

# GAURAV SHARMA

ECE Dept, Hopeman 204  
RCBox 270126, Univ. of Rochester  
Rochester, NY 14627-0126

**Phone:** (585)-275-7313 (Office)  
**email:** [gaurav.sharma@rochester.edu](mailto:gaurav.sharma@rochester.edu)  
**Web:** <http://www.ece.rochester.edu/~gsharma>

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## RESEARCH INTERESTS

- Computer Vision, Image Processing, and Color Imaging
- Multimedia Security, Data Hiding, and Authentication
- Signal Processing for Communications and Bioinformatics

## EDUCATION

- 08/92 – 08/96     **Ph.D. (Electrical & Computer Engr., Minor: Mathematics)**  
*North Carolina State University, Raleigh, NC.*     **GPA = 4.0/4.0**  
**Dissertation :** "Signal processing for evaluation and design of color recording devices"  
**Adviser :** Prof. H. Joel Trussell
- 08/92 – 06/95     **M.S. (Applied Math.)**  
*North Carolina State University, Raleigh, NC.*     **GPA = 4.0/4.0**
- 08/90 – 01/92     **Master of Engineering (Electrical Communication Engr.)**  
*Indian Institute of Science(IISc), Bangalore, India.*     **GPA = 7.7/8.0**
- 08/86 – 06/90     **Bachelor of Engineering (Electronics & Communication Engr.)**  
*Indian Institute of Technology (formerly Univ. of R.), Roorkee, India.*     **First div. with honors**

## EXPERIENCE

- 08/03 –     **University of Rochester, Rochester, NY**  
*Distinguished Researcher, Center of Excellence in Data Science (CoE), 07/17 –*  
*Professor, Electrical and Computer Engineering Dept., 07/14 –*  
*Professor, Dept. of Computer Science, 08/14 –*  
*Professor, Dept. of Biostatistics and Computational Biology, 07/14 –*  
*Associate Professor, Electrical and Computer Engineering Dept., 08/03 – 06/14*  
*Associate Professor, Dept. of Biostatistics and Computational Biology, 10/08 – 06/14*  
*Associate Professor, Dept. of Oncology, 07/10 – 06/14*  
Research in multimedia security, bioinformatics/genomic signal processing, color imaging/image processing, and digital halftoning. Graduate and undergraduate teaching in signal/image processing, communications, digital color imaging, and information theory.
- Director, Center for Emerging and Innovative Sciences (CEIS), 07/09 – 10/2010*  
*Director, Center for Electronic Imaging Systems (CEIS), 07/08 – 07/09*  
Executive leadership of CEIS – a NYSTAR (New York State Foundation for Science, Technology and Innovation) funded center for advanced technology located at the University of Rochester. The Center charter is to promote economic growth in the state through transfer of university research to industry. Responsible for strategy, development plans, and operations of the center.  
*Associate Director, Center for Electronic Imaging Systems (CEIS), 09/07 – 06/08*  
Led all technical activities at CEIS. Responsible for coordinating proposal evaluations, annual showcase, and technical highlights in reports and presentations.

06/93 – 08/03

**Xerox Research and Technology**, Webster, NY*Principal Scientist, 03/03 - 08/03**Member of Research Staff, 08/96 - 03/03**Research Intern, 06/93-08/93, 06/94-08/94, 07/95-08/95*

*Individual Contributor* responsible for research in digital imaging and image processing for next generation printers, multi-function devices and emerging document solutions and services. Technical areas: color imaging, scanning, hardcopy and electronic image watermarking, multimedia security, halftoning, display color characterization, and networked color solutions. In addition to direct contributions to Xerox products, the research engendered one *edited book*, over *35 patents*, and over *40 journal and conference publications*.

*Project Leader, Color Imaging R& D, 01/02 - 08/03*

Lead and managed a six-member research team that shared the two-fold responsibilities of: a) developing and delivering color management technology to Xerox business groups and b) research and development in future color imaging algorithms and document solutions and services. Responsible for setting project targets and research objectives in collaboration with business groups and upper management and for project administration and coordination in order to accomplish these targets. Also responsible for personnel matters relating to performance evaluation and salary planning. Provided technical leadership to the Xerox color community via an internal color forum and conducted evaluations of internal and external intellectual property in color imaging.

03/2000 – 05/2003

**Adjunct Faculty, EE/CE Depts., Rochester Institute of Technology**, Rochester, NY

Developed and taught graduate/senior undergraduate courses on communication networks, speech and image compression, and data and computer communications.

08/92 – 08/96

**Research & Teaching Assistant, ECE Dept., North Carolina State Univ.**, Raleigh, NC

Conducted research in color signal processing and image restoration. Assisted in teaching of graduate courses in digital signal and image processing.

02/92 – 06/92

**R & D Engr., Switching Div., Center for Development of Telematics**, Bangalore

Worked with others in the team on finalizing the specifications and architecture for a 100,000 line ISDN exchange.

06/89 – 08/89

**Summer Intern, Space Applications Center**, Ahmedabad, India.

Implemented a DSP-based digital voice echo canceler for telephony applications.

**HONORS AND AWARDS**

- Awarded Senior Membership by the Society for Imaging Science and Technology (IS&T), June 2016
- Recognition award from SPIE and IS&T for five years of service as Editor for Journal of Electronic Imaging, 15 Feb. 2016.
- Fellow of the IEEE.
- Fellow of the SPIE.
- Fellow of the Society for Imaging Science and Technology (IS&T).
- Best paper award, Visual Communications and Image Processing, 2009 (with Chao Yu).
- Co-author on paper receiving student paper award at ICASSP 2006.
- IEEE Region I Technical Innovation Award for "Contributions to the Theory and Practice of Color Imaging and Imaging Systems," 2008.
- Elected to Sigma Xi, the scientific research society.
- Elected to Phi Kappa Phi and Pi Mu Epsilon national honor societies.

- Received M.N.S. Swamy and S.V.C. Aiya medals awarded to the best student in the graduating master's class in ECE at Indian Institute of Science, Bangalore, India (out of 45 students).
- Xerox Inventor Recognition "Star" Award (25 patents), May 2007.
- Xerox Emerging Leaders Program, 2003.
- Achievement Award, Xerox Innovation Group, for significant contributions in technical leadership.
- Inventor's Awards, Xerox Corporation, 1997,2000-2002.
- Received the Xerox Technical Minority Scholarship in 1993.
- Listed in Marqui's Who's Who in the World
- Listed in Marqui's Who's Who in Science and Engineering
- Listed in Marqui's Who's Who of Emerging Leaders
- Listed in Marqui's Who's Who Among American Teachers & Educators, 2008.
- Recipient of Cactus prize awarded for best interactive paper at IS&T/SID's Color Imaging Conference in 2003.
- Recipient of Cactus prize awarded for best interactive paper at IS&T/SID's Color Imaging Conference in 2002.
- Recognized as an ICME 2011 Quality Reviewer.

## VISITING POSITIONS HELD

- Invited Faculty, Summer Research Institute (SURI), École Polytechnique fédérale de Lausanne (EPFL), Switzerland, 10 – 21 Jun. 2013.
- Color in Informatics and Media Technology (CIMET) Visiting Scholar at the Norwegian Color Science Laboratory, Gjøvik University College, Gjøvik, Norway, 9 October – 19 October 2012 (program funded by the European Commission, Erasmus Mundus).
- Visiting Researcher, Hewlett-Packard Laboratories, Palo-Alto, CA, Jan. – Jun. 2012.
- Visiting Scientist, Sharp Laboratories of America, Camas, WA, July 2011.

## PEER-REVIEWED JOURNAL PUBLICATIONS

1. M. Habibzadeh, M. Hassanaliyagh, A. Ishikawa, T. Soyata, and G. Sharma, "Hybrid Solar-Wind Energy Harvesting for Embedded Applications: Supercapacitor-based System Architectures and Design Tradeoffs," *IEEE Circuits and Systems Magazine*, 2018, accepted for Publication.
2. H. Xie, C. E. Rodríguez-Pardo, and G. Sharma, "Multi-objective optimization for color display primary designs," *J. Electronic Imaging*, 2017, accepted for publication, to appear.
3. J. Adams, K. Dinesh, M. Xiong, C. Tarolli, S. Sharma, N. Sheth, A. J. Aranyosi, W. Zhu, S. Goldenthal, K. Biglan, E. R. Dorsey, and G. Sharma, "Multiple wearable sensors in Parkinson and Huntington disease individuals: A pilot study in clinic and at home," *Digital Biomarkers*, vol. 1, pp. 52–63, 2017.
4. Z. Tan, G. Sharma, and D. H. Mathews, "Modeling RNA secondary structure with sequence comparison and experimental mapping data," *Biophysical J.*, vol. 113, no. 2, pp. 330–338, 2017.
5. D. Piekna-Przybylska, G. Sharma, S. B. Maggirwar, and R. A. Bambara, "Deficiency in DNA damage response, a new characteristic of cells infected with latent HIV-1," *Cell Cycle*, vol. 16, no. 10, pp. 968–978, 2017, pMID: 28388353.
6. A. Nadeau and G. Sharma, "An audio watermark designed for efficient and robust resynchronization after analog playback," *IEEE Trans. Info. Forensics and Security*, vol. 12, no. 6, pp. 1393–1405, Jun. 2017.
7. A. Elliethy and G. Sharma, "Accelerated parametric chamfer alignment using a parallel, pipelined GPU realization," *J. Real-Time Image Proc.*, vol. 13, 2017.

8. A. Elliethy and G. Sharma, "Automatic registration of vector road maps with wide area motion imagery by exploiting vehicle detections," *IEEE Trans. Image Proc.*, vol. 25, no. 11, pp. 5304 – 5315, Nov. 2016.
9. M. Hassanalieragh, T. Soyata, A. Nadeau, and G. Sharma, "UR-SolarCap: An open source intelligent auto-wakeup solar energy harvesting system for supercapacitor based energy buffering," *IEEE Access*, vol. 4, 2016. DOI:10.1109/ACCESS.2016.2519845.
10. J. A. Rebhahn, D. R. Roumanes, Y. Qi, A. Khan, J. Thakar, A. Rosenberg, F. E.-H. Lee, S. A. Quataert, G. Sharma, and T. R. Mosmann, "Competitive SWIFT cluster templates enhance detection of aging changes," *Cytometry, Part A*, vol. 89, no. 1, pp. 59–70, 2016. DOI: 10.1002/cyto.a.22740.
11. A. Nadeau, M. Hassanalieragh, G. Sharma, and T. Soyata, "Energy awareness for supercapacitors using Kalman filter state-of-charge tracking," *J. Power Sources*, vol. 296, pp. 383 – 391, Nov. 2015.
12. Y. Fu, G. Sharma, and D. H. Mathews, "Dyalign II: Common secondary structure prediction for RNA homologs with domain insertions," *Nucleic Acids Res.*, vol. 42, no. 22, pp. 13939–13948, 2014, DOI: 10.1093/nar/gku1172.
13. J. A. Rebhahn, N. Deng, G. Sharma, A. M. Livingstone, S. Huang, and T. R. Mosmann, "An animated landscape representation of CD4<sup>+</sup> T-cell differentiation, variability and plasticity: Insights into the behavior of populations versus cells," *European Journal of Immunology*, vol. 44, no. 8, pp. 2216–2229, Aug. 2014.
14. H. Aly and G. Sharma, "A regularized model-based optimization framework for pan-sharpening," *IEEE Trans. Image Proc.*, vol. 23, no. 6, pp. 2596–2608, Jun. 2014.
15. D. Piekna-Przybylska, M. Sullivan, G. Sharma, and R. A. Bambara, "The U3 region in the HIV-1 genome adopts G-quadruplex structure in its RNA and DNA sequence," *Biochemistry*, vol. 53, no. 16, pp. 2581–2593, 2014.
16. "SWIFT - scalable clustering for automated identification of rare cell populations in large, high-dimensional flow cytometry datasets: Part 1 - Algorithm design," I. Naim, S. Datta, J. Rebhahn, J. S. Cavanaugh, T. R. Mosmann, and G. Sharma, *Cytometry, Part A*, vol. 85, no. 5, pp. 408–421, May 2014.
17. "SWIFT - scalable clustering for automated identification of rare cell populations in large, high-dimensional flow cytometry datasets: Part 2 - Biological evaluation," T. R. Mosmann, I. Naim, J. Rebhahn, S. Datta, J. S. Cavanaugh, J. M. Weaver, and G. Sharma, *Cytometry, Part A*, vol. 85, no. 5, pp. 422–433, May 2014.
18. "Improved low-density parity check accumulate (LDPCA) codes," C. Yu and G. Sharma, *IEEE Trans. Comm.*, vol. 61, no. 9, pp. 3590–3599, Sept. 2013.
19. D. Piekna-Przybylska, G. Sharma, and R. A. Bambara, "Mechanism of HIV-1 RNA dimerization in the central region of the genome, and significance for viral evolution," *Jnl. Biol. Chemistry*, vol. 288, no. 33, pp. 24140 – 24150, Aug. 2013.
20. "Content authentication for printed images utilizing high capacity data hiding," O. Bulan and G. Sharma, *J. Electronic Imaging*, vol. 22, no. 3, pp. 033,006–1–13, Jul.-Sept. 2013.
21. "Color barcodes for mobile applications: A per channel framework," H. Blasinski, O. Bulan, and G. Sharma, *IEEE Trans. Image Proc.*, vol. 22, no. 4, pp. 1498–1511, Apr. 2013.
22. "Critical assessment of automated flow cytometry data analysis techniques," N. Aghaeepour *et al.*, *Nature methods*, vol. 10, no. 3, pp. 228–238, Mar. 2013.
23. "Capacity Analysis For Orthogonal Halftone Orientation Modulation Channels," O. Bulan, V. Monga, G. Sharma, *IEEE Trans. Image Proc.*, vol. 21, no. 1, pp. 405–411, Jan. 2012.
24. "TurboFold: Iterative probabilistic decoding of RNA secondary structure," A. O. Harmanci, G. Sharma, and D. H. Mathews, *BMC Bioinformatics*, 2011, 12:108, early access available online, April 20, 2011.
25. "High capacity color barcodes: Per channel data encoding via orientation modulation in elliptical dot arrays," O. Bulan and G. Sharma, *IEEE Trans. Image Proc.*, vol. 20, no. 5, May 2011, pp. 13371350.
26. "Distributed estimation and coding: A sequential framework based on a side-informed decomposition," C. Yu and G. Sharma, *IEEE Trans. Signal Proc.*, vol. 59, no. 2, pp. 759–773, Feb. 2011.
27. "Per-separation Clustered-Dot Color Halftone Watermarks: Separation Estimation Based on Spatial Frequency Content," B. Oztan and G. Sharma, *J. Electronic Imaging*, vol. 19, no. 4, pp. 043007–1–22, Oct.-Dec. 2010.
28. "Adaptive sensing and optimal power allocation for wireless video sensors with sigma-delta imager," M. Marijan, I. Demirkol, D. Maričić, G. Sharma, and Ž. Ignjatović, *IEEE Trans. Image Proc.*, vol. 19, no. 10, Oct. 2010, pp. 2540–2550.
29. "Camera scheduling and energy allocation for lifetime maximization in user-centric visual sensor networks," C. Yu and G. Sharma, *IEEE Trans. Image Proc.*, vol. 19, no. 8, Aug. 2010, pp. 2042–2055.

