U. Uludag and **A. Ross**, "Biometric Template Selection: A Case Study in Fingerprints", *Proc. of 4th Int'l Conference on Audio- and Video-Based Person Authentication (AVBPA)*, LNCS 2688, pp. 335-342, (Guildford, UK), June 9-11, 2003.

29. A. K. Jain and **A. Ross**, "Learning User-specific Parameters in a Multibiometric System", *Proc. of Int'l Conference on Image Processing (ICIP)*, pp. 57-60, Rochester, New York, September 22-25, 2002.
30. **A. Ross**, A. K. Jain and J. Reisman, "A Hybrid Fingerprint Matcher", *Proc. of Int'l Conference on Pattern Recognition (ICPR)*, Quebec City, August 11-15, 2002.
31. **A. Ross**, J. Reisman, A. K. Jain, "Fingerprint Matching Using Feature Space Correlation", *Proc. of Post-ECCV Workshop on Biometric Authentication*, LNCS 2359, pp. 48-57, Denmark, June 1, 2002.
32. A. K. Jain and **A. Ross**, "Fingerprint Mosaicking", *Proc. of IEEE Int'l Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Orlando, Florida, May 13 - 17, 2002.
33. A. K. Jain, **A. Ross** and S. Prabhakar, "Fingerprint Matching Using Minutiae and Texture Features", *Proc. of Int'l Conference on Image Processing (ICIP)*, pp.282-285, Thessaloniki, Greece, Oct 7 - 10, 2001.
34. A. K. Jain, S. Pankanti, S. Prabhakar, and **A. Ross**, "Recent Advances in Fingerprint Verification", *Invited Paper in Proc. of 3rd Int'l Conference on Audio- and Video-Based Person Authentication (AVBPA)*, pp. 182-191, Sweden, June 6-8, 2001.
35. **A. Ross**, A. K. Jain, and J. Qian, "Information Fusion in Biometrics", *Proc. of 3rd Int'l Conference on Audio- and Video-Based Person Authentication (AVBPA)*, pp. 354-359, Sweden, June 6-8, 2001.
36. **A. Ross**, C. B. Owen and A. Vailaya, "Models for User Access Patterns on the Web: Semantic Content versus Access History", *Proc of 5th Annual World Conference on the WWW and Internet (Webnet 2000)*, pp.464-469, San Antonio, Texas, Oct 30 - Nov 4, 2000. **Received the Top Paper award.**
37. A. K. Jain, **A. Ross** and S. Pankanti, "A Prototype Hand Geometry-based Verification System", *Proc. of 2nd Int'l Conference on Audio- and Video-based Biometric Person Authentication (AVBPA)*, Washington D.C., pp.166-171, March 22-24, 1999.

### Book Chapters

1. A. K. Jain and **A. Ross**, "Introduction to Biometrics", in Handbook of Biometrics, A. K. Jain, P. J. Flynn and A. Ross (Eds.), Springer, 2007. ISBN: 978-0-387-71040-2.
2. **A. Ross**, K. Nandakumar and A. K. Jain, "Introduction to Multibiometrics", in Handbook of Biometrics, A. K. Jain, P. J. Flynn and A. Ross (Eds.), Springer, 2007. ISBN: 978-0-387-71040-2.
3. K. Nandakumar, **A. Ross** and A. K. Jain, "Incorporating Ancillary Information in Multibiometric Systems", in Handbook of Biometrics, A. K. Jain, P. J. Flynn and A. Ross (Eds.), Springer, 2007. ISBN: 978-0-387-71040-2.
4. **A. Ross** and A. K. Jain, "Fusion Techniques in Multibiometric Systems", in Face Biometrics for Personal Identification, R. I. Hammound, B. R. Abidi and M. A. Abidi (Eds.), Springer, 2007. ISBN: 978-3-540-49344-0.
5. **A. Ross** and A. K. Jain, "Multimodal Human Recognition Systems", in Multi-Sensor Image Fusion and Its Applications. R.S. Blum and Z. Liu (Eds.), CRC Taylor and Francis, 2005. ISBN: 0-8493-3417-9.

### Technical Reports

1. A. K. Jain, S. Prabhakar and **A. Ross**, "Fingerprint Matching: Data Acquisition and Performance Evaluation", *MSU Technical Report TR99-14*, 1999.
2. A. K. Jain, **A. Ross** and S. Prabhakar, "Biometrics-Based Web Access", *MSU Technical Report TR98-33*, 1998.

