

MIN WU

CONTACT INFORMATION

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EDUCATION

Ph.D. Electrical Engineering, Princeton University, 2001.
Dissertation: Multimedia Data Hiding, April 2001. Advised by Prof. Bede Liu.

B.S.E. Electrical Engineering (highest honors), Tsinghua University, Beijing, 1996.
Department of Automation, School of Information Sciences and Technologies

B.A. Economics (highest honors), Tsinghua University, Beijing, 1996.
Dual-degree program, School of Economics and Management

RESEARCH INTERESTS

Multimedia Security and Information Forensics; Multimedia Signal Processing.

PROFESSIONAL EXPERIENCE

Professor, University of Maryland, College Park, since 2011.

Associate Professor, University of Maryland, College Park, 2006 – 2011.

Assistant Professor, University of Maryland, College Park, 2001 – 2006.
Department of Electrical and Computer Engineering;
Institute of Advanced Computer Studies and Institute for Systems Research.

Visiting Associate Professor, Stanford University, 2007 – 2008.
Electrical Engineering Department and Information Systems Laboratory.

Intern, Panasonic Information and Network Labs, Princeton, NJ, Summer 1999.

Intern, NEC Research Institute, Princeton, NJ, Summer 1998.

AWARDS AND RECOGNITIONS

1. *IEEE Fellow*, effective January 2011, “for contributions to multimedia security and forensics”
2. *MIT “TR100” Young Innovator Award*, 2004.
MIT Technology Review Magazine’s Year 2004 list of 100 top young innovators under age of 35 “whose contribution to emerging technologies will profoundly influence our world, shaping how we live and work in the future.”
3. *ONR Young Investigator Award (YIP)*, 2005.
U.S. DoD ONR Mathematical, Computer, and Information Sciences Division.
4. *NSF Faculty Early Career Development Award (CAREER)*, 2002.
NSF Computer and Information Science and Engineering (CISE) Directorate

5. Computer World “40 under 40” Young Innovator Award, 2007.
Selected as one of the 40 innovative IT people under the age of 40.
 6. Selected as one of 100 outstanding young engineers to participate in the 11th Frontier of Engineering Symposium organized by the National Academy of Engineering in 2005.
 7. *IEEE Signal Processing Society 2005 Best Paper Award*, for a paper published in IEEE Transactions on Signal Processing.
 8. *EURASIP 2004 Best Paper Award*, for a paper published in EURASIP Journal on Applied Signal Processing in 2004.
 9. *IEEE Mac Van Valkenburg Early Career Teaching Award*, 2009.
For “outstanding contributions to undergraduate and graduate education in electrical and computer engineering, including innovative curricular development and influential mentoring.”
 10. *E. Robert Kent Junior Faculty Teaching Award*, College of Engineering, University of Maryland, College Park, 2009-2010.
 11. *George Corcoran Faculty Award*, University of Maryland, College Park, 2003.
For outstanding contribution to electrical engineering education and teaching.
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LIST OF PUBLICATIONS AND PATENTS

Overview: Two books, one book chapter; 34 journal papers published or in press; 92 refereed conference papers; 8 U.S. patents issued and 2 patents pending.

Journal article citations per ISI Web of Knowledge: $h = 17$, more than 1230 cites in total;
 Google Scholar: $h = 33$, about 3800 cites in total;
 Patents being cited by other patents for 270 times.

See <http://www.ece.umd.edu/~minwu/research.html> for abstracts and electronic copies.
 See Researcher ID page <http://www.researcherid.com/rid/B-7501-2009> for ISI journal citation data.
 Names in italic are my research advisees; names with ^ are students whose course projects that I advised were further developed into the publications.

BOOKS & BOOK CHAPTER

1. **M. Wu** and B. Liu: *Multimedia Data Hiding*, Springer-Verlag Publisher, 220 pages (research monograph), ISBN# 0387954260, October 2002.
2. K.J.R. Liu, W. Trappe, Z.J. Wang, **M. Wu**, and H. Zhao: *Multimedia Fingerprinting Forensics for Traitor Tracing*, EURASIP Book Series on Signal Processing and Communications, Hindawi Publishing Co., ISBN# 9775945186, 2005.
3. **M. Wu** and Q. Sun: “Video Security and Protection,” in *The Essential Guide to Image Processing*,

edited by A. Bovik, Elsevier, 2009.

1. C-Y. Lin, **M. Wu**, Y-M. Lui, J.A. Bloom, M.L. Miller, and I.J. Cox: "Rotation, Scale, and Translation Resilient Public Watermarking for Images", IEEE Trans. on Image Processing, vol.10, no.5, pp.767-782, May 2001.
2. **M. Wu**, R. Joyce, H-S. Wong, L. Guan, and S-Y. Kung: "Dynamic Resource Allocation via Video Content and Short-term Traffic Statistics", IEEE Trans. on Multimedia, Special Issue on Multimedia over IP, vol.3, no.2, pp.186-199, June 2001.
3. W. Trappe, **M. Wu**, Z. Wang, and K.J.R. Liu: "Anti-collusion Fingerprinting for Multimedia", IEEE Trans. on Signal Processing, Special issue on Signal Processing for Data Hiding in Digital Media and Secure Content Delivery, vol. 51, no. 4, pp.1069-1087, April 2003. [Received 2005 IEEE Signal Processing Society Best Paper Award]
4. **M. Wu** and B. Liu: "Data Hiding in Image and Video: Part-I – Fundamental Issues and Solutions", IEEE Trans. on Image Proc., vol.12, no.6, pp.685-695, June 2003.
5. **M. Wu**, H. Yu, and B. Liu: "Data Hiding in Image and Video: Part-II – Designs and Applications", IEEE Trans. on Image Proc., vol.12, no.6, pp.696-705, June 2003.
6. **M. Wu**: "Joint Security and Robustness Enhancement for Quantization Based Embedding," IEEE Trans. on Circuits and Systems for Video Technology, Special Issue on Authentication, Copyright Protection, and Information Hiding, vol. 13, no. 8, pp.831-841, August 2003.
7. **M. Wu**, W. Trappe, Z. Wang, and K.J.R. Liu: "Collusion Resistant Fingerprinting for Multimedia", IEEE Signal Processing Magazine, Special Issue on Digital Rights Management, vol. 21, no. 2, pp.15-27, March 2004.
8. **M. Wu** and B. Liu: "Data Hiding in Binary Image for Authentication and Annotation", IEEE Trans. on Multimedia, vol. 6, no. 4, pp.528-538, August 2004.
9. Z. Wang, **M. Wu**, W. Trappe, and K.J.R. Liu: "Group-Oriented Fingerprinting for Multimedia Forensics", EURASIP Journal on Applied Signal Processing, Special Issue on Multimedia Security and Rights Management, vol.2004:14, pp.2153-2173, October 2004. [Received 2004 EURASIP Best Paper Award]
10. H. Zhao, **M. Wu**, Z. Wang, and K.J.R. Liu: "Forensic Analysis of Nonlinear Collusion Attacks for Multimedia Fingerprinting," IEEE Trans. on Image Proc., vol. 14, no. 5, pp.646-661, May 2005.
11. Z. Wang, **M. Wu**, H. Zhao, W. Trappe, and K.J.R. Liu: "Anti-Collusion Forensics of Multimedia Fingerprinting Using Orthogonal Modulation," IEEE Trans. on Image Proc., vol. 14, no. 6, pp.804-821, June 2005.
12. G-M. Su and **M. Wu**: "Efficient Bandwidth Resource Allocation for Low-Delay Multiuser Video Streaming," IEEE Trans. on Circuits and Systems for Video Technologies, vol. 15, no. 9, pp. 1124-1137, Sept. 2005.
13. H. Gou and **M. Wu**: "Data Hiding in Curves with Applications to Fingerprinting Maps," IEEE Trans. on Signal Proc., Special Issue on Secure Media, vol. 53, no. 10, pp. 3988-4005, Oct. 2005.
14. G-M. Su, Z. Han, **M. Wu**, and K.J.R. Liu, "Multiuser Cross-Layer Resource Allocation for Video Transmission over Wireless Networks," IEEE Network Magazine, Special Issue on Multimedia over Broadband Wireless Networks, vol. 20, no. 2, pp.21-27, March 2006.