30. "Orientation modulation for data hiding in clustered-dot halftone prints," O. Bulan, G. Sharma, and V. Monga, *IEEE Trans. Image Proc.*, vol. 19, no. 8, Aug. 2010, pp. 2042–2055.
31. "Efficient classification of scanned media using spatial statistics," G. B. Unal, G. Sharma, and R. Eschbach, *International Journal of Pattern Recognition and Artificial Intelligence*, vol. 24, no. 6, 2010, pp. 917–946.
32. "Continuous phase-modulated halftones," B. Oztan and G. Sharma, *IEEE Trans. Image Proc.*, vol. 18, no. 12, Dec. 2009, pp. 2718–2734.
33. "Stochastic sampling of the RNA structural alignment space," A. O. Harmanci, G. Sharma, and D. H. Mathews, *Nucleic Acids Research*, vol. 37, no. 12, July 2009, pp. 4063–4075.
34. "Optimal spread spectrum watermark embedding via a multistep feasibility formulation," H. O. Altun, A. Orsdemir, G. Sharma, and M. F. Bocko, *IEEE Trans. Image Proc.*, vol. 18, no. 2, Feb. 2009, pp. 371–387.
35. "Preprocessing methods for improved lossless compression of color look-up tables," S. R. A. Balaji, G. Sharma, M. Q. Shaw, R. Guay, *Journal of Imaging Science and Technology*, vol. 52, no. 4, pp. 040901-1–9, Jul./Aug. 2008.
36. "Insertion, deletion codes with feature-based embedding: A new paradigm for watermark synchronization with applications to speech watermarking," D. J. Coumou, G. Sharma, *IEEE Trans. Info. Forensics and Security*, vol. 3, no. 2, Jun 2008, pp. 153–165.
37. "PARTS: Probabilistic Alignment for RNA joint Secondary structure prediction," A. O. Harmanci, G. Sharma, and D. H. Mathews, *Nucleic Acids Research*, vol. 36, no. 7, Apr. 2008, pp. 2406–2417.
38. "Misregistration sensitivity in clustered-dot color halftones," B. Oztan, G. Sharma, and R. P. Loce, *J. Electronic Imaging*, vol. 17, no. 2, Apr./Jun. 2008, pp. 023004,1–30.
39. "Efficient pairwise RNA structure prediction using probabilistic alignment constraints in Dynalign," A. O. Harmanci, G. Sharma, D. H. Mathews, *BMC Bioinformatics*, 8:130, April 2007.
40. "Scanner characterization for color measurement and diagnostics," B. S. Lee, R. Bala, G. Sharma, *J. Electronic Imaging*, vol. 16, no. 4, pp. 043009–1–13, Oct./Dec. 2007.
41. "A set theoretic framework for watermarking and its application to semifragile tamper detection," H. O. Altun, G. Sharma, M. Celik, M. Bocko, *IEEE Trans. Info. Forensics and Security*, vol. 1, no. 4, Dec. 2006, pp. 479–492.
42. "Local image registration by adaptive filtering," G. Caner, A. M. Tekalp, G. Sharma, and W. Heinzelman, *IEEE Trans. Image Proc.*, vol. 15, no. 10, Oct. 2006, pp. 3053–3065.
43. "Lossless watermarking for image authentication: A new framework and an implementation," M. U. Celik, G. Sharma, and A. M. Tekalp, *IEEE Trans. Image Proc.*, vol. 15, no. 4, April 2006, pp. 1042–1049.
44. "Two-dimensional transforms for device color correction and calibration," R. Bala, G. Sharma, V. Monga, J. P. VandeCapelle, *IEEE Trans. Image Processing*, vol. 14, no. 8, pp. 1172–1186, Aug. 2005.
45. "System optimization in digital color imaging," R. Bala, G. Sharma, *IEEE Signal Processing Magazine, special issue on Color Imaging*, vol. 22, no. 1, pp. 55–63, Jan 2005.
46. "The CIEDE2000 color-difference formula: Implementation notes, supplementary test data, and mathematical observations," G. Sharma, W. Wu, E. N. Dalal, *Color Research and Application* vol. 30, no. 1, pp. 21–30, Feb. 2005.
47. "Lossless generalized-LSB data embedding," M. U. Celik, G. Sharma, E. Saber, and A. M. Tekalp, *IEEE Trans. on Image Proc.*, vol. 14, no. 2, pp. 253–266, Feb. 2005.
48. "Collusion-resilient fingerprinting using random pre-warping," M. U. Celik, G. Sharma and A. M. Tekalp, *IEEE Signal Processing Letters*, vol. 11, no. 10, pp. 831–835, Oct. 2004.
49. "Gray-level-embedded lossless image compression," M. U. Celik, G. Sharma, and A. M. Tekalp, *Image Communication*, vol. 18, July 2003, pp. 443–454.
50. "Color printer characterization adjustment for different substrates," M. Shaw, G. Sharma, R. Bala, and E. N. Dalal, *Color Research and Application*, vol. 28, no. 6, Dec. 2003, pp. 454–467.
51. "Hierarchical watermarking for secure image authentication with localization," M. U. Celik, G. Sharma, E. Saber, and A. M. Tekalp, *IEEE Trans. on Image Proc.*, vol. 11, no. 6, June 2002, pp. 585–595.
52. "LCDs versus CRTs – Color-calibration and gamut considerations," G. Sharma, *Proceedings IEEE*, special issue on Flat Panel Display Technologies, vol. 90, no. 4, Apr. 2002, pp. 605–622.
53. "Show-through cancellation in scans of duplex printed documents," G. Sharma, *IEEE Trans. on Image Proc.*, vol. 10, No. 5, May 2001, pp. 736–754.

54. "Set theoretic estimation for problems in subtractive color," G. Sharma, *Color Research and Application*, vol. 25, no. 4, October 2000, pp. 333-348.
55. "Target-less scanner color calibration," G. Sharma, *Journal of Imaging Science and Technology*, vol. 44, no. 4, pp. 301-307, Jul./Aug. 2000.
56. "End-to-end color printer calibration by total least squares regression," M. Xia, E. Saber, G. Sharma, and A. M. Tekalp, *IEEE Trans. on Image Proc.*, vol. 8, no. 5, May 1999, pp. 700-716.
57. "Performance evaluation of burst error correcting codes on a Gilbert-Elliott channel," G. Sharma, A. A. Hassan, and A. Dholakia, *IEEE Trans. on Communications*, vol. 46, no. 7, July 1998, pp. 846-849.
58. "Color imaging for multimedia," G. Sharma, M. J. Vrhel, and H. J. Trussell, *Proceedings IEEE*, vol. 86, no. 6, Jun. 1998, pp. 1088-1108.
59. "Optimal non-negative color scanning filters," G. Sharma, H. J. Trussell, and M. J. Vrhel, *IEEE Trans. on Image Proc.*, vol. 7, no. 1, pp. 129-133, Jan 1998.
60. "Set theoretic signal restoration using an error in variables criterion," G. Sharma and H. J. Trussell, *IEEE Trans. on Image Proc.*, vol. 6, no. 12, Dec 1997, pp. 1692-1697.
61. "Digital color imaging," G. Sharma and H. J. Trussell, *IEEE Trans. on Image Proc.*, vol. 6, no. 7, Jul. 1997, pp. 901-932.
62. "Figures of merit for color scanners," G. Sharma and H. J. Trussell, *IEEE Trans. on Image Proc.*, vol. 6, no. 7, Jul. 1997, pp. 990-1001.
63. "Set theoretic estimation in color scanner characterization," G. Sharma and H. J. Trussell, *Jnl. Electronic Imaging*, vol. 5, no. 4, Oct. 1996, pp. 479-489.
64. "A DFT based alternating projection algorithm for parameter estimation of superimposed complex sinusoids," Gaurav Sharma and V.U. Reddy, *Signal Processing*, vol. 37, no. 1, May 1994, pp. 73-85.

## CONFERENCE PAPERS

1. L. Ding, A. Kuriyan, R. Ramchandran, and G. Sharma, "Multi-scale morphological analysis for retinal vessel detection in wide-field fluorescein angiography," 2017, accepted, to appear.
2. B. Li, K. Dinesh, G. Sharma, and Z. Duan, "Video-based vibrato detection and analysis for polyphonic string music," in *Proc. International Society for Music Information Retrieval Conference (ISMIR)*, 2017.
3. L. Ding, A. Elliethy, and G. Sharma, "3D georegistration of wide area motion imagery by combining SfM and chamfer alignment of vehicle detections to vector roadmaps," in *Proc. IEEE Intl. Conf. Image Proc.*, Sep. 2017, China National Convention Center, Beijing, China.
4. Y. Zhang, L. Ding, and G. Sharma, "Hazerd: an outdoor scene dataset and benchmark for single image dehazing," in *Proc. IEEE Intl. Conf. Image Proc.*, Sep. 2017, China National Convention Center, Beijing, China.
5. M. Habibzadeh, M. Hassanalieragh, T. Soyata, and G. Sharma, "Solar/wind hybrid energy harvesting for supercapacitor-based embedded systems," in *Proc. Midwest Symposium on Circuits and Systems (MWSCAS)*, Aug. 2017.
6. M. Habibzadeh, M. Hassanalieragh, T. Soyata, and G. Sharma, "Supercapacitor-based embedded hybrid solar/wind harvesting system architectures," in *IEEE Intl. System-on-Chip Conf. (SOCC)*, Sept. 2017.
7. A. Nadeau, K. D. Dinesh, G. Sharma, and M. Xiong, "In-situ calibration of accelerometers in body-worn sensors using quiescent gravity," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, March 5-9, 2017, New Orleans, pp. 2192-2196.
8. A. Elliethy and G. Sharma, "Vehicle tracking in wide area motion imagery : A facility location motivated combinatorial approach," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, March 5-9, 2017, New Orleans, accepted, 1932-1936.
9. L. Ding and G. Sharma, "Fusing structure from motion and lidar for dense accurate depth map estimation," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, March 5-9, 2017, New Orleans, pp. 1283-1287.
10. B. Li, K. Dinesh, Z. Duan, and G. Sharma, "See and listen: Score-informed association of sound tracks to players in chamber music performance videos," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, March 5-9, 2017, New Orleans, pp. 2906-2910.