## Abstracts/Extended Abstracts

1. J. Shah, **A. Ross** and A. K. Jain, "Can Fingerprints Be Generated From Minutiae Points?", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), pp. 9-10, September 2005.
2. S. Shah, **A. Ross**, J. Shah, S. Crihalmeanu, "Fingerprint Mosaicing Using Thin Plate Splines", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), pp. 60-61, September 2005.
3. **A. Ross** and A. K. Jain, "Biometrics: When Identity Matters", *Advances in Biometric Person Authentication, Proc. of 5th Chinese Conference on Biometric Recognition (SinoBiometrics)*, (Guangzhou, China), LNCS vol. 3338, pp. 1-2, Springer Publishers, December 2004.
4. **A. Ross** and R. Govindarajan, "Feature Level Fusion in Biometric Systems", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 2004.
5. **A. Ross**, S. Crihalmeanu, R. Govindarajan, L. Hornak and S. Schuckers, "A Centralized Web-Enabled Multimodal Biometric Database", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 2004.
6. K. Nandakumar, A. K. Jain and **A. Ross**, "Score Normalization in Multimodal Biometric System", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 2004.
7. V. Manian and **A. Ross**, "A Texture-based Approach to Face Detection", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 2004.
8. Y. Chen, S. Dass, **A. Ross** and A. K. Jain, "Average Deformation Model Based on Three-Dimensional Minutiae Data", *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 2004.

## 10 Sponsored research

Amounts and percentages indicated within parenthesis are approximate numbers.

1. **CAREER: Human Recognition - Models for Biometric Pattern Representation, Individuality, Indexing and Fusion**  
Agency: National Science Foundation  
Total Award (to date): \$330,000 (expected award: \$540,000)  
Duration: May 2007 - April 2010 (anticipated end date: April 2012)  
Role: PI
2. **Collaboratory for Multiphase Flow Research**  
Agency: Research and Development Solutions, LLC (RDS)  
Total Award: \$71,500 (Ross: \$71,500)  
Duration: November 2007 - October 2008  
Role: Co-PI  
Other Investigators: PI: Dr. R. Bajura
3. **RCG: Information Fusion Networks for Intelligence and Security**  
Agency: WV EPSCoR  
Total Award (to date): \$477,000 (Ross: \$75,000)  
Duration: July 2007 - June 2008  
Role: PI  
Other Investigators: Co-PIs: Drs. B. Duval, E. Eshen, E. Fuller, B. Morris, D. Adjeroh, C.-Q. Zhang

4. **Modeling Human Activity for Automated Detection of Anomalous Behavior**  
Agency: National Science Foundation (I/UCRC Supplemental)  
Total Award: \$75,000 (Ross: \$37,500)  
Duration: July 2007 - November 2008  
Role: Co-PI  
Other Investigators: PI: Dr. L. Hornak; Co-PIs: Drs. D. Adjeroh, B. Cukic
  
5. **Wireless Sensor Networks for Biometric Detection**  
Agency: National Science Foundation (I/URC Supplemental)  
Total Award: \$50,000 (Ross: \$45,000)  
Duration: July 2007 - November 2008  
Role: Co-PI  
Other Investigators: PI: Dr. L. Hornak; Co-PI: Dr. B. Cukic
  
6. **Computational Limits for Scaling Fingerprint Pattern Matching**  
Agency: MITRE Corporation  
Total Award: \$30,000 (Ross: \$25,000)  
Duration: May 2007 - December 2007  
Role: PI  
Other Investigators: Co-PI: L. Williams
  
7. **Indexing Large-scale Multimodal Biometric Databases**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$50,000 (Ross: \$25,000)  
Duration: August 2007 - July 2008  
Role: PI  
Other Investigators: Co-PI: Dr. A. K. Jain (Michigan State University)
  
8. **Securing Multibiometric Templates Using Fuzzy Vault**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$50,000 (Ross: \$25,000)  
Duration: August 2007 - July 2008  
Role: Co-PI  
Other Investigators: PI: Dr. A. K. Jain (Michigan State University)
  
9. **Recovering Frontal Facial Image from Surveillance Video**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$58,200 (Ross: \$21,038)  
Duration: January 2007 - December 2007  
Role: Co-PI  
Other Investigators: PI: Dr. B. Abdi (University of Tennessee, Knoxville)
  
10. **Information Networks for Homeland Security (RGI Grant Program)**  
Agency: WV Higher Education Policy Commission/WV EPSCoR  
Total Award: \$50,000 (Ross: \$5,000)  
Duration: April 2006 - April 2007  
Role: Co-PI  
Other Investigators: PI: Dr. E. Eshen; Co-PIs: Drs. E. Fuller, B. Morris, D. Adjeroh, C.-Q. Zhang