15. *A. Swaminathan, Y. Mao, and M. Wu*: "Robust and Secure Hashing for Images," *IEEE Trans. on Info. Forensics and Security*, vol. 1, no. 2, pp. 215-230, June 2006.
16. *S. He and M. Wu*: "Joint Coding and Embedding Techniques for Multimedia Fingerprinting," *IEEE Trans. on Info. Forensics and Security*, vol. 1, no. 2, pp. 231-247, June 2006.
17. *Y. Mao and M. Wu*: "A Joint Signal Processing and Cryptographic Approach to Multimedia Encryption", *IEEE Trans. on Image Processing*, vol. 15, no. 7, pp. 2061-2075, July 2006.
18. *M. Chen, Y-F. Zheng, and M. Wu*: "Classification-Based Spatial Error Concealment for Visual Communications," *EURASIP Journal on Applied Signal Processing, Special Issue on Video Analysis and Coding for Robust Transmission*, 2006.
19. *Y. Mao, Y. Sun, M. Wu, and K.J.R. Liu*: "JET: Dynamic Join-Exit-Tree Amortization and Scheduling for Contributory Key Agreement", *ACM/IEEE Trans. on Networking*, vol. 14, no. 5, pp. 1128-1140, Oct. 2006.
20. *G-M. Su, Z. Han, M. Wu, and K.J.R. Liu*, "A Scalable Multiuser Framework for Video Over OFDM Networks: Fairness and Efficiency", *IEEE Trans. on Circuits and Systems for Video Technologies*, vol. 16, no. 10, pp.1217-1231, Oct. 2006.
21. *Z. Han, G-M. Su, A. Kwasinski, M. Wu and K.J.R. Liu*: "Distortion Management of Real-time MPEG-4 FGS Video Over Downlink Multi-code CDMA Networks", *IEEE Trans. on Wireless Communications*, vol. 5, no. 11, pp.3056-3067, Nov. 2006.
22. *A. Swaminathan, M. Wu, and K.J.R. Liu*: "Non-intrusive Component Forensics of Visual Sensors Using Output Images," *IEEE Trans. on Info. Forensics and Security*, vol. 2, no. 1, pp. 91-106, March 2007.
23. *Y. Mao and M. Wu*: "Tracing Malicious Relay Nodes in Cooperative Wireless Communications," *IEEE Trans. on Info. Forensics and Security*, vol. 2, no. 2, pp. 198-212, June 2007.
24. *G-M. Su, Z. Han, M. Wu, and K.J.R. Liu*, "Joint Uplink and Downlink Optimization for Real-Time Multiuser Video Streaming over WLANs," *IEEE Journal of Selected Topics in Signal Processing, Special Issue on Network-Aware Multimedia Proc. & Communications*, vol. 1, no. 2, pp. 280-294, August 2007.
25. *Y. Mao and M. Wu*: "Unicity Distance of Robust Image Hashing," *IEEE Trans. on Info. Forensics and Security*, vol. 2, no. 3, pp. 462-467, September 2007.
26. *S. He and M. Wu*: "Collusion-Resistant Video Fingerprinting for Large User Group," *IEEE Trans. on Info. Forensics and Security*, vol. 2, no. 4, pp. 697-709, December 2007.
27. *S. He and M. Wu*: "Adaptive Detection for Group-based Multimedia Fingerprinting," *IEEE Signal Processing Letters*, vol. 14, no. 12, pp.964-967, December 2007.
28. *A. Swaminathan, M. Wu, and K.J.R. Liu*: "Digital Image Forensics via Intrinsic Fingerprints," *IEEE Trans. on Info. Forensics and Security*, vol. 3, no. 1, pp.101-117, March 2008.
29. *M. Chen, G-M. Su, and M. Wu*: "Dynamic Resource Allocation for Robust Distributed Multi-Point Video Conferencing," *IEEE Trans. on Multimedia*, vol. 10, no. 5, pp. 910-925, August 2008.
30. *S. He, D. Kirovski, and M. Wu*: "High-Fidelity Data Embedding for Image Annotation," *IEEE Trans. on Image Processing*, vo. 18, no. 2, pp.429-435, February 2009.
31. *A. Swaminathan, M. Wu, and K.J.R. Liu*: "Component Forensics: Theory, Methodologies, and Applications," *IEEE Signal Processing Magazine*, vol. 26, no. 2, pp.28-48, March 2009.
32. *A.L. Varna, S. He, A. Swaminathan, and M. Wu*: "Fingerprinting Compressed Multimedia Signals," *IEEE Trans. on Info. Forensics and Security*, vol. 4, no. 3, pp. 330-345, September 2009.

33. *H. Gou, A. Swaminathan, and M. Wu*: "Intrinsic Sensor Noise Features for Forensic Analysis on Scanners and Scanned Images," *IEEE Trans. on Info. Forensics and Security*, vol. 4, no. 3, pp. 476-491, September 2009.
34. *A.L. Varna and M. Wu*: "Modeling and Analysis of Correlated Binary Fingerprints for Content Identification," *IEEE Trans. on Info. Forensics and Security*, vol. 6, no. 3, pp. 1146-1159, September 2011.
35. *R. Garg, A.L. Varna, and M. Wu*: "An Efficient Gradient Descent Approach for Secure Localization in Resource Constrained Wireless Sensor Networks," submitted for journal publication.
36. *W-H. Chuang, A.L. Varna, and M. Wu*: "Modeling and Analysis of Ordinal Ranking for Content Fingerprints," submitted for journal publication.
37. *W. Lu and M. Wu*: "Forensic Hash for Multimedia Information Assurance," submitted for journal publication, under revision.
38. *W-H. Chuang, H. Su, and M. Wu*: "Forensic Linkage of Digital Imaging Device," submitted for journal publication, under revision.
39. *W. Lu, A.L. Varna, and M. Wu*: "Confidentiality Preserving Search of Multimedia," submitted for journal publication, under revision.