11. K. Dinesh, B. Li, X. Liu, Z. Duan, and G. Sharma, "Enhancing multi-pitch estimation of chamber music performances via video-based activity detection," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, March 5-9, 2017, New Orleans, accepted, to be presented.
12. H. Xie, C. E. Rodríguez-Pardo, and G. Sharma, "Pareto optimal primary designs for color displays," in *IS&T Electronic Imaging: Color Imaging XXII: Displaying, Processing, Hardcopy, and Applications*, vol. 2017, San Francisco, California, 29 Jan.- 2 Feb. 2017, accepted, to be presented.
13. Y. Zhang, L. Ding, and G. Sharma, "A local-linear-fitting-based matting approach for accurate depth upsampling," in *Proc. IEEE Western NY Image and Signal Proc. Workshop (WNYISPW)*, Rochester, NY, Nov. 2016 (**Best Paper Award**).
14. K. Dinesh, M. Xiong, J. Adams, R. Dorsey, and G. Sharma, "Signal analysis for detecting motor symptoms in parkinson's and huntington's disease using multiple body-affixed sensors: A pilot study," in *Proc. IEEE Western NY Image and Signal Proc. Workshop (WNYISPW)*, Rochester, NY, Nov. 2016.
15. L. Ding, A. Elliethy, E. Freedenberg, S. A. Wolf-Johnson, J. Romphf, P. Christensen, and G. Sharma, "Comparative analysis of homologous buildings using range imaging," in *Proc. IEEE Intl. Conf. Image Proc.*, Sep. 2016, pp. 4378–4382.
16. A. S. Elliethy and G. Sharma, "Image anonymization for PRNU forensics : A set theoretic framework addressing compression resilience," in *Proc. IEEE Intl. Conf. Image Proc.*, Sep. 2016, pp. 3907–3911.
17. K. Dinesh and G. Sharma, "Per-channel color barcodes for displays," in *Proc. IEEE Intl. Conf. Image Proc.*, Sep. 2016, pp. 3992–3996.
18. A. Elliethy and G. Sharma, "A joint approach to vector road map registration and vehicle tracking for wide area motion imagery," in *Proc. IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, Shanghai, China, Mar. 2016, pp. 1100–1104.
19. C. Rodríguez-Pardo and G. Sharma, "Multiprimary display color calibration: A variational framework for robustness to device variation," in *IS&T Electronic Imaging: Color Imaging XXI: Displaying, Processing, Hardcopy, and Applications*, vol. 2016, no. 20, San Francisco, California, Feb. 2016, pp. COLOR–304.1–7.
20. A. Elliethy and G. Sharma, "Vector road map registration to oblique wide area motion imagery by exploiting vehicles movements," in *Proc. Video Surveillance and Transportation Imaging Applications*, San Francisco, California, Feb. 2016, pp. VSTIA–520.1–8.
21. G. Sharma, "Image-based data interfaces revisited: Barcodes and watermarks for the mobile and digital worlds (Invited Paper)," in *8th Intl. Conf. on Comm. Sys. and Networks (COMSNETS)*, Bangalore, India, Jan. 2016, pp. 1–6.
22. A. S. Elliethy and G. Sharma, "Improved specular regions localization and optical-flow based motion estimation via joint processing," in *Proc. IEEE Intl. Conf. Image Proc.*, Québec City, Canada, September 2015, pp. 232–236.
23. M. Hassanliragh, A. Page, T. Soyata, G. Sharma, M. Aktas, G. Mateos, B. Kantarci, and S. Andreescu, "Health monitoring and management using internet-of-things (IoT) sensing with cloud-based processing: Opportunities and challenges," in *Proc. of the 12th IEEE International Conference on Services Computing (SCC 2015)*, New York, NY, USA, Jun. 2015, pp. 285–292.
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132. "Measures of goodness for color scanners," G. Sharma and H. J. Trussell, in *Proc. IS&T/SID Fourth Color Imaging Conference: Color Science, Systems, and Applications*, Scottsdale, AZ, 19-22 Nov. 1996, pp. 28-32.
133. "Optimal filter design for multi-illuminant color correction," G. Sharma and H. J. Trussell, *Proc. IS&T/OSA Optics and Imaging in the Information Age*, 20-24 Oct. 1996, Rochester, NY, pp. 83-86.

134. "Restoration of uncertain blurs using an error in variables criterion," G. Sharma and H. J. Trussell, *Proceedings IEEE International Conference on Image Processing*, 16-19 Sept. 1996, Lausanne, Switzerland, pp. III-81-84.
135. "Simulation of error trapping decoders on a fading channel," G. Sharma, A. Dholakia and A.A. Hassan, in *Proc. IEEE Vehicular Technology Conference*, 28 Apr.–1 May 1996, Atlanta, GA, vol. 2, pp. 1361–1365.
136. "Comparison of measures of goodness of color scanning filters," H.J. Trussell, G. Sharma, P. Chen and S.A. Rajala, *Proc. Ninth IEEE Workshop on Image and Multi-dimensional signal processing*, March 3-6, 1996, Belize, pp. 98-99.
137. "Color scanner performance trade-offs," G. Sharma and H.J. Trussell, in *Proc. SPIE: Color imaging : device-independent color, color hard copy, and graphic arts*, 29 Jan-1 Feb. 1996, San Jose, CA, vol. 2658, pp. 270–278.
138. "Automatic calibration of halftones," K. Knox, C. Hains and G. Sharma, *Proc. SPIE: Human Vision and Electronic Imaging*, 29 Jan-1 Feb. 1996, San Jose, CA, vol. 2657, pp. 432-436.
139. "Decomposition of fluorescent illuminant spectra for accurate colorimetry," G. Sharma and H.J. Trussell, *Proceedings IEEE International Conference on Image Processing*, 13-16 Nov. 1994, Austin, TX, vol. II, pp. 1002-1006.
140. "Signal processing methods in color calibration," H.J. Trussell and G. Sharma, *Proc. SPIE: Device Independent Color Imaging*, 6-10 Feb. 1994, San Jose, CA, vol. 2170, pp. 18-23.
141. "Application of set theoretic methods to the calibration of colorimetry instrumentation," G. Sharma and H.J. Trussell, Contributed Lecture, *Cornelius Lanczos International Centenary Conference*, 12-17 Dec. 1993, Raleigh, NC.
142. "Characterization of scanner sensitivity," G. Sharma and H.J. Trussell, *Proc. of the IS&T/SID Color Imaging Conference: Transforms and Portability of Color*, 7-11 Nov. 1993, Scottsdale, AZ, pp. 103-107.

#### EDITED BOOK

- "Digital Color Imaging Handbook," G. Sharma, Ed., CRC Press, 2003, ISBN: 084930900X.

#### CONTRIBUTED BOOK CHAPTERS

- "Color fundamentals for digital imaging, G. Sharma, in *Digital Color Imaging Handbook*, G. Sharma, Ed., CRC Press, 2003.
- G. Honan, N. Gekakis, M. Hassanalieragh, A. Nadeau, G. Sharma, and T. Soyata, "Energy harvesting and buffering for cyber physical systems: A review," in *Cyber-Physical Systems: A Computational Perspective*, G. M. Siddesh, G. C. Deka, K. G. Srinivasa, and L. M. Patnaik, Eds. Boca Raton, FL: CRC Press, Taylor & Francis Group, 2016, ch. 7, pp. 191–218.
- N. Gekakis, A. Nadeau, M. Hassanalieragh, Y. Chen, Z. Liu, G. Honan, F. Erdem, G. Sharma, and T. Soyata, "Modeling of supercapacitors as an energy buffer for cyber-physical systems," in *Cyber-Physical Systems: A Computational Perspective*, G. M. Siddesh, G. C. Deka, K. G. Srinivasa, and L. M. Patnaik, Eds. Boca Raton, FL: CRC Press, Taylor & Francis Group, 2016, ch. 6, pp. 171–190.

#### MAGAZINE COLUMNS AND NEWSLETTER ARTICLES

1. "Select trends in image, video, and multidimensional signal processing," G. Sharma, L. Karam, and P. Wolfe, *IEEE Sig. Proc. Mag.*, vol. 29, no. 1, pp. 174–176, Jan. 2012.
2. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *Electronic Imaging*, Newsletter of the SPIE Electronic Imaging Technical Group, vol 15, no. 2, pp. 1, June 2005.

## BOOK REVIEWS

- “Hidden Markov Processes: Theory and Applications to Biology by M. Vidyasagar,” reviewed by G. Sharma, *SIAM Review*, vol. 15, no. 1, 2017, pp. 9–12.
- “Introduction to Digital Color Imaging by Hsien-Che Lee,” reviewed by G. Sharma, *IEEE Sig. Proc. Mag.*, vol. 23, no. 5, Sept. 2006, pp. 119–120.
- “Introduction to Digital Color Imaging by Hsien-Che Lee,” reviewed by G. Sharma, *J. Electronic Imaging*, vol. 15, No. 2, August 2006, pp. 029901,1–2.
- “Visual Color and Color Mixture by Jozef B. Cohen,” reviewed by G. Sharma, *Color Research and Application*, vol. 28, no. 1, Feb. 2003, pp 76.

## KEYNOTE/HIGHLIGHT TALKS

1. “Probabilistic Decoding in Communications and Bioinformatics: A Turbo Approach,” G. Sharma, , Keynote at Global Initiative of Academic Networks (GIAN) Workshop and IEEE Signal Processing Society Distinguished Lecturer Talk, 11 December 2016, Indian Institute of Information Technology (IIIT), Allahabad, India.
2. “Large Scale Visual Analytics for Wide Area Motion Imagery,” G. Sharma, , IEEE UP Section Conference on Electrical, Computer and Electronics (UPCON), 10 December 2016, Indian Institute of Technology (IIT), (Banaras Hindu University) Varanasi, India.
3. “Translating Signal Processing Theory Into Applications,” G. Sharma, , IEEE UP Section Conference on Electrical, Computer and Electronics (UPCON), 5 December 2015, Indian Institute of Information Technology (IIIT), Allahabad, India.
4. “Translating Signal Processing Theory Into Applications,” G. Sharma, , National Seminar on New Trends in Signal Processing (NeTSiP-2015), 3–4 October 2015, Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT), Gandhinagar, India.
5. “How to Write a Quality Technical Paper and Where to Publish Within IEEE”, *IEEE Authorship Workshop*, 20 August 2015, Indian Institute of Technology, Madras, Chennai, India.
6. “How to Write a Quality Technical Paper and Where to Publish Within IEEE”, *IEEE Authorship Workshop*, 18 August 2015, Don Bosco Institute of Technology, Mumbai, India.
7. “Probabilistic Decoding in Communications and Bioinformatics: A Turbo Approach,” G. Sharma, *IEEE SPS-APSIPA Winter School on Machine Intelligence and Signal Processing (MISP)*, Dec 20-23, 2014, Indraprastha Institute of Information Technology (IIITD), Delhi, India.
8. “Imaging Arithmetic: Physics  $\cup$  Math  $>$  Physics + Math,” G. Sharma, *CP7.0 Workshop: Colour Imaging and Printing - State of the Art and Trends for a New Generation*, Oct. 24, 2012.
9. “Turbo-decoding of RNA Secondary Structure,” G. Sharma, *30th Brazilian Telecommunications Symposium (SBrT’12)*, 14 September, 2012.
10. “Digital Watermarking: A Feasible Signal Design Perspective,” G. Sharma, *International Conference on Image Information Processing (ICIIP)*, Wagnaghat, Shimla, Himachal Pradesh, India, Nov. 4, 2011.
11. “Color Imaging Arithmetic: Physics  $\cup$  Math  $>$  Physics + Math,” G. Sharma, *Computational Color Imaging Workshop*, Milan, Italy, Apr. 20, 2011.

## INVITED SEMINARS AND TALKS

1. “Wearable Sensor Analytics for Medicine,” G. Sharma, *invited presentation at Gujarat Technological University*, March 21, 2017, Ahmedabad, India.
2. “Digital Biomarkers for Huntington’s Disease using Multiple Bodyaffixed, Lightweight Sensors,” G. Sharma, *invited presentation at Huntington Study Group (HSG) Annual Meeting*, November 04, 2016, Nashville, TN.