11. **Automated 3D Ear Acquisition and Identification from Surveillance Video**  
Agency: DoD, Army, Office of Research and Development  
Total Award: \$207,000 (Ross: 45%)  
Duration: January 2006 - May 2008  
Role: Co-PI  
Other Investigators: PI: Dr. H. Ammar
  
12. **Video Metrology-Based Human Biometric Profiling**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$68,000 (Ross: 30%)  
Duration: December 2006 - December 2007  
Role: Co-PI  
Other Investigators: PI: Dr. D. Adjeroh; Co-PIs: Drs. X. Li and B. Cukic
  
13. **A Dynamic Hierarchical Fusion Architecture for Biometric Systems**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$72,000 (Ross: \$36,000)  
Duration: January 2006 - May 2007  
Role: PI  
Other Investigators: Co-PI: Dr. A. K. Jain (Michigan State University)
  
14. **Multispectral Iris Analysis: Phase II**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$65,000 (Ross: \$40,000)  
Duration: December 2006 - December 2007  
Role: PI  
Other Investigators: Co-PI: Drs. L. Hornak and X. Li.
  
15. **MRI Collaborative Research: Acquisition of Instrumentation for Biometric Authentication Research**  
Agency: National Science Foundation  
Total Award: \$215,805 (Ross: 60%)  
Duration: August 2005 - July 2008  
Role: PI  
Other Investigators: Co-PI: Drs. B. Cukic, L. Hornak and M. Schuckers (PI:St. Lawrence).
  
16. **ITR Collaborative Research: Biometrics - Performance, Security and Social Impact**  
Agency: National Science Foundation  
Total Award: \$1,130,828 (Ross: 10%)  
Duration: 2/5/2004 - 1/31/2008  
Role: Co-PI  
Other Investigators: PI: Dr. L. Hornak; Co-PIs: Drs. B. Cukic, M. Schuckers (St. Lawrence), S. Schuckers (Clarkson), A. K. Jain (Michigan State), L. Nelson (Univ of Pittsburgh).
  
17. **Enhancing Iris Systems using Conjunctival Vascular Patterns**  
Agency: Center for Identification Technology Research (NSF-CITeR)  
Total Award: \$50,000 (Ross: \$20,000)  
Duration: December 2005 - December 2006  
Role: Co-PI

Other Investigators: PI: Dr. R. Derakhshani (Univ Missouri Kansas City)

**18. Multispectral and Multiframe Iris Analysis: Phase I**

Agency: Center for Identification Technology Research (NSF-CITeR)

Total Award: \$64,000 (Ross: \$40,000)

Duration: June 2005 - May 2006

Role: PI

Other Investigators: Co-PI: Drs. L. Hornak and X. Li.

**19. Interoperability, Performance, and Fusion Issues in Fingerprint Sensors**

Agency: Center for Identification Technology Research (NSF-CITeR)

Award: \$105,000 (Ross: \$27,100)

Duration: January 2005 - May 2006

Role: Co-PI

Other Investigators: PI: Dr. S. Schuckers (Clarkson); Co-PI: Dr. S. Kumar (Clarkson).

**20. On the Independence of Biometric Modalities**

Agency: Center for Identification Technology Research (NSF-CITeR)

Award: \$80,000 (Ross: \$40,000)

Duration: May 2004 - December 2005

Role: PI

Other Investigators: Co-PI: Dr. A. K. Jain (Michigan State).

**21. Generation of Synthetic Irises**

Agency: Center for Identification Technology Research (NSF-CITeR)

Award: \$55,000 (Ross: \$20,000)

Duration: January 2005 - December 2005

Role: Co-PI

Other Investigators: PI: Dr. N. Schmid; Co-PI: Drs. B. Cukic and H. Singh.

**22. MUBI: Continued Development of a Multibiometric Performance Prediction Tool**

Agency: Center for Identification Technology Research (NSF-CITeR)

Award: \$32,000 (Ross: \$8,800)

Duration: January 2005 - December 2005

Role: Co-PI

Other Investigators: PI: Dr. B. Cukic.

**23. NBSP Standards, Research, Education**

Agency: National Biometrics Security Project

Total Award: \$450,000 (Ross: 5%)

Duration: 1/1/2004 - 8/13/2004

Role: PI

Other Investigators: Co-PIs: Drs. G. Trapp, A. Noore, L. Hornak and B. Cukic.