REFEREED CONFERENCE PAPERS

1. **M. Wu**: "An OCR Approach Based on Peripheral Direction Contributivity and Orthogonal Experimental Analysis", *Proc. of 1st Symposium of Undergraduate Research in Science and Technology*, pp.44-51, Tsinghua University, Beijing, April 1996 (in Chinese).
2. X-L. Wu and **M. Wu**: "An Experimental System of Multi-font Multi-Language Character Recognition", *Proc. of National Conf. on Character Recognition and Document Analysis, China*, pp.59-66, Sept. 1996 (in Chinese).
3. **M. Wu** and B. Liu: "Watermarking for Image Authentication", *Proc. of IEEE International Conference on Image Processing (ICIP'98)*, vol.2, pp.437-441, Chicago, IL, Oct. 1998.
4. **M. Wu**, W. Wolf, and B. Liu: "An Algorithm for Wipe Detection", *Proc. of IEEE International Conference on Image Processing (ICIP'98)*, vol.1, pp.893-897, Chicago, IL, Oct. 1998.
5. **M. Wu**, H. Yu, and A. Gelman: "Multi-level Data Hiding for Digital Image and Video", *Proceedings of SPIE*, vol. 3845, *Multimedia Systems and Applications II*, pp.10-21, Photonics East Conference, Boston, MA, Sept. 1999.
6. **M. Wu** and B. Liu: "Digital Watermarking Using Shuffling", *Proc. of IEEE International Conference on Image Processing (ICIP'99)*, vol.1, pp.291-295, Kobe, Japan, Oct. 1999.
7. **M. Wu** and B. Liu: "Attacks on Digital Watermarks", *Proc. of 33rd Asilomar Conference on Signals, Systems, and Computers*, vol.2, pp.1508-1512, Pacific Grove, CA, Oct. 1999.
8. C-Y. Lin, **M. Wu**, J.A. Bloom, M.L. Miller, I.J. Cox, and Y-M. Lui: "Rotation, Scale, and Translation Resilient Public Watermarking for Images," *Proc. of SPIE*, vol. 3971, *Security and Watermarking of Multimedia Contents II*, pp.90-98, *Electronic Imaging Conferences (EI'00)*, San Jose, CA, Jan. 2000.
9. **M. Wu**, E. Tang, and B. Liu: "Data Hiding in Binary Image", *Proc. of IEEE International Conf. on Multimedia & Expo (ICME'00)*, vol.1, pp.393-396, New York City, NY, Aug. 2000.
10. **M. Wu** and H. Yu: "Video Access Control via Multi-level Data Hiding", *Proc. of IEEE*

- International Conference on Multimedia & Expo (ICME'00), vol.1, pp.381-384, New York City, NY, Aug. 2000.
11. **M. Wu**, R. Joyce, and S-Y. Kung: "Dynamic Resource Allocation via Video Content and Short-term Traffic Statistics", Proc. of IEEE International Conference on Image Processing (ICIP'00), invited paper, vol.3, pp.58-61, Vancouver, Canada, Sept. 2000.
 12. P. Yin, **M. Wu**, and B. Liu: "Video Transcoding by Reducing Spatial Resolution", Proc. of IEEE International Conference on Image Processing (ICIP'00), vol.1, pp.972-975, Vancouver, Canada, Sept. 2000.
 13. H-S. Wong, **M. Wu**, R. Joyce, L. Guan, and S-Y. Kung: "A Neural Network Approach For Predicting Network Resource Requirement in Video Transmission", IEEE Pacific Rim Conference on Multimedia (PCM'00), pp. 116-119, Sydney, Australia, Dec. 2000.
 14. **M. Wu**, S.A. Craver, E.W. Felten, and B. Liu: "Analysis of Attacks on SDMI Audio Watermarks", Proc. of IEEE International Conference on Acoustic, Speech, and Signal Processing (ICASSP'01), vol.3, pp.1369-1372, Salt Lake City, UT, May 2001.
 15. S.A. Craver, **M. Wu**, B. Liu, A. Stubblefield, B. Swartzlander, D.S. Wallach, D. Dean, and E.W. Felten: "Reading Between the Lines: Lessons from the SDMI Challenge", Proc. of 10th Usenix Security Symposium, Washington, DC, Aug. 2001. Also was accepted by the 4th Info. Hiding Workshop.
 16. **M. Wu** and B. Liu: "Modulation and Multiplexing Techniques for Multimedia Data Hiding", Invited paper, Proc. of SPIE, vol. 4518, Multimedia Systems and Applications IV, pp.228-238, ITcom'01 Conference, Denver, CO, Aug. 2001.
 17. S. Craver, **M. Wu**, and B. Liu: "What Can We Reasonably Expect from Watermark?", Proc. of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics, pp.223-226, New Paltz, NY, Oct. 2001.
 18. P. Yin, **M. Wu**, and B. Liu: "A Robust Error Resilient Approach for MPEG Video Transmission Over Internet", Proc. of SPIE, vol.4671, Inter. Conference on Visual Comm. & Image Processing (VCIP'02), pp.103-111, San Jose, CA, Jan. 2002.
 19. W. Trappe, **M. Wu**, and K.J.R. Liu: "Collusion-Resistant Fingerprinting for Multimedia," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'02), vol.4, pp.3309-3312, Orlando, FL, May 2002.
 20. W. Trappe, **M. Wu**, and K.J.R. Liu: "Joint Coding and Embedding for Collusion-Resistant Fingerprinting," invited paper, Proc. of EUSIPCO 2002, invited paper, special session on Security Issues in Digital Watermarking, Toulouse, France, Sept. 2002.
 21. X-L. Wu and **M. Wu**: "A Recognition Algorithm for Chinese Characters With Diverse Fonts", Proc. of IEEE International Conference on Image Processing (ICIP'02), vol.3, pp.981-984, Rochester, NY, Sept. 2002.
 22. W. Trappe, **M. Wu**, and K.J.R. Liu: "Anti-Collusion Codes: Multi-User and Multimedia Perspectives," Proc. of IEEE International Conference on Image Processing (ICIP'02), vol.2, pp.149-152, Rochester, NY, Sept. 2002.
 23. **M. Wu** and Y. Mao: "Communication-Friendly Encryption of Multimedia", Proc. of IEEE Multimedia Signal Processing Workshop (MMSP'02), pp.292-295, St. Thomas, U.S. Virgin Islands, Dec. 2002.
 24. H. Zhao, **M. Wu**, Z.J. Wang, and K.J.R. Liu: "Nonlinear Collusion Attacks on Independent Fingerprints For Multimedia," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'03), vol. 5, pp. 664-667, Hong Kong, April 2003.