3. "Image-based Data Interfaces: Revisiting Barcodes and Watermarks for Mobile Applications," G. Sharma, *invited presentation at Gujarat Technological University*, March 15, 2016, Ahmedabad, India.
4. "Large Scale Visual Analytics for Wide Area Motion Imagery," G. Sharma, *invited presentation given at IEEE Gujarat Section and IEEE Student Branch Ahmedabad University*, March 14, 2016, Ahmedabad, India.
5. "Color Barcodes for Mobile and Other Applications," G. Sharma, *invited presentation given to Honeywell Corporation*, March 03, 2016.
6. "Color Science and Imaging: A Brief Introduction and Overview," G. Sharma, *invited presentation at Samsung Research India*, G. Sharma, Jan 08, 2016, Bangalore, India.
7. "Color Barcodes and Health Sensing on Smart Phones," G. Sharma, *invited presentation at Flipkart India*, Jan 07, 2016, Bangalore, India.
8. "Image-based data interfaces revisited: Barcodes and watermarks for the mobile and digital worlds," G. Sharma, *invited speaker at 8th Intl. Conf. on Comm. Sys. and Networks (COMSNETS)*, Bangalore, India, Jan. 6, 2016.
9. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at Center of Excellence in Signal and Image Processing, College of Engineering, Pune (COEP) and the Institution of Engineering and Technology (IET), Pune Local Chapter*, August 21, 2015, Pune, India.
10. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at IEEE Madras Section*, August 19, 2015, Chennai, India.
11. "Set Theoretic Watermarking: An Optimality and Feasibility Framework for Data Hiding," G. Sharma, *invited presentation at Bhaskaracharya Institute For Space Applications and Geo-Informatics (BISAG)*, 19 March 2015.
12. "Set Theoretic Watermarking: An Optimality and Feasibility Framework for Data Hiding," G. Sharma, *invited presentation at Gujarat Technological University*, March 18, 2015, Ahmedabad, India.
13. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," *invited presentation at Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT) and Gujarat Chapter of IEEE*, Jan. 8, 2015, Gandhinagar, India.
14. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," *invited presentation at Indraprastha Institute of Information Technology (IIITD)*, Aug. 7, 2014, New Delhi, India.
15. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," *invited presentation at Chung Ang University*, May 21, 2014, Seoul, South Korea.
16. "Mathematical Modeling, Design, and Optimization of Multiprimary Color Displays," G. Sharma, *invited presentation at Inha University*, Nam-gu, Incheon, South Korea, 20 May 2014.
17. "Set Theoretic Watermarking: An Optimality and Feasibility Framework for Data Hiding," G. Sharma, *invited presentation at Dept. of Electrical and Electronic Engineering, Yonsei University*, Seoul, South Korea, 20 May 2014.
18. "Mathematical Modeling, Design, and Optimization of Multiprimary Color Displays," G. Sharma, *invited presentation at Samsung Advanced Technology Training Institute (SATTI)*, Suwon, South Korea, 19 May 2014.
19. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," *invited presentation at Department of Automation, Tsinghua University*, May 16, 2014, Beijing, China.
20. "Decoding RNA Secondary Structure from Multiple Homologs: A Turbo-Decoding Approach," *invited presentation at School of Life Sciences, Tsinghua University*, May 16, 2014, Beijing, China.
21. "Color Barcodes for Mobile and Other Applications," G. Sharma, *invited presentation at Conference 9: Image Processing & Pattern Recognition*, part of the International Symposium on Optoelectronic Technology and Application, China National Convention Center, Beijing, China, 14 May 2014.
22. "Color Barcodes for Mobile and Other Applications," G. Sharma, *invited presentation at Qualcomm*, August 28, 2013, San Diego, CA.
23. "Turbo-Decoding of RNA Secondary Structure," G. Sharma, *invited talk at the Stochastic Information Processing (SIP) group*, June 19, 2013, Computer Science Department, University of Geneva, Geneva, Switzerland.
24. "Set Theoretic Watermarking: An Optimality and Feasibility Framework for Data Hiding," G. Sharma, *invited talk at the Stochastic Information Processing (SIP) group*, June 19, 2013, Computer Science Department, University of Geneva, Geneva, Switzerland.
25. "Turbo-Decoding of RNA Secondary Structure," G. Sharma, *invited talk at École Polytechnique fédérale de Lausanne (EPFL)*, June 18, 2013, Lausanne, Switzerland.

26. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited talk at École Polytechnique fédérale de Lausanne (EPFL)*, June 12, 2013, Lausanne, Switzerland.
27. "Color Barcodes for Mobile and Other Applications," G. Sharma, *invited seminar at the Sharp Labs America*, June 03, 2013, Camas, WA.
28. "Color Barcodes for Mobile and Other Applications," G. Sharma, *invited seminar at the Rochester Institute of Technology, Center for Imaging Science (CIS) Seminar Series*, May 8, 2013, Rochester, NY.
29. "Technology Transfer and Entrepreneurship: A Sampling from the University of Rochester," G. Sharma, *invited talk at EuTec Seminar Autumn, 2012, Gjøvik University College*, October 15, 2012.
30. "System Optimization in Digital Color Imaging," G. Sharma, *invited guest lectures in course in course IMT5261: Special Topics in Color Imaging, Gjøvik University College*, October 10 & 17, 2012.
31. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited talk at National Engineering College*, August 29, 2012, Kovilpatti, Tamilnadu, India.
32. "A Set-theoretic framework for Data Hiding," G. Sharma, *invited talk at National Engineering College*, August 29, 2012, Kovilpatti, Tamilnadu, India.
33. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited talk at Hewlett-Packard Laboratories*, June 12, 2012, Palo Alto, CA.
34. "Making Perceptual Constraints First Class Citizens in the Watermarking World: A Set Theoretic Framework," *invited talk at Dept. of Electrical Engineering and Computer Science*, June 6, 2012, Evanston, IL.
35. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited talk at the Stanford Center for Image Systems Engineering (SCIEN)*, May 15, 2012, Palo Alto, CA.
36. "Perception based Color Visualization and Distributed Media Processing," *invited presentation at Army Research Laboratory, Adelphi, MD*, 07, May 2012.
37. "Decoding RNA Secondary Structure from Multiple Homologs: A Turbo-Decoding Approach," *invited presentation at University of California, Santa Cruz, Dept. of Biomolecular Engineering*, May 03, 2012, Santa Cruz, CA.
38. "Turbo-Decoding of RNA Secondary Structure," *invited presentation at University of California, Berkeley EECS Dept. Networking, Communications, and DSP Seminar*, April 23, 2012, Berkeley, CA.
39. "Multi-primary Displays: Modeling and Color Characterization," G. Sharma, *invited presentation at Qualcomm*, April 20, 2012, San Jose, CA.
40. "Distributed Communications and Mobile Color Barcodes," G. Sharma, *invited presentation at Huawei Research Laboratory*, April 04, 2012, Santa Clara, CA.
41. "Systems Approaches in Imaging Systems," G. Sharma, *invited presentation at Sharp Central Research Laboratory*, March 23, 2012, Tenri, Japan.
42. "Systems Approaches in Color and Imaging," G. Sharma, *invited presentation at Sony Shinagawa Technology Center*, March 22, 2012, Shinagawa, Japan.
43. "Systems Approaches in Color and Imaging," G. Sharma, *invited presentation at Chiba University*, March 22, 2012, Chiba, Japan.
44. "Decoding RNA Secondary Structure: An Iterative Belief Propagation Turbo-Decoding Approach," G. Sharma, *invited presentation at Dept. of Computer Science, University of Memphis*, February 17, 2012, Memphis, TN.
45. "Turbo-Decoding of RNA Secondary Structure," G. Sharma, *invited presentation at Hewlett Packard Labs*, February 01, 2012, Palo Alto, CA.
46. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *NIIT University Distinguished Visitor Lecture Seminar*, November 07, 2011, Neemrana, Rajasthan, India.
47. "Set Theoretic Watermarking: An Optimality and Feasibility Framework for Data Hiding," G. Sharma, *invited seminar at Digimarc Corporation*, August 02, 2011, Beaverton, OR.
48. "TurboFold: Iterative Probabilistic Secondary Structure Prediction for Multiple RNA Sequences," G. Sharma, *invited seminar at the Sharp Labs America*, July 22, 2011, Camas, WA.
49. "Mathematical Metrics for Evaluating Color Recording Devices," G. Sharma, *Invited Seminar at The Norwegian Color Research Laboratory, Gjøvik University College*, April 27th, 2011, Gjøvik, Norway.



50. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *Invited Seminar at The Norwegian Color Research Laboratory*, Faculty of Computer Science and Media Technology at Gjøvik University College, April 26, 2011, Gjøvik, Norway.
51. "Feasibility and Optimality Watermarking using Convex Projections," G. Sharma, *Invited Seminar at The Norwegian Color Research Laboratory*, Gjøvik University College, April 26, 2011, Gjøvik, Norway.
52. "Mathematical Metrics for Evaluating Color Recording Devices," Dipartimento di Eletttronica E Informazione, Politecnico Milano, April 19th, 2011.
53. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *invited seminar at the Sharp Labs America*, January 31, 2011, Camas, WA.
54. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *Invited Seminar, Qualcomm*, December 2, 2010, San Diego, CA.
55. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Qualcomm*, December 2, 2010, San Diego, CA.
56. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Department of Computer Engineering Seminar, Rochester Institute of Technology*, October 28, 2010, Rochester, NY.
57. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Hong Kong University of Science and Technology*, September 30, 2010, Hong Kong.
58. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Xerox Corporation*, August 12, 2010, Webster, NY.
59. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Indian Institute of Technology*, July 12, 2010, New Delhi, India.
60. "Decoding RNA Structure," G. Sharma, *invited presentation at Sri Venkateswara Institute of Medical Sciences*, July 10, 2010, Tirupati, India.
61. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Indian Institute of Science*, July 03, 2010, Bangalore, India.
62. "TurboFold: Iterative Probabilistic Secondary Structure Prediction for Multiple RNA Sequences," G. Sharma, *invited presentation at Samsung India*, July 02, 2010, Bangalore, India.
63. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at Samsung India*, July 02, 2010, Bangalore, India.
64. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at Hewlett Packard Labs India*, July 02, 2010, Bangalore, India.
65. "High Capacity Data Hiding and Encoding Approaches for Printed Documents," O. Bulan and G. Sharma, *invited seminar at the Rochester Chapter of the IEEE Signal Processing Society*, April 22, 2010, Rochester, NY.
66. "Systems Approaches in Imaging Systems," G. Sharma, *invited seminar at the Sharp Labs America*, April 8, 2010, Camas, WA.
67. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited seminar at the Rochester Institute of Technology, Center for Imaging Science (CIS) Seminar Series*, March 24, 2010, Rochester, NY.
68. "Optimality and Feasibility Frameworks for Data Embedding: A Set Theoretic Approach," G. Sharma, *Invited Seminar, Arab Academy for Science, Technology, and Maritime Transport*, November 11, 2009, Cairo, Egypt.
69. "Grand Challenge Problems in Media Security," G. Sharma, *Regional Symposium on Graduate Education and Research in Information Security (GERIS)*, 27 October 2009, Binghamton, NY.
70. "Set-theoretic Watermarking: A Feasibility Framework for Data Embedding," G. Sharma, *Research Seminar, Graduate Institute of Electronics Engineering, National Taiwan University*, April 27, 2009, Taipei, Taiwan.
71. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at National Taiwan University of Science and Technology*, April 24, 2009, Taipei, Taiwan.
72. "Set-theoretic Watermarking: A Feasibility Framework for Data Embedding," G. Sharma, *Research Seminar, ECE Dept., State University of New York (SUNY) at Binghamton*, February 25, 2009, Binghamton, NY.
73. "High Capacity Data Embedding in Halftone Images via Dot Orientation Modulation," O. Bulan, V. Monga, G. Sharma, *invited Technical Presentation at the Rochester Chapter of Society for Imaging Science and Technology*, Rochester, NY, 11 Feb. 2009.

74. "Joint Prediction of RNA Secondary Structure," G. Sharma, *invited seminar at the Electrical and Systems Engineering Department, Washington University, Saint Louis*, February 04, 2009, Saint Louis, MO.
75. "Set-theoretic Watermarking: A Feasibility Framework for Data Embedding," G. Sharma, *invited seminar at the Chicago Chapter of the IEEE Signal Processing Society*, October 31, 2008, Chicago, IL.
76. "High Capacity Data Hiding in Halftone Images," G. Sharma, *invited presentation at Xerox Research Center*, February 21, 2008, Webster, NY.
77. "Set theoretic Watermarking: A Feasibility Framework for Data Hiding," G. Sharma, *invited presentation at Hewlett Packard Laboratories*, January 31, 2008, Palo Alto, CA.
78. "Efficient Joint Prediction of RNA Secondary Structure," G. Sharma, *invited presentation at Computer Science Research Institute, Sandia National Laboratories*, November 9, 2007, Albuquerque NM.
79. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at Ricoh Innovations Inc.*, November 2, 2007, San Jose, CA.
80. "Set-theoretic Watermarking," G. Sharma, *invited presentation as part of Engineering Week at Harris Corporation*, February 20, 2007, Rochester, NY.
81. "Efficient Joint Prediction of RNA Secondary Structure," G. Sharma, *invited presentation at Microsoft Research*, January 26, 2007, Redmond, WA.
82. "Imaging Arithmetic: Physics  $U$  Math  $>$  Physics + Math," G. Sharma, *invited presentation at North Carolina State University, Electrical and Computer Engineering Dept.*, October 6, 2006, Raleigh, NC.
83. "Set-theoretic Watermarking," G. Sharma, *invited presentation at Syracuse University, Dept. of Electrical Engineering and Computer Science*, August 17, 2006, Syracuse, NY.
84. "Multimedia Authentication Watermarks: Integrating Cryptography with Signal Processing," G. Sharma, *invited presentation at General Motors, India Science Laboratory*, July 06, 2006, Bangalore, India.
85. "Multimedia Authentication Watermarks: Integrating Cryptography with Signal Processing," G. Sharma, *invited presentation at Dept of Mathematics and Statistics*, May 10, 2006, Rochester Institute of Technology, Rochester, NY.
86. "Authentication Watermarking: Security, Localization, and a new Lossless Framework," G. Sharma, *invited presentation for Xerox Innovation Group*, March 16, 2006, Webster, NY.
87. "Mis-registration color models for periodic halftone screens," G. Sharma, *invited presentation at Xerox Labs, El Segundo, CA*, Jan. 20, 2006.
88. "Authentication Watermarking: Security, Localization, and a new Lossless Framework," G. Sharma, *invited presentation for IEEE Rochester Signal Processing Society Chapter*, Nov. 30, 2005.
89. "Physically Motivated Signal Processing: Applications in Digital Imaging," G. Sharma, *National University of Singapore, ECE Dept*, Oct 28, 2004.
90. "Authentication Watermarking: Security, Localization, and a new Lossless Framework," G. Sharma, *invited presentation at National University of Singapore, CS Dept*, Oct 28, 2004.
91. "Authentication Watermarking: Security, Localization, and a new Lossless Framework," G. Sharma, *invited seminar at Polytechnic University Brooklyn, CS Dept*, Oct 01, 2004.
92. "Exploiting Physics in Digital Imaging," G. Sharma, *University of Montreal, Computer Science Colloquium*, 20 May 2004, Montreal, Canada.
93. "Signal Processing for Physical Imaging," G. Sharma, *Cornell University Electrical and Computer Engineering Colloquium*, 20 April 2004, Ithaca, NY.
94. "Color Image Capture: Challenges and Opportunities," G. Sharma, *invited presentation before the Rochester Institute of Technology, IEEE Student Chapter*, 06 Feb 2004, Rochester, NY.
95. "Show-through in Duplex Documents: Correction and Exploits," G. Sharma, *invited presentation at Sony America*, 23 Jan 2004, San Jose, CA.
96. "Perspectives on R&D Careers in a Large Company," G. Sharma, *invited guest lecture as part of a course on preparing for careers in academia*, 17 November 2003, University of Rochester, Rochester, NY.
97. "Two-dimensional transforms for device color calibration," R. Bala, G. Sharma, V. Monga, *invited presentation at the late breaking news session IS&T/SID Eleventh Color Imaging Conference: Color Science, Systems and Applications*, 07 Nov. 2003, Scottsdale, AZ.