**24. National Biometric Security Project - Year 2**

Agency: National Biometrics Security Project

Award: \$461,699 (Ross: 5%)

Duration: 10/1/2004 - 9/30/2005

Role: Co-PI

Other Investigators: PI: Dr. G. Trapp; Co-PIs: Drs. R. Althouse, J. Atkins, B. Cukic, L. Hornak, V. Kleist, J. Nolan, and A. Noore.

25. **Phase I&II: Research Support for DoD Biometrics**

Agency: Lockheed Martin/DOD Biometric Fusion Center

Award: \$715,000 (Ross: 10%)

Duration: 01/01/2005 - 12/31/2005

Role: Co-PI

Other Investigators: PI: Dr. L. Hornak; Co-PI: Drs. B. Cukic, X. Li, N. Schmid, A. K. Jain (Michigan State), S. Dass (Michigan State), S. Schuckers (Clarkson), M. Schuckers (St. Lawrence).

26. **Feature Level Fusion in Biometrics and Face Indexing**

Agency: Center for Identification Technology Research (NSF-CITeR)

Award: \$65,000 (Ross: \$32,500)

Duration: January 2004 - May 2005

Role: PI

Other Investigators: Co-PI: Dr. N. Schmid.

27. **Biometric Score Normalization and Template Update**

Agency: Center for Identification Technology Research (NSF-CITeR)

Total Award: \$80,000 (Ross: \$40,000)

Duration: May 2003 - May 2004

Role: PI

Other Investigators: Co-PI: Dr. A. K. Jain (Michigan State).

## 11 Professional Presentations

### Invited Talks

1. **A. Ross**, "Biometric Fusion", Invited Lecture, *BEACON Lecture Series at Lockheed Martin*, (Fairmont, WV), November 28, 2007.
2. **A. Ross**, "Estimating Fingerprint Deformation", Invited Lecture, *Biometric Feature Identification and Analysis*, (Goettingen, Germany), September 8, 2007. Invited by University of Goettingen.
3. **A. Ross**, "Multispectral Iris Analysis", Invited Lecture, *BEACON Lecture Series at Lockheed Martin*, (Fairmont, WV), August 8, 2007.
4. **A. Ross**, "Biometric Technology: Personal Recognition Using Fingerprints, Iris and Face", Invited Talk, *Identity Solutions Symposium*, (Jonesboro, AR), February 21, 2007. Invited by Dr. Farhad Moeeni, Director, Center for the Study of Automatic Identification, Arkansas State University.
5. **A. Ross**, "Multibiometrics: An Overview of Information Fusion in Biometrics", Invited Talk, *IDGA Image Fusion Conference*, (Alexandria, VA), January 22, 2007.
6. **A. Ross**, "Biometrics: Putting Pattern Recognition to the Test?", Invited Lecture, *Kavli Frontiers of Science Symposium*, (Irvine, CA), November 4, 2006. Invited by the National Academy of Sciences.
7. **A. Ross**, "Information Fusion in Biometrics", Invited Lecture, *Tagging, Tracking, and Locating Humans at a Distance (TTL) Workshop*, (McLean, VA), August 1, 2006. Invited by David Pitcher, Information Systems Engineer, MITRE Corporation.