25. Z.J. Wang, **M. Wu**, H. Zhao, W. Trappe, and K.J.R. Liu: "Resistance of Orthogonal Gaussian Fingerprints to Collusion Attacks," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'03), invited paper, Special Session on Multimedia Security and Rights Management, vol. 4, pp.724-727, Hong Kong, April 2003.
26. H. Zhao, **M. Wu**, Z.J. Wang, and K.J.R. Liu: "Performance of Detection Statistics Under Collusion Attacks on Independent Multimedia Fingerprints," Proc. of IEEE International Conference on Multimedia & Expo (ICME'03), vol. 1, pp.205-208, Baltimore, MD, July 2003.
27. Z.J. Wang, **M. Wu**, W. Trappe, and K.J.R. Liu: "Anti-Collusion of Group-Oriented Fingerprinting," Proc. of IEEE International Conference on Multimedia & Expo (ICME'03), vol. 2, pp.217-220, Baltimore, MD, July 2003.
28. **M. Wu**: "Joint Security and Robustness Enhancement for Quantization Based Embedding," Proc. of IEEE International Conference on Image Processing (ICIP'03), vol. 2, pp.14-17, Barcelona, Spain, Sept. 2003.
29. *M. Chen*, **M. Wu**, and Y-F. Zheng: "Classification-Based Spatial Error Concealment for Images," Proc. of IEEE International Conference on Image Processing (ICIP'03), vol. 2, pp. 675-678, Barcelona, Spain, Sept. 2003.
30. **M. Wu**, W. Trappe, Z. Wang, and K.J.R. Liu: "Collusion Resistant Multimedia Fingerprinting: A Unified Framework", Electronic Imaging Symposium: Security, Steganography, and Watermarking of Multimedia Contents VI, San Jose, CA, Proc. of SPIE, vol. 5306, pp.748-759, Jan. 2004.
31. **M. Wu**: "Distortion Compensated Lookup-Table Embedding: Joint Security and Robustness Enhancement for Quantization Based Data Hiding", Electronic Imaging Symposium: Security, Steganography, and Watermarking of Multimedia Contents VI, San Jose, CA, Proc. of SPIE, vol. 5306, pp. 610-621, Jan. 2004.
32. *Y. Mao*, Y. Sun, **M. Wu**, and K.J.R. Liu: "Dynamic Join-Exit Amortization and Scheduling for Time-Efficient Group Key Agreement", Proc. of IEEE Infocom '2004, vol. 4, pp.2617-2627, Hong Kong, March 2004. [Acceptance rate 18.4% out of 1420]
33. *S. He* and **M. Wu**: "Performance Study on ECC-based Collusion-Resistant Multimedia Fingerprinting," Proc. of Conferences on Information Sciences and Systems (CISS'04), invited paper, pp.827-832, Princeton, NJ, March 2004.
34. *G-M. Su*, Z. Han, A. Kwasinski, **M. Wu**, K.J.R. Liu, and N. Farvardin: "Distortion Management of Real-time MPEG-4 FGS Video over Downlink Multicode CDMA Networks", Proc. of IEEE Inter. Conf. on Communications (ICC'04), Wireless Communications Symposium, vol. 5, pp.3071-3075, Paris, France, Jun. 2004.
35. *G-M. Su* and **M. Wu**: "Efficient Bandwidth Resource Allocation for Low-Delay Multiuser MPEG-4 Video Transmission," Proc. of IEEE Inter. Conf. on Communications (ICC'04), Multimedia Technologies and Services Symposium, vol. 3, pp.1308-1312, Paris, France, Jun. 2004.
36. *A. Swaminathan*, *Y. Mao* and **M. Wu**: "Image Hashing Resilient to Geometric and Filtering Operations," Proc. of IEEE Workshop on Multimedia Signal Processing (MMSP'04), pp.355-358, Siena, Italy, Sept. 2004.
37. *Y. Mao* and **M. Wu**: "Security Evaluation for Communication-Friendly Encryption of Multimedia," Proc. of IEEE International Conf. on Image Processing (ICIP'04), Special Session on Multimedia Security Issues in Streaming and Mobile Applications, pp. 569-572, Singapore, Oct. 2004.
38. *H. Gou* and **M. Wu**: "Data Hiding in Curves for Collusion-Resistant Digital Fingerprinting," Proc. of IEEE International Conference on Image Processing (ICIP'04), pp. 51-54, Singapore, Oct. 2004.

39. *H. Gou* and **M. Wu**: "Fingerprinting Curves," International Workshop on Digital Watermarking (IWDW'04), Seoul, Korea, invited paper, in Lecture Notes on Computer Science (LNCS) vol. 3304, pp.13-28, Oct. 2004.
40. *G-M. Su*, *Z. Han*, **M. Wu**, and *K.J.R. Liu*: "Dynamic Distortion Control for 3-D Embedded Wavelet Video over Multiuser OFDM Networks," Proc. of IEEE International Conference on Global Communications (Globecom'04), vol. 2, pp.650-654, Dallas, Texas, Dec. 2004.
41. **M. Wu**, *J. Fridrich*, *M. Goljan*, and *H. Gou*: "Handling Uneven Embedding Capacity in Binary Images: A Revisit," SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 5681, pp. 194-205, January 2005.
42. *S. He* and **M. Wu**: "Group-Oriented Joint Coding and Embedding Technique for Multimedia Fingerprinting," SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 5681, pp. 96-105, January 2005.
43. *G-M. Su*, *Z. Han*, **M. Wu**, and *K.J.R. Liu*: "Joint Uplink and Downlink Optimization for Video Conferencing over Wireless LAN," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'05), vol. 2, pp 1101-1104, Philadelphia, PA, March 2005.
44. *H. Gou* and **M. Wu**: "Robust Digital Fingerprinting for Curves," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'05), vol. 2, pp. 529-532, Philadelphia, PA, March 2005.
45. *S. He* and **M. Wu**: "Improving Collusion Resistance of Error Correcting Code Based Multimedia Fingerprinting," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'05), vol. 2, pp. 1029 – 1032, Philadelphia, PA, March 2005.
46. *A. Swaminathan*, *Y. Mao* and **M. Wu**: "Security of Feature Extraction in Image Hashing," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'05), vol. 2, pp. 1041– 1044, Philadelphia, PA, March 2005. (Received ICASSP'05 Student Paper Award)
47. *A. Swaminathan*, *Y. Mao*, **M. Wu**, and *Krishnan Kailas*: "Data Hiding in Compiled Program Binaries for Enhancing Computer System Performance," 7th International Information Hiding Workshop (IHW), Barcelona, Spain, and Lecture Notes on Computer Science (LNCS), vol. 3727, pp.357-371, June 2005. [Acceptance rate 31%]
48. *S. He* and **M. Wu**: "Building Efficient and Effective Multimedia Fingerprinting via Joint Coding and Embedding," Proc. of ACM Multimedia and Security Workshop, New York City, NY, pp.127-136, Aug. 2005.
49. *S. He* and **M. Wu**: "Performance Study on Multimedia Fingerprinting Employing Traceability Codes," International Workshop on Digital Watermarking (IWDW'05), Siena, Italy, and Lecture Notes on Computer Science (LNCS), vol. 3710, pp.84-96, Sept. 2005.
50. *Y. Mao* and **M. Wu**: "Coordinated Sensor Deployment for Improving Secure Communications and Sensing Coverage," Proc. of ACM Workshop on Security of Ad Hoc and Sensor Networks (SASN'2005), Alexandria, VA, pp.117-128, Nov. 2005.
51. *H. Gou* and **M. Wu**: "Fingerprinting Digital Elevation Maps," SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 6072, pp. 373–384, January 2006.
52. *A. Swaminathan*, *S. He*, and **M. Wu**: "Exploring QIM based Anti-Collusion Fingerprinting for Multimedia," SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 6072, pp. 698–709, January 2006.
53. *A. Swaminathan*, **M. Wu**, and *K.J.R. Liu*: "Component Forensics for Digital Camera: A Non-