98. "Digital Color Scanning: Challenges and Opportunities," G. Sharma, invited presentation at Hewlett-Packard, Barcelona, Spain, 18 Oct. 2003.
99. "Show-through Cancellation for Duplex Scanning," G. Sharma, *invited Technical Presentation before Rochester Chapter of Society for Imaging Science and Technology*, Rochester, NY, 21 Feb. 2001.
100. "Document Echo Cancellation: Electronic Show-through Correction for Scans of Duplex Printed Pages," G. Sharma, *invited seminar at Department of Electrical and Computer Engineering, Univ. of Rochester*, Rochester, NY, 03 Oct. 2001.
101. "Image Processing for Digital Imaging," G. Sharma, *invited seminar at Silicon Automation Systems (now Sasken)*, Bangalore, India, October 17, 2000.
102. "Image Processing for Digital Imaging," G. Sharma, *invited seminar at the Department of Electrical Computer Engineering, Indian Institute of Science, Bangalore, India*, October 16, 2000.
103. "Total Least Squares Regression in Color Printer Calibration," M.Xia, E. Saber, G. Sharma, and A. M. Tekalp, *IEEE Western NY Image Proc. Workshop*, Rochester, NY, 19 Sept. 1997.

## MENTORING/TRAINING SESSIONS AND TALKS

1. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your Next paper," G. Sharma, *presentation at Gujarat Technological University*, March 21, 2017, Ahmedabad, India.
2. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your Next paper," S. Hemami and G. Sharma, information session at the *IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, Shanghai International Convention Center/Oriental Riverside Hotel, Shanghai, China, 24 March 2016.
3. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your Next paper," G. Sharma, *presentation at Gujarat Technological University*, March 16, 2016, Ahmedabad, India.
4. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your Next paper," G. Sharma, invited presentation at Aug. 24, 2015, Seth Jai Parkash Mukand Lal Institute of Engineering & Technology (JMIT), Radaur, Yamunanagar, Haryana, India.
5. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your Next paper," S. Hemami and G. Sharma, information session at the *IEEE Intl. Conf. Acoustics Speech and Sig. Proc.*, Brisbane Convention & Exhibition Centre, Brisbane, Australia, 21 April 2015.
6. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your First paper," G. Sharma, *invited presentation at Gujarat Technological University*, March 28, 2014, Ahmedabad, India.
7. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your First paper," G. Sharma, *invited presentation at Bhaskaracharya Institute For Space Applications and Geo-Informatics (BISAG)*, 19 March 2015.
8. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your First paper," G. Sharma, *Indo-US Collaboration on Engineering Education (IUCEE) Webinar*, 17 June 2014.
9. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your First paper," G. Sharma, information session at *International Symposium on Optoelectronic Technology and Application*, China National Convention Center, Beijing, China, 13 May 2014.
10. "Publication Etiquette and Ethics: Things You Should Know Before Submitting your First paper," G. Sharma, *invited presentation at Gujarat Technological University*, March 28, 2014, Ahmedabad, India.

## PANELS

1. Invited panelist for "Challenges and Opportunities for Handheld Device Displays," panel at *27th annual Symposium on Electronic Imaging*, San Francisco, CA, 10 Feb. 2015..
2. Panel organizer, "Online Learning - Will Technology Transform Higher Education?", 2013 Electronic Imaging Symposium, Tuesday, Feb 5 2013, 6-7:30pm, Hyatt Regency Hotel, San Francisco Airport.

3. Invited panelist for "The Future of Watermarking," panel at *Media Watermarking, Security, and Forensics XIV, IS&T/SPIE Electronic Imaging Symposium*, 05 Feb. 2013, San Francisco, CA.
4. Invited panelist for "How can a PhD add value to a career," panel at 2011 Western NY Image Processing Workshop, CIMS Building, Rochester Institute of Technology, Rochester, NY, November 14 2011.
5. Invited panelist for "Research in Color Science: Next Challenges," panel at HP Labs, Jan 23, 2009.
6. Invited panelist on Rochester Asians' Network panel "Transitions from the Corporate World - Strategies for Success," Penfield Country Club, Penfield, NY, Oct. 3 2008.

## PATENTS

1. US Patent # 9111186, "Color barcodes for mobile applications: A per channel framework," issued 18 Aug. 2015, Inventors: H. Blasinski, O. Bulan, and G. Sharma.
2. US Patent # 8294953, "Lossless compression of color look-up table via hierarchical differential encoding or cellular interpolative prediction," issued January 24, 2012, Inventors: M. Shaw, R. G. Guay, G. Sharma, and A. B. Rajagopalan.
3. US Patent # 8120812, "System and method for obtaining color consistency for a color print job across multiple output devices," issued February 21 2012, Inventors: G. Sharma, R. Bala and, R. J. Rolleston.
4. US Patent # 8100330, "Method for encoding and decoding data in a color barcode pattern," issued January 24, 2012, Inventors: O. Bulan, V. Monga, and G. Sharma.
5. US Patent # 8047447, "Method for encoding and decoding data in a color barcode pattern," issued November 01, 2011, Inventors: O. Bulan, V. Monga, and G. Sharma.
6. US Patent # 8023160, "Encoding message data in a cover contone image via halftone dot orientation," issued September 20, 2011, Inventors: V. Monga, G. Sharma, and O. Bulan.
7. US Patent # 8014035, "Decoding message data embedded in an image print via halftone dot orientation," issued September 06, 2011, Inventors: V. Monga, G. Sharma, and O. Bulan.
8. US Patent # 7952767, "Method for coherent watermark insertion and detection in color halftone images," issued 31 May 2011, Inventors: G. Sharma and S. Wang.
9. US Patent # 7747073, "Method and apparatus for adjusting color profiles to meet a desired aim," issued June 29, 2010, Inventors: R. Bala and G. Sharma.
10. US Patent # 7719722, "System and method of halftoning for multi-pass rendering," issued May 18, 2010, Inventors: G. Sharma, S. Wang, and Z. Fan.
11. US Patent # 7580149, "Method and system for identification of repeat print jobs using object level hash tables," issued August 25, 2009, Inventors: V. Monga and G. Sharma.
12. US Patent # 7558961, "Systems and methods for embedding messages in look-up tables," issued Jul 07, 2009, Inventors: G. Sharma and S. A. Schweid.
13. US Patent # 7525704, on "System for providing depth discrimination of source images encoded in a rendered composite image," issued 28 April 2009, Inventors: R. P. Loce, Y. Zhang, G. Sharma, S. J. Harrington, P. Crean.
14. US Patent # 7474783, on "Systems and methods for associating color profiles with a scanned input image using spatial attributes," issued 6 January 2009, Inventors: G. Sharma, R. Eschbach, S. Wang.
15. US Patent # 7453604, on "Systems and methods for estimating an image marking process using scanned image attributes," issued 18 November 2008, Inventors: R. Eschbach, G. Sharma, S. Wang.
16. US Patent # 7450873, on "Marking system involving non-business usage," issued 11 November 2008, Inventors: G. Sharma, R. Sherman, C. J. Regruit, R. J. Rolleston, S. Revankar.
17. US Patent # 7379588, on "System for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite image to obtain a normalized color image," issued 25 May 2008, Inventors: R. P. Loce, Y. Zhang, G. Sharma.
18. US Patent # 7376264, "Systems for spectral multiplexing of a source image and a background image to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite images," issued 20 May 2008, Inventors: R. P. Loce, Y. Zhang, G. Sharma, and S. J. Harrington.

19. US Patent # 7355752, "Two-dimensional calibration architectures for color devices," issued 8 Apr. 2008, Inventors: G. Sharma, R. Bala, J. P. VandeCapelle, M. S. Maltz, L. K. Mestha.
20. US Patent # 7352491, "System and method for selecting the best set of devices for rendering color documents," issued 1 Apr. 2008, Inventors: R. Bala, G. Sharma, R. J. Rolleston.
21. US Patent # 7339704, "Method for standardizing input CMYK values for clustered printing environments," issued 4 Mar. 2008, Inventors: L. K. Mestha, N. W. Zeck, K. J. Mihalyov, and G. Sharma.
22. US Patent #7336401, "Systems and methods for estimating an image marking process using event mapping of scanned image attributes," issued 26 Feb. 2008, Inventors: G. Unal and R. Eschbach and G. Sharma.
23. US Patent #7328116, "Visual monitor calibration," issued 05 Feb. 2008, Inventors: R. Bala, R. Eschbach, G. Sharma.
24. US Patent #7295703, "Method for scanner characterization for color measurement of printed media having four or more colorants," issued 13 Nov. 2007, Inventors: R. Bala, J. Stinehour, G. Sharma.
25. US Patent #7286682, "Show-through watermarking of duplex printed documents," issued 23 Oct. 2007, Inventors: G. Sharma and S. Wang.
26. US Patent #7272261, "Method and system for classifying scanned media," issued 18 Sept. 2007, Inventors: S. Wang, R. Eschbach, G. Sharma.
27. US Patent #7269297, "Illuminant-neutral gray component replacement in systems for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite image," issued 11 Sept. 2007, Inventors: R. P. Loce, Y. Zhang, and G. Sharma
28. US Patent #7230738, "System for spectral multiplexing of source images to provide a composite image with noise encoding to increase image confusion in the composite image, for rendering the composite image, and for spectral demultiplexing of the composite image," issued June 12, 2007, Inventors: Y. Zhang, G. Sharma, R. P. Loce, and S. J. Harrington.
29. US Patent # 7218785, "Systems for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite image," issued 15 May 2007, Inventors: G. Sharma, R. P. Loce, and S. J. Harrington.
30. US Patent # 7215792, "Systems for spectral multiplexing of source images to provide a composite image with gray component replacement, for rendering the composite image, and for spectral demultiplexing of the composite image," issued 8 May 2007, Inventors: G. Sharma, Y. Zhang, R. P. Loce, and S. J. Harrington.
31. US Patent Application #7199905, "Systems and Methods for halftoning Multiple Color Separation Layers by Inter-layer Error Diffusion," issued 3 Apr. 2007, Inventor: G. Sharma.
32. US Patent #7155068, "Systems for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing the composite image, which achieve increased dynamic range in a recovered source image," issued 26 Dec. 2006, Inventors: Y. Zhang, G. Sharma, R. P. Loce, S. J. Harrington.
33. US Patent # 7145697, "Show-through compensation apparatus and method," , issued 05 Dec. 2006 , Inventors: G. Sharma and K. T. Knox.
34. US Patent #7136522, "Systems for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite image to animate recovered source images," issued 14 Nov. 2006, Inventors: S. J. Harrington, R. P. Loce, and G. Sharma.
35. US Patent # 7136189, "Color halftoning using a multi-level successive-filling halftone screening algorithm," issued 14 Nov. 2006, Inventors: G. Sharma, H. Shin, S. W. Wang, and Z. Fan.
36. US Patent #7127112, "System for spectral multiplexing of source images to provide a composite image, for rendering the composite image, and for spectral demultiplexing of the composite image by use of an image capture device," issued Oct. 24, 2006, Inventors: G. Sharma and R. P. Loce and S. J. Harrington.
37. US Patent #7095530, "Color vector halftoning using successive-filling with improved color registration latitude," issued Aug. 22, 2006, Inventors: D. Mantell and G. Sharma.
38. US Patent #7085004, "Calibration system for document processing system including visual layout validation for target measurements," issued Aug. 01, 2006, Inventors: G. Sharma and T. Balasubramanian.
39. US Patent # 6992797, "Systems and methods for embedding messages in look-up tables," issued Jan 31, 2006, Inventors: G. Sharma and S. A. Schweid.
40. US Patent # 6927381, "Photosensitive imaging system sensitive to orange light," issued 09 August, 2005, Inventors: P. A. Hosier, J. C. Tandon, J. E. Jedlicka, G. Sharma and A. E. Perregaux, R. P. Herloski.