8. **A. Ross**, “Information Fusion in Biometrics: An Overview”, Invited Lecture, *Interagency Biometric Conference*, (McLean, VA), May 2, 2006. Invited by Booz Allen Hamilton.
9. **A. Ross**, “Reliability of Biometrics”, Invited Talk, *The Forensic Science Symposium*, (Indianapolis, IN), April 18, 2006. Invited by Dr. Jay Siegel, Director, Forensic and Investigative Sciences Program, Indiana University-Purdue University Indianapolis (IUPUI) School of Science.
10. **A. Ross**, “New Developments in Biometrics”, Invited Lecture, *The Forensic Science Symposium*, (Indianapolis, IN), April 18, 2006. Invited by Dr. Jay Siegel, Director, Forensic and Investigative Sciences Program, Indiana University-Purdue University Indianapolis (IUPUI) School of Science.
11. **A. Ross**, “Biometrics: When Identity Matters”, Invited Lecture, *Truman Medical Center, Department of Ophthalmology at University of Missouri-Kansas City*, (Kansas City, MO), November 18, 2005. Invited by Dr. Rohit Krishna, Dr. Nelson Sabates and Dr. Ashim Mitra.
12. **A. Ross**, “Information Fusion in Biometrics”, Invited Lecture, *Carnegie Mellon University, CyLAB*, (Pittsburgh, PA), June 17, 2005. Invited by Prof. Vijayakumar Bhagavatula, Professor, Electrical and Computer Engineering, Carnegie Mellon University.
13. **A. Ross**, “Multibiometrics: Part I & II”, Invited Lecture, *Michigan State University*, (East Lansing, MI), March 15 and 17, 2005. Invited by Prof. Anil K. Jain, University Distinguished Professor, Michigan State University.
14. **A. Ross**, “Biometrics: When Identity Matters”, Keynote Speaker, *The 5th Chinese Conference on Biometric Recognition (Sinobiometrics’04)*, (GuangZhou, China), December 13, 2004. Invited by Dr. Stan Z. Li, Director, Center for Biometrics Research and Testing (CBRT), Institute of Automation, Chinese Academy of Sciences (CASIA).
15. **A. Ross**, “Biometrics: Practical Security Applications Available Now for the Workplace”, Invited Speaker, *CIO Interact 2004: A Technology and Business Symposium*, (Altoona, PA), March 29, 2004. Invited by Blair Technology Group.
16. **A. Ross**, “An Introduction to Fingerprint Recognition and Multimodal Biometrics”, Invited Lecture, *University of Notre Dame*, (Notre Dame, IN), January 20, 2004. Invited by Dr. Kevin Bowyer, Schubmehl-Prein Professor and Chair, Computer Science and Engineering, University of Notre Dame.
17. **A. Ross**, “Biometric Authentication: Progress and Prospects”, Invited Speaker, *SPIE Conference on Optics and Photonics in Global Homeland Security*, (Washington, DC), December 2-4, 2003. Invited by Dr. Behrooz Kamgar-Parsi, Naval Research Lab.
18. **A. Ross**, “Multibiometric Systems”, Invited Speaker, *Interagency Information Exchange on Biometrics*, (McLean, VA), May 6-8, 2003. Invited by Booz Allen Hamilton.
19. **A. Ross**, “Information Fusion in Fingerprint Authentication”, Invited Talk, *Siemens Corporate Research (SCR), Inc.*, (Princeton, NJ), March 2003. Invited by Dr. James Reisman, SCR.
20. **A. Ross**, “Information Fusion in Fingerprint Authentication”, Invited Talk, *Identix, Inc.*, (Jersey City, NJ), February 2003. Invited by Dr. Paul Griffin, CTO, Identix, Inc.
21. **A. Ross**, “May I have your fingerprints?”, Invited Talk, *Hope College*, (Holland, MI), 2001. Invited by Ryan McFall, Assistant Professor, Hope College.

## Conference and Workshop Presentations

1. **A. Ross**, “An Introduction to Multibiometrics”, *European Signal Processing Conference (EUSIPCO)*, (Poznan, Poland), September 4, 2007. Oral Presentation.
2. **A. Ross**, “Information Fusion in Biometrics”, *Joint Statistical Meetings*, (Salt Lake City, UT), August 2, 2007. Oral Presentation.