- intrusive Approach,” Proc. of Conf. on Info. Sciences and Systems (CISS), invited paper, Princeton, NJ, pp. 1194–1199, March 2006.
54. *A. Swaminathan, M. Wu,* and K.J.R. Liu: “Non-intrusive Forensic Analysis of Visual Sensors Using Output Images,” Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP’06), Toulouse, France, vol. 5, pp.401–404, May 2006.
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 57. *G-M. Su, M. Chen,* and **M. Wu**: “Cross-Path PDMA-based Error Protection for Streaming Multiuser Video over Multiple Paths,” IEEE Int. Conf. on Image Processing (ICIP’06), Atlanta, Georgia, pp. 21–24, Oct. 2006.
 58. *S. He* and **M. Wu**: “Collusion-Resistant Video Fingerprinting for Large User Group,” IEEE Int. Conf. on Image Processing (ICIP’06), Atlanta, Georgia, pp. 2303–2306, Oct. 2006.
 59. *A. Swaminathan, M. Wu,* and K.J.R. Liu: “Image Tampering Identification Using Blind Deconvolution,” IEEE Int. Conf. on Image Processing (ICIP’06), Atlanta, Georgia, pp. 2311–2314, Oct. 2006.
 60. *A. Swaminathan, M. Wu,* and K.J.R. Liu: “Forensic Analysis via Intrinsic Fingerprints,” SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 6505, February 2007.
 61. *H. Gou, A. Swaminathan,* and **M. Wu**, “Robust scanner identification based on noise features,” SPIE Conference on Security, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 6505, February 2007.
 62. *A.L. Varna, S. He, A. Swaminathan, M. Wu,* H. Lu, and Z. Lu, “Collusion-Resistant Fingerprinting For Compressed Multimedia Signals,” Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP’07), pp. II 165-168, Honolulu, Hawaii, April 2007.
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 66. **M. Wu,** *A. Swaminathan,* and *Y. Mao*, “A Signal Processing and Randomization Perspective of Robust and Secure Image Hashing,” Proc. of IEEE Workshop on Statistical Signal Processing (SSP’07), Madison, Wisconsin, August 2007.
 67. *A.L. Varna, S. He, A. Swaminathan,* and **M. Wu**, “Analysis of Nonlinear Collusion Attacks on Fingerprinting Systems for Compressed Multimedia,” Proc. of IEEE Int. Conf. on Image Processing (ICIP’07), pp. II 133-136, San Antonio, TX, Sept. 2007.
 68. *H. Gou* and **M. Wu**, “Improving Embedding Payload in Binary Images with ‘Super-Pixels’,” Proc.

- of IEEE Int. Conf. on Image Processing (ICIP'07), pp. III 277-280, San Antonio, TX, Sept. 2007.
69. *H. Gou, A. Swaminathan, and M. Wu*, "Noise Features for Image Tampering Detection and Steganalysis," Proc. of IEEE Int. Conf. on Image Processing (ICIP'07), pp. V 97-100, San Antonio, TX, Sept. 2007.
 70. *A. Swaminathan, M. Wu, and K.J.R. Liu*, "A Component Estimation Framework for Information Forensics," Proc. of IEEE Workshop on Multimedia Signal Processing (MMSP'07), pp. 397-400, Chania, Crete, Greece, Oct. 2007.
 71. *A. Swaminathan, Y. Mao, G-M. Su, H. Gou, A.L. Varna, S. He, M. Wu, and D. Oard*, "Confidentiality-Preserving Rank-Ordered Search," 3rd ACM International Workshop on Storage Security and Survivability (StorageSS 2007), pp. 7-12, Alexandria, VA, Oct. 2007.
 72. *W. Luo, M. Wu, and J. Huang*, "MPEG Recompression Detection Based on Block Artifacts," SPIE Conference on Security, Forensics, Watermarking and Steganography, San Jose, CA, Proc. of SPIE, vol. 6819, January 2008.
 73. *A. Swaminathan, M. Wu, and K.J.R. Liu*, "A Pattern Classification Framework for Theoretical Analysis of Component Forensics," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'08), Las Vegas, NV, April 2008.
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 75. *M. Taylor, C-E. Yin, M. Wu, and G. Qu*: "A Hardware-Assisted Data Hiding Based Approach in Building High Performance Secure Execution Systems," Proc. of IEEE International Workshop on Hardware-Oriented Security and Trust (HOST'08), pp. 93-96, Anaheim, CA, June 2008.
 76. *A.L. Varna, A. Swaminathan, and M. Wu*, "A Decision Theoretic Framework for Analyzing Hash-based Content Identification Systems", Proc. of ACM Digital Rights Management Workshop, pp. 67-76, Oct. 2008.
 77. *W. Lu, A. Swaminathan, A.L. Varna, and M. Wu*, "Enabling Search over Encrypted Multimedia Databases", Proc. of SPIE, vol. 7254, Conf. on Media Forensics and Security, January 2009.
 78. *W-H. Chuang, A. Swaminathan, and M. Wu*, "Tampering Identification Using Empirical Frequency Response," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'09), pp. 1517-1520, Taipei, Taiwan, April 2009.
 79. *W. Lu, A.L. Varna, A. Swaminathan, and M. Wu*, "Secure Image Retrieval Through Feature Protection," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'09), pp. 1533-1536, Taipei, Taiwan, April 2009.
 80. *A.L. Varna and M. Wu*, "Theoretical Modeling and Analysis of Content Identification", IEEE International Conference on Multimedia and Expo (ICME), pp. 1528-1531, New York, July 2009.
 81. *W-H. Chuang, A.L. Varna, and M. Wu*, "Modeling and Analysis of Ordinal Ranking in Content Fingerprinting," Proc. of IEEE Int. Workshop on Information Forensics and Security (WIFS'09), pp. 116-120, London, UK, December 2009. [30% acceptance rate]
 82. *A.L. Varna and M. Wu*, "Modeling Content Fingerprints Using Markov Random Fields", Proc. of IEEE Int. Workshop on Information Forensics and Security (WIFS'09), pp. 111-115, London, UK, December 2009. [30% acceptance rate]
 83. *W. Lu, A.L. Varna, and M. Wu*, "Forensic Hash for Multimedia Information", Proc. of SPIE, vol. 7541, Conf. on Media Forensics and Security, January 2010.
 84. *A.L. Varna, W-H. Chuang, and M. Wu*, "A Framework for Theoretical Analysis of Content