41. US Patent # 6895101, "System and method for embedding information in digital signals," issued 17 May, 2005, Inventors: M. U. Celik, G. Sharma, and A. M. Tekalp.
42. US Patent # 6844941, "Color halftoning using a single successive filling halftone screen," issued Jan 18, 2005, Inventors: G. Sharma, S. Wang, and Z. Fan.
43. US Patent # 6654143, "Printer characterization adjustment for different papers," issued Nov. 25, 2003, Inventors: E. Dalal, R. Balasubramanian, R. Rasmussen, G. Sharma, M. Shaw, M. E. Farrell, D. C. Robinson.
44. US Patent # 6647140, "Spectrum inverter apparatus and method," Issued Nov. 11, 2003, Inventors: S. W. Wang, G. Sharma.
45. US Patent # 6646248, "Photosensitive imaging apparatus sensitive to orange light," Issued Nov. 11, 2003, Inventors: P. A. Hosier, J. C. Tandon, J. E. Jedlicka, G. Sharma, A. E. Perregaux, R. P. Herloski.
46. US Patent # 6525845 "Methods and apparatus for modifying image data based on identification of marking process," Issued Feb. 25, 2003, Inventors: G. Sharma, S. A. Schweid, and J. Shiau.
47. US Patent # 6501567, "Method and system for designing spatially-partitioned and correlated stochastic screens for color halftoning," Issued Dec. 31, 2002, Inventors: G. Sharma and S. Wang.
48. US Patent # 6353675, "Methods and apparatus for identifying marking process and modifying image data based on image spatial characteristics," Issued Mar. 05, 2002, Inventor: G. Sharma.
49. US Patent # 6288798, "Show-through compensation apparatus and method," Issued Sep. 11, 2001, Inventor: G. Sharma.
50. US Patent # 6088095, "Model based spectral calibration of color scanners," Issued July 11, 2000, Inventor: G. Sharma.
51. US Patent # 05649073, "Automatic calibration of halftones," Issued July 15, 1997, Inventors: K. T. Knox, C. Hains, and G. Sharma.
52. Three pending US patent applications.

## COURSES DEVELOPED AND CONDUCTED

- Signals, ECE#241, Fall 2017, 2016, 2015, 2014, 2013, Univ. of Rochester, undergraduate.
- Digital Communications, ECE#444/244, Fall 2017, 2015, Spring 2013, Fall 2011, 2009, 2007, 2006, 2004, 2003, Univ. of Rochester, graduate/senior.
- Probabilistic Models for Inference and Estimation, ECE#443, Fall 2016, Univ. of Rochester, graduate.
- Computational Bioinformatics in the Big Data Era, ECE#492, Spring 2014, Univ. of Rochester, graduate.
- Real-time Signal Processing Portfolio, ECE#294, Fall 2014, 2013, Univ. of Rochester, undergraduate.
- Information Theory, ECE#450, Fall 2014, 2010, 2008, Spring 2006, 2004, Univ. of Rochester, graduate.
- Communication Systems, ECE #242, Spring 2008, 2007, 2006, 2005, Univ. of Rochester, undergraduate.
- Special Topics in Image Processing, ECE #492N, Spring 2005, Univ. of Rochester, graduate.
- Digital Image Processing, EE#301-779, Spring 2003, Rochester Institute of Technology, graduate.
- Data & Computer Commun., CE#306-694, Spring 2001, Rochester Institute of Technology, undergraduate.
- Speech and Image Compression, EE#301-749, Winter 2001, Rochester Institute of Technology, graduate.
- Communication Networks, EE#301-692, Spring 2000, Rochester Institute of Technology, graduate/senior.

## GRADUATE THESIS DIRECTION

- *Doctoral Students*
  - "Digital watermarking methods for authentication, tamper localization and lossless recovery," Mehmet U. Celik, ECE Dept., Univ. of Rochester, thesis defended December 2004 (co-advised with A. M. Tekalp).

- “Image registration for multi-view image processing,” Gülçin Caner, Celik, ECE Dept., Univ. of Rochester, thesis defended July 2006 (co-advised with A. M. Tekalp and W. Heinzelman).
- “Clustered-dot periodic halftones: modeling, modulation, and applications,” Basak Oztan, ECE Dept., Univ. of Rochester, thesis completed December 2009.
- “Probabilistic computational methods for structural alignment of RNA sequences,” Arif Özgün Harmanci, thesis defended April 2010 (co-advised with D. H. Mathews).
- “Set-theoretic watermarking,” Oktay Altun, ECE Dept., Univ. of Rochester, thesis defended August 2010 (co-advised with M. Bocko).
- “High Capacity Data Embedding for Printed Documents,” Orhan Bulan, ECE Dept., Univ. of Rochester, thesis defended October 2011.
- “Distributed Estimation, Coding, and Scheduling in Wireless Visual Sensor Networks,” Chao Yu, thesis defended Feb 13, 2013.
- “Vehicle Detection and Tracking in Wide Area Motion Imagery by Co-Registering and Exploiting Vector Roadmaps”, Ahmed Elliethy, thesis defended Jan 25, 2017.
- “Hidden Markov Models for Supercapacitor State-of-Charge Tracking and Audio Watermarking.” Andrew Nadeau, thesis defended Aug 20, 2017.
- Advising and supervising graduate research of Carlos Eduardo Rodriguez Pardo, Research area: “Color Displays and Visualizaion.”
- Advising and supervising graduate research of Irving Barron, Research area: “TBD.”
- Advising and supervising graduate research of Li Ding, Research area: “Comparative Analytics for Large Spatial Datasets.”
- Advising and supervising graduate research of Karthik Dinesh, Research area: “Motion Analysis for Medicine and Entertainment Applications.”

- *Masters Thesis Students*

- Hao Xie, Thesis: “Pareto Optimal Primary Designs for Color Displays”, April 18, 2017.
- Yanfu Zhang, Thesis: “Upsampling of Color-Depth Images and a Dehazing Benchmarking Dataset”, April 18, 2017.
- Iftekhar Naim, Thesis “Scalable Model-based Clustering for Flow Cytometry,” April 13, 2011.
- Claude Fillion, Thesis: “Detection of content adaptive scaling of images for forensic applications,” December 16, 2010.
- Darius Fennell, Thesis: “Wavelet-based moving object detection in video with camera motion,” April 14, 2009.
- Yang Yu, Thesis: “Estimating motion in IVUS images using pyramidal Lucas Kanade method,” April 14, 2009 (joint with Marvin Doyley).
- S. R. Aravindh Balaji, Thesis: “Pre-processing methods for lossless compression of color look-up tables,” December 06, 2007.
- Angela D’Orazio, Thesis: “Adaptive determination of alignment constraints for RNA secondary structure prediction,” December 12, 2007.
- Vishnu Prasan, Thesis: “Image broadcast in VANETs: A feasibility study using JPEG 2000 with unequal error protection,” December 12, 2007.
- Mithun Mukherjee, Thesis: “P-HIP : A multiresolution halftoning algorithm for progressive display,” EE Dept., Rochester Institute of Technology , thesis completed Dec. 2004.

- *Non-thesis Masters Students*

- Ismail Sadiq, Topic: “Biological Sequence Alignment.”
- Weijun Li, Sarang Lele, Juncheng Feng, Topic: “3-D Modeling from Imagery”.
- Jake Arkin, Topic: “Computer Vision on Embedded Systems”.
- Yuchuan Zhuang, Topic: “Image based analysis of photolytic degradation of daguerreotypes”.
- Shuo Chen, Topic: “Image based analysis of photolytic degradation of daguerreotypes”.
- Henryk Błasiński, Topic: “Evaluating Color Barcodes for Mobile Applications”.
- Adem Orsdemir, Topic: “Multi-media security,” December 2008.
- Junwen Mao, Topic: “Image forensics,” Jan 2009.
- Chaoyi Chen and Kunyu Xiong, Topic: “Vehicular ad hoc networks,” December 2007.
- Adil Bilici, Topic: “Multi-dimensional data interpolation techniques for color device characterization,” ECE Dept., University of Rochester, August 2005.

- Ed Bremer, Topic: “Correspondence estimation in multi-view imagery,” ECE Dept., University of Rochester, December 2005.
- Matjaz Kranjc, Topic: “Power-aware routing for wireless sensor motes,” May 2006.
- MS students supervised for projects: Andrew Law, Dan Lewis, Ryan Aures

- *Undergraduate Students*

- Ariana Cervantes (MechE), Summer 2016.
- Matthew Dombroski, Summer 2016.
- Akihiro Ishikawa, Summer 2015.
- Seth Schober, Fall 2013, Spring 2014.
- Darcey Riley (CS), Spring 2011.
- Jinnan Hussain, Summer 2011.
- Colin Funai, Fall 2010 – Spring 2011.

- *Undergraduate Senior Design Projects*

- “Key-less home entry system utilizing RFID,” Kyle Aures, Scott Warren, Aaron Wescott, and Adam R. Williamson, May 2008.
- “Speech communication over wireless sensor motes,” Matjaz Kranjc, Osonde Osoba , May 2005.
- “Wireless microphone network using the Mote IV platform,” Ryan Aures, Matthew Holland, Yang Zhang, Corey Witt, May 2006.
- “Super-resolution Reconstruction for MRI Images,” Saeed Shaikh, May 2007.

## CONSULTING

- AIG Inc., Sept. 2014 –.
- Silicon Valley Expert Witness Group (SVEWG), May 2009-
- MEI Inc., West Chester, PA, Oct 2009-Jan2010. Training and consulting in color and security imaging.
- Graphic Security Systems, FL: Subject matter expert in intellectual property litigation, May 2009-Aug 2011.
- Texas Instruments, Dallas, TX: Intellectual property assessment in the area of color display device and calibration technology, March 2009.
- Allied Security Trust, Poughkeepsie, NY: Patent evaluation, April – June 2008.
- NanoArk Corporation, Henrietta, NY: Image processing for archival applications, July 2008 – ,
- Consultant on R&D strategy and evaluation for Steve Hoover, Vice-President and Center Manager, Xerox Research Center Webster, Xerox Innovation Group, Xerox Corporation, January 2007 - December 2007.
- Consultant on R&D strategy and evaluation for Sid Dalal, Vice-President and Center Manager, Imaging and Services Technology Center, Xerox Innovation Group, Xerox Corporation, June 2005 – January 2006.
- Eastman Kodak Company, Rochester, NY: Intellectual property assessment in the area of imaging technology, March 2006 – April 2007.

## PROFESSIONAL SERVICE/ACTIVITIES

- Conference Co-Chair, *Media Watermarking, Security, and Forensics (MWSF)*, part of the IS&T Electronic Imaging Symposium, 28 January- 1 February 2018, San Francisco, California.
- Technical Program Co-Chair, IEEE International Conference on Image Processing (ICIP), 25 – 28 September 2016, Phoenix, AZ.
- Editor-in-Chief, SPIE/IS&T Journal of Electronic Imaging, 2011-2015.
- Symposium Chair, IS&T/SPIE Electronic Imaging Symposium, 3-7 February 2013, San Francisco, CA.