3. **A. Ross**, “Augmenting Ridge Curves with Minutiae Triplets for Fingerprint Indexing”, *SPIE Conference on Biometric Technology for Human Identification IV*, (Orlando, FL), April 9, 2007. Oral Presentation.
4. **A. Ross**, “Segmenting Non-ideal Irises Using Geodesic Active Contours”, *Biometrics Symposium at the Biometric Consortium Conference*, (Baltimore, MD), September 20, 2006. Oral Presentation.
5. **A. Ross**, “From Templates to Images: Reconstructing Fingerprints from Minutiae Points”, *IEEE Workshop on Privacy Research In Vision*, (New York City, NY), June 22, 2006. Oral Presentation.
6. **A. Ross**, “Multispectral Iris Analysis: A Preliminary Study”, *IEEE Computer Society Workshop on Biometrics*, (New York City, NY), June 18, 2006. Oral Presentation.
7. **A. Ross**, “A Calibration Model for Fingerprint Sensor Interoperability”, *SPIE Conference on Biometric Technology for Human Identification III*, (Orlando, FL), April 17, 2006. Oral Presentation.
8. **A. Ross**, “Image Versus Feature Mosaicing: A Case Study in Fingerprints”, *SPIE Conference on Biometric Technology for Human Identification III*, (Orlando, FL), April 17, 2006. Oral Presentation.
9. **A. Ross**, “Performance Enhancement of 2D Face Recognition via Mosaicing”, *Fourth IEEE Workshop on Automatic Identification Advanced Technologies (AuotID)*, (Buffalo, NY), October 17, 2005. Oral Presentation.
10. **A. Ross**, “Can Fingerprints Be Generated From Minutiae Points?”, *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 19, 2005. Oral Presentation.
11. **A. Ross**, “Feature Level Fusion Using Hand and Face Biometrics”, *SPIE Conference on Biometric Technology for Human Identification II*, (Orlando, USA), March 29, 2005. Oral Presentation.
12. **A. Ross**, “A Discussion on Match Score Fusion Techniques”, *SC 37 Working Group Meeting on Biometrics*, (Paris, France), November 18, 2004. Oral Presentation.
13. **A. Ross**, “A Texture-based Approach to Face Detection”, *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 20, 2004. Oral Presentation.
14. **A. Ross**, “Feature Level Fusion in Biometrics”, *Biometric Consortium Conference (BCC)*, (Crystal City, VA), September 20, 2004. Poster Presentation.
15. **A. Ross**, “Multimodal Biometrics: An Overview”, *European Signal Processing Conference (EUSIPCO)*, (Vienna, Austria), September 9, 2004. Oral Presentation.
16. **A. Ross**, “Estimating Fingerprint Deformation”, *International Conference on Biometric Authentication (ICBA)*, (HongKong), July 15, 2004. Oral Presentation.
17. **A. Ross**, “Palmprint Authentication System for Civil Applications”, *International ECCV Workshop on Biometric Authentication (BioAW)*, (Prague, Czech Republic), May 15, 2004. Oral Presentation. (Original authors: D. Zhang, G. Lu, W. K. Kong, and M. Wong).
18. **A. Ross**, “Biometric Sensor Interoperability: A Case Study in Fingerprints”, *International ECCV Workshop on Biometric Authentication (BioAW)*, (Prague, Czech Republic), May 15, 2004. Poster Presentation.
19. **A. Ross**, “Estimating Fingerprint Deformation”, *The Biometric Consortium Conference*, (Arlington, VA), September 22-24, 2003. Oral Presentation at the Research Symposium.
20. **A. Ross**, “Learning User-specific Parameters in a Multibiometric System”, *International Conference on Image Processing (ICIP)*, Rochester, New York, September 22-25, 2002. Oral Presentation.
21. **A. Ross**, “A Hybrid Fingerprint Matcher”, *International Conference on Pattern Recognition (ICPR)*, Quebec City, August 11-15, 2002. Oral Presentation.
22. **A. Ross**, “Hiding a Face in a Fingerprint Image”, *International Conference on Pattern Recognition (ICPR)*, Quebec City, August 11-15, 2002. Oral Presentation. (Original Authors: A. K. Jain, U. Uludag and R.-L. Hsu).

23. **A. Ross**, “Fingerprint Mosaicking”, *IEEE Int’l Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Orlando, Florida, May 13 - 17, 2002. Oral Presentation.
24. **A. Ross**, “Fingerprint Matching Using Minutiae and Texture Features”, *International Conference on Image Processing (ICIP)*, Thessaloniki, Greece, Oct 7 - 10, 2001. Poster Presentation.
25. **A. Ross**, “Information Fusion in Biometrics”, *3rd Int’l Conference on Audio- and Video-Based Person Authentication (AVBPA)*, Sweden, June 6-8, 2001. Oral Presentation.
26. **A. Ross**, “A Prototype Hand Geometry-based Verification System”, *2nd Int’l Conference on Audio- and Video-based Biometric Person Authentication (AVBPA)*, Washington D.C., March 22-24, 1999. Poster Presentation.

## Panel Presentations

1. **A. Ross**, “Sentient Computing: The Role of Multimodal Biometrics”, *IEEE Workshop on Multimodal Sentient Computing*, (Minneapolis, MN), June 22, 2007. Panel Title: Multimodal Sentient Computing.
2. **A. Ross**, “Biometrics?”, *SPIE Conference on Biometric Technology for Human Identification III*, (Orlando, FL), April 17, 2006. Panel Title: Biometrics Barriers.
3. **A. Ross**, “The Ramblings of a Biometrician: Biometrics from an Engineering Perspective”, *West Virginia Law Review Annual Symposium*, (Morgantown, WV), March 27, 2006. Panel Title: Biometric Systems: Technology, Needs, and a Privacy Framework.
4. **A. Ross**, “Match Score Level Fusion, Score normalization and User-specific parameters”, *Biometric Consortium Conference (BCC), Multibiometrics and Fusion Session*, (Crystal City, VA), September 22, 2004. Panel Title: Multibiometrics and Fusion.