- Fingerprinting", Proc. of SPIE, vol. 7541, Conf. on Media Forensics and Security, January 2010.
85. *R. Garg, A.L. Varna, and M. Wu*, "Gradient Descent Approach for Secure Localization in Resource Constrained Wireless Sensor Networks," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP 2010), pp. 1854-1857, Dallas, TX, March 2010.
 86. *W. Lu, A.L. Varna, and M. Wu*, "Security Analysis for Privacy Preserving Search of Multimedia," IEEE Int. Conf. on Image Processing (ICIP'10), Hong Kong, Sept. 2010.
 87. *W. Lu and M. Wu*, "Multimedia Forensic Hash based on Visual Words," IEEE Int. Conf. on Image Processing (ICIP'10), Hong Kong, Sept. 2010.
 88. *W-C. Chuang, A.L. Varna, and M. Wu*, "Performance Impact of Ordinal Ranking on Content Fingerprinting," IEEE Int. Conf. on Image Processing (ICIP'10), Hong Kong, Sept. 2010.
 89. *W-H. Chuang and M. Wu*, "Semi Non-Intrusive Training for Cell-Phone Camera Model Linkage," Proc. of IEEE Int. Workshop on Information Forensics and Security (WIFS 2010), Seattle, WA, December 2010. [28% acceptance rate]
 90. *W. Lu, A.L. Varna, and M. Wu*, "Secure Video Processing: Problems and Challenges," Invited Paper, Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP 2011), Prague, Czech Republic, May 2011.
 91. *A.L. Varna and M. Wu*, "Modeling Temporal Correlations in Content Fingerprints," Proc. of IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP 2011), Prague, Czech Republic, May 2011.
 92. *W-H. Chuang and M. Wu*, "Exploring Compression Effects for Improved Source Camera Identification Using Strongly Compressed Video," IEEE Int. Conf. on Image Processing (ICIP'11), Brussels, Belgium, Sept. 2011.
 93. *W. Lu and M. Wu*, "*Seam Carving Estimation Using Forensic Hash*," Prof. of ACM Multimedia Security Workshop (MM&Sec), Buffalo, NY, Sept. 2011.
 94. *R. Garg, A.L. Varna and M. Wu*, " 'Seeing' ENF: Natural Time Stamp for Digital Video via Optical Sensing and Signal Processing," long paper accepted by ACM Multimedia, Scottsdale, Arizona, to appear Nov. 2011. [17% acceptance rate; 1 of the 3 finalists for Best Paper Award]

PATENTS

1. J. Bloom, M. Miller, I. Cox, **M. Wu**, C-Y. Lin, and Y-M. Lui: "Rotation, Scale, and Translation Resilient Public Watermarking for Images Using a Log-polar Fourier Transform," US Patent 6,282,300, issued Aug. 28, 2001. (Cited by 78 patents)
2. **M. Wu** and B. Liu: "Watermarking Scheme for Image Authentication," US Patent 6,285,775, issued Sept. 4, 2001. (Cited by 126 patents)
3. H. Yu, **M. Wu**, X. Li, and A. Gelman: "Methods and Apparatus for Multi-layer Data Hiding," US Patent 6,456,726, issued Sept. 24, 2002. (Cited by 45 patents)
4. **M. Wu** and H. Yu: "Human Visual Model for Data Hiding," US Patent 6,611,608, issued Aug. 26, 2003. (Cited by 20 patents)
5. **M. Wu**, R. Joyce, A. Vetro, H-S. Wong, L. Guan, and S-Y. Kung: "Dynamic Network Resource Allocation Using Multimedia Content Features and Traffic Features," US Patent 6,947,378, issued Sept. 20, 2005.

6. **M. Wu** and *H. Gou*: "Method for concealing data in curves of an image," U.S. Patent 7,817,817, provisional filing Sept. 2004, formal filing Sept. 2005, issued on Oct. 19, 2010.
7. *S. He* and **M. Wu**: "Method for fingerprinting multimedia content," U.S. Patent 7,814,564, provisional filing Jan. 2005, formal filing Jan. 2006, issued on Oct. 12, 2010. (Licensed to industry in North and Latin America by UMD)
8. **M. Wu**, *A. Swaminathan*, and *Y. Mao*: "Data Hiding in Compiled Program Binaries for Supplementing Computer Functionality," U.S. Patent 7,840,789, provisional filing June 2005, formal filing June 2006, issued on Nov. 23, 2010.
9. *A. Swaminathan*, **M. Wu**, and K.J.R. Liu: "Non-intrusive Component Forensics for Visual Sensors and Devices," filed March 2006.
10. *A. Swaminathan*, *Y. Mao*, *G-M. Su*, *H. Gou*, *A.L. Varna*, *S. He*, **M. Wu**, and *D. Oard*, "Confidentiality-Preserving Rank-Ordered Search," filed Oct. 2007.

CITATION IMPACT HIGHLIGHTS

- (Statistics as of June 2011) **Patents** being cited by other patents for 270 times;
Journal and conference article citations per Google Scholar: h = 33, about 3800 cites in total;
Journal article citations per ISI: h = 17, more than 1230 cites in total.

(Statistics as of Fall 2010)

- [J8] Top 20 highly cited paper in 10-year history of IEEE Trans. on Multimedia out of 940+ papers; Google Scholar citation combining the journal and conference work [J8, C9] is over 320.
- [J3] Top 1.5% highly cited papers out of 7800+ in 20-year history of IEEE Trans. on Signal Processing; has 123 ISI citations and over 200 Google citations.
- [J1] Top 50 highly cited paper out of 3200+ papers over 18-year history of IEEE Trans. on Image Processing; 219 citations per ISI and over 490 citations per Google Scholar.
- Three journal papers are among the top 5% highly cited papers out of 300+ papers in the IEEE Trans. on Information Forensics and Security since the journal's inception: ranked 4th [J15], 10th [J16], and 12th[J22], respectively.