- Symposium Co-Chair, IS&T/SPIE Electronic Imaging Symposium, 22-26 January 2012, San Francisco, CA.
- Technical Program Co-Chair, IEEE International Conference on Image Processing (ICIP), 30 September – 3 October, 2012, Orlando, FL.
- Technical Program Co-Chair, IEEE Signal Processing Society 10th IVMSWP Workshop: Perception and Visual Signal Analysis, Ithaca, New York, USA, June 15-17, 2011.
- Member, Computer Science Industry Advisory Board (CS IAB), New York Institute of Technology, 2015.
- Conference Co-Chair, *Conference 9: Image Processing & Pattern Recognition*, part of the International Symposium on Optoelectronic Technology and Application 2014 (IPTA 2014), China National Convention Center, Beijing, China, 13-15 May 2014.
- Member, IEEE Spectrum, Editorial Advisory Board, 2014.
- Editorial Board Member for IS&T and Wiley text book series on Imaging Science and Technology, 2010-.
- Associate Editor, SPIE/IS&T Journal of Electronic Imaging, 2003-2010.
- Member, Ethics Subcommittee of the SPIE Board of Editors, 2014-2015.
- Editorial Board Member, Signal Processing Area, Journal of Electrical and Computer Engineering, Hindawi Publishing Corporation (Open Access), 2009-2010.
- Associate Editor, IEEE Transactions on Information Forensics and Security, 2004-2009.
- Editorial Board Member, Research Letters in Signal Processing, Hindawi Publishing Corporation (Open Access), 2008-2009.
- Associate Editor, IEEE Transactions on Image Processing, 2003-2008.
- Area Editor, IEEE Transactions on Image Processing, 2004-2007.
- Chair, IEEE Conference Publications Committee (CPC), 2017.
- Treasurer, IEEE Publication Services and Products Board, 2015 – 2017.
- Member of the Nominations and Awards Committee, IEEE Publication Services and Products Board, 2016.
- Member, IEEE Finance Committee (IEEE FinComm), 2015 – 2017.
- Member, IEEE Technical Activities Board (TAB) Finance Committee, 2015 – 2017.
- Member-at-large, IEEE Publication Services and Products Board, 2015-2017, appointed by IEEE Board of Directors.
- Member, IEEE Publication Services and Products (PSPB) Strategic Planning Committee, 2013- 2016.
- Member, IEEE Platform Guidance Group, 2015-.
- Member, IEEE Future Conference IP Ad Hoc, 2016-.
- Member, IEEE Signal Processing Society Conference Board Executive Subcommittee (CBES), 2015-2016.
- Academic and Industry Contributor, IEEE Signal Processing Society Public Visibility Initiative, 2015.
- Member, IEEE Signal Processing Society, Conference Board, 2014-2016.
- Member, Multimedia Signal Processing Technical Committee (MMSP-TC) of the IEEE Signal Processing Society, 2015-2017.
- Chair, Image, Video, and Multiple Dimensional Signal Processing Technical Committee (IVMSWP-TC) (of IEEE Signal Processing Society), 2010-2011.
- Vice-chair, IVMSWP-TC, 2008-2009.
- Past Chair, IVMSWP-TC, 2012-2013.
- Member, Symposium Task Force, IS&T/SPIE Electronic Imaging Symposium, San Francisco, CA, 2016.
- Member, Symposium Steering Committee, IS&T/SPIE Electronic Imaging Symposium, San Francisco, CA, 2012, 2013, 2014.
- Leader for Indo-US Collaboration on Engineering Education (IUCEE) workshop on “Digital Color Imaging,” Aug. 24, 2015, Seth Jai Parkash Mukand Lal Institute of Engineering & Technology( JMIT), Radaur, Yamunanagar, Haryana, India.

- Leader for Indo-US Collaboration on Engineering Education (IUCEE) workshop on “Effective Research Methodologies,” Mar. 11, 2015, Madanapalle Institute of Technology & Science, Madanapalle, Andhra Pradesh, India.
- Leader for Indo-US Collaboration on Engineering Education (IUCEE) workshop “Advanced Image Processing,” Jan. 10, 2015, Chitkara University, Chandigarh, India.
- Leader for Indo-US Collaboration on Engineering Education (IUCEE) research workshop “Research Avenues in Image Processing,” Aug. 13, 2014, PES University, Bangalore, India.
- Mentor for graduate students at Mentoring Sessions, 8th International Conference on Communication Systems and Networks (COMSNETS), January 5-9, 2016, Bangalore, India.
- Mentor, Joint Dept. of Science and Technology (DST)-Indo-US Collaboration on Engineering Education (IUCEE) Research Academy for women pursuing PhD in India, March 18-20, C.R.Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS), Hyderabad, India.
- Leader, Indo-US Collaboration on Engineering Education (IUCEE) Faculty Leadership Workshop on Digital Communications and Image Processing, June 05-09, 2011, Jaypee University of Engineering and Technology (JUET), A-B Road, Raghogarh, Madhya Pradesh, India.
- Leader, Indo-US Collaboration on Engineering Education (IUCEE) Faculty Leadership Workshop on Image Processing, July 05-09, 2010, Madanapalle Institute of Technology and Science (MITS), Madanapalle, Andhra Pradesh, India.
- Elected to the Image, Video, and Multiple Dimensional Signal Processing (IVMSP)<sup>1</sup> Technical Committee (of IEEE Signal Processing Society), term 2006–2012.
- Associate Member, IVMSP-TC, 2014–.
- Elected to the Information Forensics and Security (IFS) Technical Committee (of IEEE Signal Processing Society), term 2010–2012.
- Member of the Award Nominations Subcommittee for the Image and Multiple Dimensional Signal Processing (IMDSP) Technical Committee, 2006, 2007.
- Member IEEE Industry DSP Technology Standing Committee, 2005-2008.
- Advisory Member IEEE Industry DSP Technology Standing Committee, 2009-.
- Member IEEE Signal Processing Society and IEEE Communications Society.
- Served on the Society of Imaging Science and Technology’s Committees for selection of Editor-in-Chief for the Journal of Imaging Science and Technology (JIST), 2011.
- Reviewer for Progress Reports for American Association for the Advancement of Science (AAAS), Research Competitiveness Program for the King Abdulaziz City for Science and Technology (KACST), July 2017.
- Reviewer for Nebraska’s Experimental Program to Stimulate Competitive Research (EPSCoR) program, Reviews coordinated by American Association for the Advancement of Science (AAAS), Research Competitiveness Program, January 2017.
- Panelist for Review panel conducted by American Association for the Advancement of Science (AAAS), Research Competitiveness Program for the King Abdulaziz City for Science and Technology (KACST), November 2014.
- Reviewer, Samsung Research Funding Center for Future Technology (SRFC), March 2016, August 2016.
- Reviewer, NSERC (National Sciences and Engineering Research Council of Canada), March 2014.
- Ad-Hoc Reviewer for NSF Proposals, February, 2014.
- Reviewer, NSERC (National Sciences and Engineering Research Council of Canada), Jan 2014.
- Reviewer, NSF Panel, May, 2012.
- Reviewer, Research Grants Council (RGC) of Hong Kong, April 2012.
- Reviewer, NSERC (National Sciences and Engineering Research Council of Canada), Jan 2010.
- Reviewer, Louisiana Board of Regents, Pilot Funding for New Research (Pfund) program, Oct. 2009.
- Reviewer, NSF Panel, June, 2007.
- Reviewer, NSF Panel, May, 2006.

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<sup>1</sup>Prior to 2009, this committee was called the Image and Multiple Dimensional Signal Processing (IMDSP) Technical Committee.

- Chair, IEEE Rochester Section, 2007.
- Treasurer, IEEE Rochester Section, 2005, 2006.
- Chair, Rochester Chapter, IEEE Signal Processing Society, 2003.
- Vice-Chair, Rochester Chapter, IEEE Signal Processing Society, 2002.
- Treasurer, Rochester Chapter, IEEE Signal Processing Society, 2001.
- Secretary, Rochester Chapter, IEEE Signal Processing Society, 2000.
- Co-chair IEEE Rochester Section Nominating Committee, 2009.
- Chair IEEE Rochester Section Nominating Committee, 2008.
- Member of IEEE Rochester Section Audit Committee, 2007.
- Chair of IEEE Rochester Section Audit Committee 2008.
- Plenary Speaker Chair, *GENSIPS 2009: IEEE International Workshop on Genomic Signal Processing and Statistics*, May 17-21, 2009, Minneapolis, Minnesota.
- Short Course Program Chair, *IS&T/SPIE's Electronic Imaging Symposium*, 23-27 January 2011, San Francisco, CA.
- Short Course Program Co-Chair, *IS&T/SPIE's Electronic Imaging Symposium*, 17-21 January 2010, San Jose, CA.
- Tutorial Chair, *IS&T's NIP24: 24th International Congress on Digital Printing Technologies*, September 06-11, 2008, Pittsburgh, PA.
- Program Chair: Invited Papers, NIP 23, "23rd International Conference on Digital Printing Technologies," Sept. 16-21, 2007, Anchorage, Alaska.
- Panels Co-Chair, 8th International Conference on Communication Systems and Networks (COMSNETS), January 5-9, 2016, Bangalore, India.
- Workshops co-chair COMSWARE 2006, First International Conference on Communication Systems Software and Middleware (IEEE/ACM Sigmobil co-sponsored), Bangalore, India.
- Publications co-chair for IEEE International Conference on Image Processing (ICIP) 2002.
- Organizer and Chair, *2003 IEEE Western NY Image Processing Workshop*, Rochester, NY, Oct 17, 2003.
- Tutorial co-chair, *IS&T/SID 13th Color Imaging Conference*, 07-11 Nov. 2005, Scottsdale, AZ.
- Tutorial co-chair, *IS&T/SID 12th Color Imaging Conference*, 09-12 Nov. 2004, Scottsdale, AZ.
- Member of Jury for Student Paper Award Selections for *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 20 April 2009, Taipei, Taiwan.
- Moderator, "Trends in Image, Video, and Multidimensional Signal Processing," *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 25, 2011, Prague, Czech Republic.
- Session Chair, "Audiovisual and Cross-media Processing (MMSP-L2)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 9, 2017, New Orleans, LA.
- Session Co-Chair, "Video Segmentation and Tracking (IVMSP-P12)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 9, 2017, New Orleans, LA.
- Session Chair, "Encryption," *Media Watermarking, Security, and Forensics 2017, IS&T Electronic Imaging Symposium*, 30 Jan-01 Feb. 2017, San Francisco, CA.
- Session Chair, "MA-L6 – Visual Forensics", *International Conference on Image Processing (ICIP)*, Sept. 26, 2016, Phoenix, AZ.
- Session Chair, "Multimedia Forensics (IFS-P1)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 22, 2016, Shanghai, China.
- Session Co-Chair, "Video Tracking (IVMSP-L2)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 22, 2016, Shanghai, China.
- Session Chair, "Emotion and Action Recognition (MMSP-P2)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 24, 2016, Shanghai, China.

- Session Co-Chair, "Image Analysis and Applications (IVMSP-P13)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 25, 2016, Shanghai, China.
- Session Chair, "Watermarking," *Media Watermarking, Security, and Forensics 2016, IS&T Electronic Imaging Symposium*, 15-17 Feb. 2016, San Francisco, CA.
- Session Chair, "Optical Flow and Motion Estimation (ARS-P31)", *International Conference on Image Processing (ICIP)*, Sept. 28, 2015, Québec City, Canada.
- Session Chair, "Infrared, Multispectral and Hyperspectral imaging (ELI-P7)", *International Conference on Image Processing (ICIP)*, Sept. 30, 2015, Québec City, Canada.
- Session Co-Chair, "Color Deficiency," *Color Imaging XX: Displaying, Processing, Hardcopy, and Applications, IS&T/SPIE Electronic Imaging Symposium*, 9-12 Feb. 2015, San Francisco, CA.
- Session Chair, "Video/Demo and Keynote Session III," *Media Watermarking, Security, and Forensics 2015, IS&T/SPIE Electronic Imaging Symposium*, 9-11 Feb. 2015, San Francisco, CA.
- Session Chair, "Image Enhancement (IVMSP-L3)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 7, 2014, Florence, Italy.
- Session Chair, "Image Processing and Analysis", *Image Processing & Pattern Recognition*, part of the International Symposium on Optoelectronic Technology and Application, China National Convention Center, Beijing, China, 14 May 2014.
- Session Chair, "Pattern Recognition and Computer Vision", *Image Processing & Pattern Recognition*, part of the International Symposium on Optoelectronic Technology and Application, China National Convention Center, Beijing, China, 15 May 2014.
- Session Co-Chair, "Emerging Industry Signal Processing II (ITT-P1)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 31, 2013, Vancouver, Canada.
- Session Chair, "Interpolation and Super-resolution (IVMSP-L4)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 29, 2013, Vancouver, Canada.
- Session Chair, "View Synthesis (WP.L4)", *IEEE International Conference on Image Processing (ICIP)*, October 3, 2012, Orlando, FL, USA.
- Session Chair, "Image and Video Modeling, Biometrics, and Applications (IVMSP-P14)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 30, 2012, Kyoto, Japan.
- Session Co-Chair, "Technology to Practice for Signal Processing (ITT-P1)", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 28, 2012, Kyoto, Japan.
- Session Chair, "Saliency and Visual Perception," *IEEE Signal Processing Society 10th IVMSP Workshop: Perception and Visual Signal Analysis*, Ithaca, New York, USA, June 17, 2011.
- Session Chair, "Stereoscopic and 3-D Coding (IVMSP-L3)," *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 25, 2011, Prague, Czech Republic.
- Session Chair, "Stereoscopic and 3-D Processing (IVMSP-L4)," *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, March 17, 2010, Dallas, TX.
- Session Co-Chair, "Forensic Imaging (TA.L6)," *IEEE International Conference on Image Processing (ICIP)*, 28 Sept. 2010, Hong Kong.
- Session Co-Chair, "Identification," *Media Watermarking, Security, and Forensics XVI, IS&T/SPIE Electronic Imaging Symposium*, 3-6 Feb. 2014, San Francisco, CA.
- Session Chair, "Watermarking," *Media Watermarking, Security, and Forensics XIV, IS&T/SPIE Electronic Imaging Symposium*, 23-25 Jan. 2012, San Francisco, CA.
- Session co-organizer and co-chair, "Transportation Imaging," *Visual Information Processing and Communication*, 24-26 Jan. 2012, San Francisco, CA.
- Session Chair, "Forensics I," *Media Watermarking, Security, and Forensics XIII, IS&T/SPIE Electronic Imaging Symposium*, 24-26 Jan. 2011, San Francisco, CA.
- Session Chair, "Forensics I," *Media Forensics and Security XII, IS&T/SPIE Electronic Imaging Symposium*, 18-20 Jan. 2010, San Jose, CA.
- Session Chair, "Camera Calibration, Modeling, and Conditioning (TA.PG)," *IEEE International Conference on Image Processing (ICIP)*, 10 Nov. 2009, Cairo, Egypt.