## 12 Tutorials

1. **A. Ross**, “Iris Biometric: Algorithms, Performance and Applications”, *Croucher Advanced Study Institute (ASI)*, (Hong Kong) January 13, 2007.
2. **A. Ross**, “Fingerprint Biometric: Algorithms, Performance and Applications”, *Croucher Advanced Study Institute (ASI)*, (Hong Kong), January 12, 2007.
3. **A. Ross** and A. K. Jain, “Biometrics: Techniques, Applications and Challenges”. A tutorial presented at *The International Conference on Pattern Recognition (ICPR)*, (Hong Kong), August 20, 2006.
4. **A. Ross**, “Multibiometric Systems: An Overview of Information Fusion in Biometrics”. A tutorial presented at *The International Conference on Biometrics (ICB)*, (Hong Kong), January 4, 2006.
5. **A. Ross** and A. K. Jain, “Automatic Fingerprint Recognition”. A tutorial presented at *The First International Conference on Pattern Recognition and Machine Intelligence (PReMI’05)*, (Kolkata, India), December 19, 2005. Invited by Dr. Ashish Ghosh, Associate Professor, Indian Statistical Institute, Kolkata, India.
6. **A. Ross**, “Fusion in Biometrics: An Overview”. A tutorial presented at *The Biometrics Summer School*, (Alghero, Italy), June 10, 2005. Invited by Prof. Massimo Tistarelli, Universit degli Studi di Genova.
7. **A. Ross** and A. K. Jain, “Biometric Recognition: Techniques, Applications and Challenges”. A tutorial prepared for *The 17th International Conference on Pattern Recognition (ICPR)*, (Cambridge, UK), August 22, 2004. (Presented by Jain).
8. **A. Ross**, A. K. Jain and A. Namboodiri, “An Introduction to Image Processing and Pattern Recognition”. A tutorial presented at *Eaton (Rochester Hills, MI)*, 2003. Invited by Michael Farmer, Eaton.

## 13 Seminars

1. **A. Ross**, “The ABC’s of Graduate Student Research”, Graduate Seminar at the Lane Department of Computer Science and Electrical Engineering, West Virginia University, (Morgantown, WV), March 5, 2007.
2. **A. Ross**, “May I have your fingerprints please?”, Graduate Seminar at the Lane Department of Computer Science and Electrical Engineering, West Virginia University, (Morgantown, WV), February 13, 2006.
3. **A. Ross**, “Automatic Fingerprint Identification: Techniques, Challenges and Opportunities”. Graduate Seminar at the Lane Department of Computer Science and Electrical Engineering, West Virginia University, September 29, 2003.
4. **A. Ross**, “Learning User-Specific Parameters in a Multibiometric System”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, November 1, 2002.
5. **A. Ross**, “A Survey on Multimodal Biometrics”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, April 9, 2002.
6. **A. Ross**, “Fingerprint Matching using Minutiae and Texture Features”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, October 5, 2001.
7. **A. Ross**, “Multimodal Biometric Systems”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, October 19, 2000.
8. **A. Ross**, “Models For User Access Patterns On The Web”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, March 28, 2000.
9. **A. Ross**, “Towards Building a System that Describes Saccades Over Constrained Images”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, November 16, 1999.
10. **A. Ross**, “Hand Geometry-based Biometrics: Performance and Registration Issues”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, March 2, 1999.
11. **A. Ross** and S. Prabhakar, “Biometrics for Authentication on the Internet”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, October 13, 1998.
12. **A. Ross**, “Hand Geometry Based Verification System”. PRIP Seminar at the Department of Computer Science and Engineering, Michigan State University, September 29, 1998.

\*PRIP = Pattern Recognition and Image Processing Lab.

## 14 Referee Activity: Journals/Books/Funding Agencies

- Artech Publishers (2005)
- Springer Publishers (2006)
- ACTA Press (2004, 2006)
- IEEE Trans on Signal Processing (2004)
- IEEE Trans on Image Processing (2004, 2005)
- Wiley Publishers (2004,2007)
- Trans on Education (2004)
- Machine Vision and Applications (2004)
- IEEE Trans on Pattern Analysis and Machine Intelligence (2003-2007)