RESEARCH GRANTS

1. "Forensic Hash for Assured Cyber-based Sensing and Communications", National Science Foundation, \$344K, Sept. 2010 – Aug. 2013, Principal Investigator.
2. "Information Hiding based Trusted Computing System Design," Air Force Office of Scientific Research (AFOSR), \$450K, March 2010 – Feb. 2013, Co-PI (with PI Gang Qu).
3. "REU Site: Biosystem Internship for Engineers (BIEN)", National Science Foundation, \$372K, 2011-2014, Co-PI (with PI Pamela Abshire).
4. "Addressing Physical-Layer Challenges via CLAWS: Cross-Layer Approaches to Wireless Secure Communications", National Science Foundation, \$312K, Sept. 2008 – Aug. 2011, Principal Investigator.

5. "Digital Image Device Linkage," Department of Defense, \$195K for UMD subcontract, Feb. 2010 – Jan. 2011, Principal Investigator for UMD effort (with industrial partner) and Technical PI for the overall effort.
6. "Non-Intrusive Media Forensics Framework," Air Force Office of Scientific Research (AFOSR), \$300K, Dec. 2008 – Nov. 2011, Co-PI (with PI Ray Liu).
7. "REU Site: Biosystem Internship for Engineers (BIEN)", National Science Foundation, \$300K, 2008-2011, Co-PI (with PI Pamela Abshire).
8. "Novel Applications of Data Hiding in Computer Programs for Building High-Performance Trusted Computing Platforms," Air Force Office of Scientific Research (AFOSR), \$300K, Dec. 2006 – January 2010, Principal Investigator (with Co-PI Gang Qu).
9. "Multimedia Security and Forensics," Mitsubishi Electric Research Laboratory (MERL), Research Grant/Gift, \$10K, Feb. 2010, Principal Investigator.
10. "Modelling and Analysis of Multimedia Content Fingerprinting," Motion Picture Laboratory, Research Grant/Gift, \$35K, May 2009, Principal Investigator.
11. "Digital Fingerprinting for Multimedia Security and Forensics", Office of Naval Research, Young Investigator Program (ONR YIP), \$300K, June 2005 – May 2008, Principal Investigator.
12. "Signal Processing Approaches for Multimedia Security and Information Protection", National Science Foundation, Faculty Early Career Development Award (CAREER), \$356K, Feb. 2002 – Jan. 2008, Principal Investigator.
13. "Encrypted Domain Search and Processing," as part of the effort of the Joint Institute of Knowledge Discovery, Department of Defense, my share is \$88K in April 2005 – Dec. 2006, Investigator (with PI V.S. Subrahmanian and other colleagues at UMD).
14. "Data Hiding in Maps: A Modern Way to Protecting Geospatial Information," Air Force Research Laboratory, \$75K, June 2005 – June 2006, Principal Investigator (with Co-PI Ray Liu).
15. "A Collusion-Resistant Multimedia Fingerprinting Framework for Information Forensics", Air Force Research Laboratory, Digital Data Embedding Technology program, \$220K, June 2003 – Aug. 2004, Principal Investigator (with Co-PIs Ray Liu, Wade Trappe, and Jane Wang).
16. "Secure and Reliable Communications for Wireless Video," Minta Martin Foundation, \$55K, June 2002 – May 2003, Principal Investigator.

EDUCATION
GRANTS

17. Equipment gift from Sony Corporation for establishing "Sony Theater-Studio" at University of Maryland and supporting multimedia research and education, \$118K, 2004-2005 (with Ray Liu, Carol Espy-Wilson, Steve Marcus, and Nariman Farvardin).
18. Grant from Microsoft Corporation supporting multimedia curriculum development, \$72K, 2003, Principal Investigator (with Co-PI Ray Liu).

19. "REU Site: Undergraduate Research Internships in Telecommunications Engineering", National Science Foundation, \$1M, 2002-2007, Participating Investigator (with PIs Steve Marcus and Ray Liu at UMD).
20. "A Multidisciplinary Integrated Capstone Design Curriculum for Electrical and Computer Engineering", National Science Foundation, Departmental Curriculum Reform Planning Grant, \$100K, 2002-2003, Participating Investigator (with PIs Neil Goldsman and Jon Orloff at UMD).

RESEARCH
ADVISING

Overview: Graduated six Ph.D.'s and three M.S. students; advised 19 undergraduate students in research; currently supervising 5 Ph.D. students.

- Graduated Ph.D. students
 1. Yinian Mao ("Securing Multi-layer Communications: A Signal Processing Approach", 2006; Job at Qualcomm – Security Group);
 2. Guan-Ming Su ("Dynamic Resource Allocation for Multiuser Video Streaming," 2006; Job at Marvell Inc.).
 3. Hongmei Gou ("Digital Forensic Techniques for Graphic Data", 2007; Job at Texas Instrument);
 4. Shan He ("A Joint Coding and Embedding Framework for Multimedia Fingerprinting," 2007; Job at Thomson Corporate Research);
 5. Meng Chen ("Error Control and Concealment of Visual Communications," 2007 – part time study; Job at PCTEL Inc);
 6. Ashwin Swaminathan ("Multimedia Forensic Analysis via Intrinsic and Extrinsic Fingerprints," 2008; Job at Qualcomm Research).
 7. Avinash L. Varna ("Multimedia Protection Using Content and Embedded Fingerprints," 2011; Job at Intel DRM group).
- Current Ph.D. students
 8. Wenjun Lu (On forensic hash and secure media search; degree expected 2011).
 9. Wei-Hong Chuang (On multimedia fingerprinting; degree expected 2012).
 10. Ravi Garg (On cross-layer approaches to security and forensics; degree expected 2013).
 11. Hui Su (topic TBD).
- M.S. students

Laskshmi Srinivasan (2002); Eda Ormanci (2004); Kenneth Ho (2008, thesis);

Qualified for M.S. by advancing to Ph.D. candidacy: Yinian Mao (2005); Shan He (2005); Hongmei Gou (2006); Ashwin Swaminathan (2006), Avinash L. Varna (2008), Wenjun Lu (2010), and Wei-Hong Chuang (2011).

CURRICULUM
DEVELOPMENT

- Co-developed a new undergraduate capstone design course "ENEE408G Capstone Design on Multimedia Signal Processing" (with K.J. Ray Liu), Academic Year 2001-2002, Univ. of Maryland, College Park. ["An Interactive and Team Approach to Multimedia Design Curriculum," by M. Wu and K.J.R.

Liu, in DSP Education Column, IEEE Signal Processing Magazine, pp.14-19, Nov. 2005]

TEACHING
(AT UMD)

- Developed a new graduate special topic course “ENEE739M Multimedia Communication & Information Security: A Signal Processing Perspective” (Spring 2002), and an updated version “ENEE739B Multimedia Security and Forensics” (Fall 2005), Univ. of Maryland, College Park.
- Undergraduate courses: Engineering Probability (ENEE 324); Capstone Design on Multimedia Signal Processing (ENEE 408G).
- Graduate courses: Advanced Digital Signal Processing (ENEE 630/624); Digital Image and Video Processing (ENEE 631); Multimedia Communications (ENEE 739M); Multimedia Security and Forensics (ENEE 739B); Graduate Seminar on Communications and Signal Processing (ENEE 698A).

ELECTED
POSITIONS IN
PROFESSIONAL
SOCIETIES

- Vice President – Finance, IEEE Signal Processing Society (SPS), elected for 2010-2012. Also a voting member of SPS Executive Committee, Board of Governors, Publication Board, Conference Board, and Membership Board.
- Member (2008-2011), Secretary (2010) and Vice-Chair/Chair-Elect (2011), IEEE Information Forensics and Security Technical Committee (IFS TC), IEEE Signal Processing Society. Chaired award subcommittee leading to four successful award nominations in 2008.
- Member, IEEE Multimedia Signal Processing Technical Committee (MMSP TC), IEEE Signal Processing Society, elected for 2002-2005 and 2007-2010. Chaired conference subcommittee in 2008-2009.
- Member, IEEE Image and Multi-dimensional Signal Processing Technical Committee (IMDSP TC), IEEE Signal Processing Society, elected for 2007-2012.
- Member, IEEE Multimedia Systems and Applications Technical Committee, IEEE Circuits and Systems Society, elected in 2004.
- Founding Chair, IEEE Signal Processing Washington Chapter, elected for 2006-2011.

EDITORSHIP

- Area Editor – E-Newsletter, *IEEE Signal Processing Magazine* (2007 – 2010).
- Associate Editor, *IEEE Transaction on Image Processing* (2009 – present).
- Associate Editor, *IEEE Transaction on Information Forensics and Security* (2008 – 2011).
- Associate Editor, *IEEE Signal Processing Letters* (2005 – 2007).
- Editorial Board Member, *Journal of the Franklin Institute* (2007 – present).
- Editorial Board Member, *Foundations and Trends in Signal Processing* (2006 – present).

- Guest Editor, Special Issue on Digital Forensics, *IEEE Signal Processing Magazine*, published in March 2009.

- Guest Editor, Special Issue on Multimedia Security and Rights Management, *EURASIP Journal on Applied Signal Processing*, published in October 2004.

CONFERENCE
ORGANIZER

- Publicity Chair, 2003 IEEE International Conference on Multimedia & Expo (ICME'03, Baltimore).

- Finance Chair, 2007 IEEE International Conference on Acoustic, Speech, and Signal Processing (ICASSP'07, Hawaii).

- Special Session Co-Chair, 2010 IEEE International Workshop on Multimedia Signal Processing (MMSP 2010, Saint Malo, France).

- Technical Program Co-Chair, 2013 IEEE International Conference on Image Processing (ICIP 2013, Australia) – to be held.

- Organizer or Co-Organizer of Special Technical Sessions in conferences:

“Multimedia Security and Rights Management,” IEEE Inter. Conf. on Acoustic, Speech, and Signal Processing (ICASSP'03, Hong Kong).

“Multimedia Security Issues in Streaming and Mobile Applications,” IEEE Inter. Conf. on Image Processing (ICIP'04, Singapore).

“Multimedia Security and Forensics,” Conference on Information Sciences and Systems (CISS'06, Princeton).

- Served on the Technical Program Committee for conferences:

IEEE Int'l Conf. on Acoustic, Speech, & Signal Processing (ICASSP 2002-2011)

IEEE Int'l Conf. on Image Processing (ICIP 2004-2011)

IEEE Int'l Conf. on Multimedia & Expo (ICME 2002-2011)

IEEE Workshop on Multimedia Signal Processing (MMSP 2002-2011)

IEEE Workshop on Info. Forensics and Security (WIFS'09-'11)

IEEE Int'l Symposium on Circuits and Systems (ISCAS '04, '06-'07)

IEEE Globecom Conference (2006-07)

IEEE Int'l Conf. on Communications (ICC '03-'05)

IEEE Conf. on Info. Technology: Research & Education (ITRE'03)

SPIE Conf. on Security, Watermarking and Steganography (2005-2011)

Int'l Workshop on Digital Watermarking (IWDW '02-'07, '11)

ACM Workshop on Multimedia Security (2006-2011)

ACM Workshop on Digital Rights Management (2009)

ACM Multimedia Conference (2002, 2011)

REVIEWER

- NSF Panelist and Reviewer for Computer and Info. Science and Engineering Directorate: Signal Processing Systems; Western Europe; Cyber Trust; and Formal and Mathematical Foundations for Computing and Communications; Research Competitiveness Program (jointly with AAAS).

- Proposal Reviewer for funding agencies of U.S. government, Europe, and Asia.
- Reviewer for IEEE Transactions on
 - (1) Multimedia; (2) Image Processing; (3) Signal Processing; (4) Signal Processing Letters; (5) Circuits & Systems for Video Technologies; (6) Communications; (7) Communication Letters; (8) Secure and Dependable Computing; (9) Neural Network; (10) System, Man, and Cybernetics; (11) Knowledge and Data Engineering; (12) Speech and Audio Processing; (13) Signal Processing Magazine; (14) Information Forensics and Security; (15) Pattern Analysis and Machine Intelligence.
- Reviewer for International Journals
 - (1) IEE Journals on Vision, Image, and Signal Processing; (2) SPIE Journals of Optical Engineering; (3) Journal of VLSI Signal Processing; (4) Journal on Real-Time Imaging; (5) EURASIP Journal on Applied Signal Processing; (6) Journal of Visual Communication and Image Representation; (7) Journal of New Music Research; (8) IEE Journal on Information Security.

UNIVERSITY
SERVICE

- 2007-present Faculty advisor, Women in ECE (WECE) program, UMD.
- 2010-present ECE Graduate Studies and Research Committee, UMD.
- 2010-present ECE Representative, Engineering College Research Committee, UMD.
- 2008-2010 Engineering College Council, UMD.
- 2009-2010 ECE Departmental Review Committee, UMD.
- 2004-2008 Faculty mentor for the new undergraduate “Inventis” honor program, College of Engineering, UMD.
- 2007-2008 University Advisory Committee on International Affairs and Activities with China, UMD.
- 2005-2007 ECE Department Council, UMD.
- 2005-2007 ECE Salary Committee, UMD.
- 2005-2006 ECE Faculty Search Committee, UMD.
- 2003-2007 ECE Graduate Studies and Research Committee, UMD.
- 2003-2005 ECE Undergraduate Affair Committee, UMD.
- 2003-2007 ECE Human Relations and Welfare Committee, UMD.
- 2002-2003 Area representative assisting graduate admission, UMD ECE Department.
- 2001-present Lab tours on “Multimedia in a Nutshell” introducing state-of-the-art multimedia research and education at UMD to visitors, perspective students, and general public.
- Search Committee for various ECE staff positions, UMD.

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