- Pattern Analysis and Applications Journal (2004, 2005, 2006)
- IEEE Trans on Multimedia (2004, 2005, 2006)
- Research Grants Council / Hong Kong (2004)
- Pattern Recognition Letters (2003-2007)
- Pattern Recognition (2007)
- ETRI Journal (2004, 2006)
- IEEE Trans on Systems, Man, and Cybernetics (2004-2007)
- Image and Vision Computing Journal (2004, 2006, 2007)
- International Journal of Computers and Applications (2004)
- National Sciences and Engineering Research Council of Canada (2003)
- Universal Access in the Information Society Journal (2004)
- Multimedia Cyberspace Journal (2005)
- IEE Trans on Neural Networks (2005)
- Journal of Computer Science (2005)
- IEEE Signal Processing Letters (2005,2007)
- IEEE Trans on Information Forensics and Security (2005-2007)
- IEE Proceedings of Vision, Image & Signal Processing (2005, 2006)
- Journal of Modern Optics (2005)
- Swiss National Science Foundation (2006)
- Information Sciences Journal (2006)
- Journal of Information Fusion (2006)
- Defense Academy for Credibility Assessment (DACA) (2007)
- National Science Foundation (2007)
- Computer Vision and Image Understanding (2007)
- IEEE Trans on Instrumentation and Measurement (2007)
- Journal of Electronic Imaging (2007)
- Journal of Zhejiang University Science A (2007)
- Neurocomputing (2007)
- IEICE Transactions (2007)

## 15 Professional Activities

### Editorial Board

- Area Editor (Topic: Multibiometrics), Encyclopedia of Biometrics, Springer Publishers. Editor-in-chief: Dr. Stan Li.
- Guest Co-editor, EURASIP Journal on Applied Signal Processing (JASP), Special Issue on Advanced Signal Processing and Pattern Recognition Methods for Biometrics (2007-2008).

### Conference Chair

- SPIE Conference on Biometric Technology for Human Identification V (DS 26) 2008
- SPIE Conference on Biometric Technology for Human Identification IV (DS 36) 2007

### Technical Program Committee Co-chair

- Biometrics Symposium (BSYM) (2005-2008)

### Technical Program Committee

- International Conference on Computer Vision Theory and Applications (VISAPP) 2008
- International Workshop on Combinatorial Image Analysis (IWCIA) 2008
- IEEE Workshop on Automatic Identification Advanced Technologies (AutoID) 2007
- Computer Vision and Pattern Recognition Conference (CVPR) 2007
- International Workshop on Multiple Classifier System (MCS) 2007
- International Workshop on Pattern Recognition in Information Systems (PRIS 2007)
- European Signal Processing Conference (EUSIPCO) 2007
- IEEE Computer Society Workshop on Biometrics 2007
- International Conference on Biometrics (ICB) 2007
- Iberoamericann Congress on Pattern Recognition (CIARP) 2007
- IEEE Conference on Biometrics: Theory, Applications and Systems (BTAS) 2007
- International Symposium on Visual Computing (ISVC) 2007
- International Symposium on Signal Processing and its Applications (ISSPA) 2007
- Computer Vision and Pattern Recognition Conference (CVPR) 2006
- International Conference on Pattern Recognition (ICPR) 2006
- IEEE Computer Society Workshop on Biometrics 2006
- IEEE Workshop on Privacy Research in Vision (PRIV) 2006
- Iberoamerican Congress on Pattern Recognition (CIARP) 2006
- International Symposium on Visual Computing (ISVC): Special Track 2006
- Computer Vision and Pattern Recognition (CVPR) 2006

- European Conference on Computer Vision (ECCV) 2006
- International Conference on Biometrics (ICB) 2006
- IEEE Workshop On Automatic Identification Advanced Technologies (AutoID) 2005
- International Workshop on Biometric Recognition Systems (IWBRIS 2005)
- Computer Vision and Pattern Recognition (CVPR) 2005
- SPIE: Biometric Technology for Human Identification 2005
- Audio- and Video-based Person Authentication (AVBPA) 2005
- Computer Vision and Pattern Recognition (CVPR) 2004
- International Conference on Biometric Authentication (ICBA) 2004
- Biometric Authentication Workshop (BioAW) 2004
- The 5th Chinese Conference on Biometrics Recognition (Sinobiometrics) 2004

### Session Chair

- SPIE Conference on Biometric Technology for Human Identification IV (DS 36) 2007 (two sessions: 10 April 2007)
- IEEE Computer Society Workshop on Biometrics, (New York City, USA), June 18, 2006
- Biometrics Symposium (BSYM), (Baltimore, USA), 20 September, 2006
- SPIE: Biometric Technology for Human Identification II (OR 36) 29 March 2005.
- IEEE Workshop On Automatic Identification Advanced Technologies (AutoID), 17 October 2005.
- International Conference on Biometric Authentication (ICBA), July 17 2004.
- European Signal Processing Conference (EUSIPCO), *Biometric Fusion Session*, September 9, 2004.
- The 5th Chinese Conference on Biometrics Recognition (Sinobiometrics), December 13, 2004.

### Publicity Chair

- IAPR Conference on Audio- and Video-based Person Authentication (AVBPA) 2005
  - IAPR International Conference on Biometrics (ICB) 2006
-