- Session Chair, “Gene Regulatory Networks,” IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS), 18 May 2009, Minneapolis, Minnesota.
  - Session Chair, “Image Filtering (IVMSP-L2),” *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 21 April 2009, Taipei, Taiwan.
  - Session Chair, “Object Detection and Recognition,” *Visual Communications and Image Processing (VCIP)*, 20 Jan. 2009, San Jose, CA.
  - Session Chair, “Authentication,” *Media Forensics and Security XI, IS&T/SPIE Electronic Imaging Symposium*, 19-21 Jan. 2009, San Jose, CA.
  - Session Chair, “Steganography and Steganalysis I (TA-L5),” *IEEE International Conference on Image Processing (ICIP)*, 14 Oct. 2008, San Diego, CA.
  - Session Chair, “Feature Extraction and Analysis (IMDSP-L4),” *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 03 April 2008, Las Vegas, NV.
  - Session Chair, “Processing of Physiological Signals (BISP-P1),” *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 02 April 2008, Las Vegas, NV.
  - Session Chair, “Indexing and Retrieval,” *Visual Communications and Image Processing (VCIP)*, 29-31 Jan. 2008, San Jose, CA.
  - Session Chair, “Physical Media,” *Security, Forensics, Steganography, and Watermarking of Multimedia Contents X, Electronic Imaging Symposium* 28-30 Jan. 2008, San Jose, CA.
  - Session Chair, “Gamuts Galore,” *IS&T/SID Fifteenth Color Imaging Conference*, 9 Nov. 2007, Albuquerque, NM.
  - Session Chair, “TA-P2: Security III: Watermarking,” *IEEE International Conference on Image Processing (ICIP)*, 18 September, 2007, San Antonio, TX.
  - Session Chair, “Image Formation, Sampling, Display and Quality (IMDSP-P5),” *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 18 April 2007, Honolulu, HI.
  - Session Chair, NIP 22 IS & T Digital Printing Conference, “Security and Forensic Printing,” 20 Sept. 2006, Denver, CO.
  - Session Chair, “Digital Watermarking, Data Hiding and Steganography III (TP1-L1),” *International Conference on Multimedia and Expo (ICME)*, 11 July 2006, Toronto, Canada.
  - Session Chair, “Watermarking (IMDSP-L10),” *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 19 May 2006, Toulouse, France.
  - Session Chair, “Image Enhancement, Display & Rendering,” *International Congress of Imaging Science (ICIS)*, 09 May 2006, Rochester, NY.
  - Session Chair, “Printing,” *IS&T/SID Thirteenth Color Imaging Conference*, 10 Nov. 2005, Scottsdale, AZ.
  - Organizer and Session Chair, “Bioinformatics/Genomic Signal Processing,” *Thirty-Eighth Asilomar Conf. on Signals, Systems & Computers*, Nov. 2004.
  - Session Chair, “Image Scanning, Display, and Printing I,” *IEEE International Conference on Image Processing (ICIP)*, October 27 2004, Singapore.
  - Session Chair, “Color and lighting in computer images,” *IS&T/SID Eleventh Color Imaging Conference*, 04 Nov. 2003, Scottsdale, AZ.
  - Session Chair, “Digital image capture,” IS&T's PICS Conference, 22-25 April 2001, Montréal, Canada
  - Session Chair, “Device technology,” CGIV2002: First European Conference on Colour in Graphics, Imaging, and Vision, 3-5 April 2002, Poitiers, France.
  - Panel Moderator, “Worlds Collide: Should Government or Private Industry Take the Lead on National Development?” 8th International Conference on Communication Systems and Networks (COMSNETS), January 8, 2016, Bangalore, India.
  - Panel Discussion Moderator, IEEE Signal Processing Society 10th IVMSP Workshop: Perception and Visual Signal Analysis, Ithaca, New York, USA, June 17, 2011.
- 7
- Short Course Instructor, “M1: Color, Vision, and Basic Colorimetry,” 25th Color and Imaging Conference, Lillehammer, Norway, 11 Sept. 2017.

- Short Course Instructor, "T1A: Advanced Colorimetry and Color Appearance," 25th Color and Imaging Conference, Lillehammer, Norway, 12 Sept. 2017.
- Short Course Instructor, "EI10 Introduction to Digital Color Imaging," 29th annual International Symposium on Electronic Imaging, San Francisco, CA, 30 Jan. 2017.
- Short Course Instructor, "EI10 Introduction to Digital Color Imaging," 28th annual International Symposium on Electronic Imaging, San Francisco, CA, 14 Feb. 2016.
- Short Course Instructor, "Introduction to Digital Color Imaging", Sharp Laboratories of America, 13 April 2015.
- Short Course Instructor, "SC1154: Introduction to Digital Color Imaging", 27th annual Symposium on Electronic Imaging, San Francisco, CA, 8 Feb. 2015.
- Short Course Instructor, "Introduction to Color Imaging", Samsung Advanced Technology Training Institute (SATTI), Suwon, South Korea, 19 May 2014.
- Short Course Instructor, "System Optimization in Color Imaging Systems", Samsung Advanced Technology Training Institute (SATTI), Suwon, South Korea, 19 May 2014.
- Short Course Instructor, "Introduction to Digital Color Imaging", International Symposium on Optoelectronic Technology and Application, China National Convention Center, Beijing, China, 13 May 2014.
- Tutorial Instructor, "System Optimization in Digital Color Imaging," at IS&T's Eighteenth Color Imaging Conference, November 8, 2010, San Antonio, TX (with R. Bala).
- Tutorial Instructor, "System Interactions in Digital Color Imaging," at IS&T's Sixteenth Color Imaging Conference, November 11, 2008, Portland, OR (with R. Bala).
- Tutorial Instructor, "Color Imaging System Optimization," at IS&T's NIP24: 24th International Congress on Digital Printing Technologies, September 08, 2008, Pittsburgh, PA (with R. Bala).
- Tutorial Instructor, "System Interactions in Color Imaging," at IS&T's International Congress on Imaging Science (ICIS), May 07-11, 2006, Rochester, NY (with R. Bala).
- Tutorial Instructor, "System Interactions in Color Imaging," at IS&T's Thirteenth Color Imaging Conference, Nov 07-11, 2005, Scottsdale, AZ (with R. Bala).
- Tutorial Instructor, "System Interactions in Color Imaging," at IS&T's Twelfth Color Imaging Conference, Nov 09-12, 2004, Scottsdale, AZ (with R. Bala).
- Tutorial Instructor, "System Interactions in Color Imaging," at IS&T's Eleventh Color Imaging Conference, Nov 04-07, 2003, Scottsdale, AZ (with R. Bala).
- Tutorial Instructor, "Color image scanners," at IS&T's 11th Color Imaging Conference, Nov 12-15, 2002, Scottsdale, AZ.
- IEEE Student Branch Counselor, Univ. of Rochester Branch, Sept. 2003– Sept. 2008.
- Co-chair, University of Rochester, Bioinformatics cluster, Sept. 2006 – (with David H. Mathews).
- ICASSP 2011, Technical Program Committee, representative for Image, Video and Multidimensional Signal Processing areas.
- ICASSP 2010, Technical Program Committee, representative for Image, Video and Multidimensional Signal Processing areas.
- ICASSP 2009, Technical Program Committee, representative for Image, Video and Multidimensional Signal Processing areas.
- Technical Program Committee Member, Digital Image Processing and Analysis (DIPA), June 7-10, 2010, The Westin La Paloma, Tucson, AZ, USA.
- Program Committee Member, International Conference on Content Protection and Forensics (CPAF), July 11-15, 2011, Barcelona Spain.
- Area Chair, ICIP 2016 Technical Program Committee.
- Area Chair, ICIP 2015 Technical Program Committee.
- Area Chair, ICIP 2014 Technical Program Committee.
- Area Chair, ICIP 2012 Technical Program Committee.

- Area Chair, ICIP 2011 Technical Program Committee.
- Area Chair, ICIP 2010 Technical Program Committee.
- Area Chair, ICIP 2009 Technical Program Committee.
- Area Chair, ICIP 2008 Technical Program Committee.
- Area Chair, ICIP 2007 Technical Program Committee.
- Area Chair, ICASSP 2015 Technical Program Committee
- Area Chair, ICASSP 2014 Technical Program Committee
- Area Chair, ICASSP 2013 Technical Program Committee
- Area Chair, ICASSP 2012 Technical Program Committee
- Area Chair, ICASSP 2011 Technical Program Committee
- Area Chair, ICASSP 2010 Technical Program Committee
- Area Chair, ICASSP 2009 Technical Program Committee
- Area Chair, ICASSP 2008 Technical Program Committee.
- Area Chair, ICASSP 2007 Technical Program Committee.
- Jury Member, DoCoMo USA Labs Innovative Paper Awards, for *IEEE International Conference on Image Processing (ICIP)*, 2008.
- External Examiner and Advisor, Research Week for faculty pursuing PhD in India, March 27-29, 2014, Gujarat Technical University, Ahmedabad, India.
- External Examiner and Advisor, Research Week for faculty pursuing PhD in India, March 21-22, 2013, Gujarat Technical University, Ahmedabad, India.
- Judge, Seventh IEEE Student Design Contest, 05 May 2007, Rochester Institute of Technology, Rochester, NY.
- Judge, FIRST LEGO League Qualifying Tournament, 17 November, 2012, Webster Spry Middle School, Webster, NY.
- Judge, FIRST LEGO League Qualifying Tournament, 20 November, 2010, Webster Spry Middle School, Webster, NY.
- Mentor, University of Rochester (UR) Data Dive, Community outreach event, October 25, 2015.
- Judge, FIRST LEGO League NanoQuest Competition, 03 December, 2006, Rochester, NY.
- Judge, Student Poster Contest, *Thirty-Eighth Asilomar Conf. on Signals, Systems & Computers*, Nov. 2004.
- Session Chair, "Image Processing Oral Session 5," *International Conference on Image Information Processing (ICIIP)*, Wanknaghat, Shimla, Himachal Pradesh, India, Nov. 4, 2011.
- Session Chair, "Security and Forensic Imaging," 2007 Western NY Image Processing Workshop, organized by IEEE Signal Processing Society, Rochester Section, Sept 28, 2007.
- Session Chair, "Color, Document, and Medical Imaging," 2005 Western NY Image Processing Workshop, organized by IEEE Signal Processing Society, Rochester Section, Sept 30, 2005.
- Session Chair, "Document Image Processing," 2004 Western NY Image Processing Workshop, organized by IEEE Signal Processing Society, Rochester Section, Sept 24, 2004.
- Technical program/Paper Review committee member for
  - IEEE International Conference on Image Processing (ICIP) 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017.
  - IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017.
  - IEEE International Symposium on Circuits & Systems (ISCAS), 2016, 2017.
  - IEEE Emerging Signal Processing Applications (ESPA) Conference 2012.
  - International Conference on Computer Vision Theory and Applications (VISAPP) 2012, 2013, 2015, 2018.

- 8th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISAPP), Feb. 21-24, 2013, Barcelona, Spain.
- International Conference on Photonics, Optics and Laser Technology (PHOTOPTICS), 2017, 2018.
- IEEE International Conference on Communications (ICC) 2010.
- Media Watermarking, Security, and Forensics 2018, San Francisco, CA, 28 Jan-1 Feb. 2018, San Francisco, CA (part of IS&T Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics 2017, San Francisco, CA, 29 Jan-2 Feb. 2017, San Francisco, CA (part of IS&T Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics 2016, San Francisco, CA, 14-18 Feb. 2016, San Francisco, CA (part of IS&T Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics 2015, San Francisco, CA, 9-11 Feb. 2015, San Francisco, CA (part of IS&T/SPIE Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics XVI, San Francisco, CA, February 2014 (part of IS&T/SPIE Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics XV, San Francisco, CA, 3 – 7 February 2013 (part of IS&T/SPIE Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics XIV, San Francisco, CA, 22 – 26 January 2012 (part of IS&T/SPIE Electronic Imaging Symposium).
- Media Watermarking, Security, and Forensics XIII, San Francisco, CA, 24 – 26 January 2011 (part of IS&T/SPIE Electronic Imaging Symposium).
- Visual Information Processing and Communication (VIPIC), (part of the IS&T Electronic Imaging Symposium), 2017.
- Visual Information Processing and Communication (VIPIC), (part of the IS&T Electronic Imaging Symposium), 2016.
- Visual Information Processing and Communication (VIPIC), (part of the IS&T/SPIE Electronic Imaging Symposium), 2010, 2011, 2012, 2013, 2014, 2015.
- IEEE International Workshop on Information Security and Forensics (WIFS), Guangzhou, China, 2013.
- IEEE International Workshop on Information Security and Forensics (WIFS), Tenerife, Spain, 2012.
- IEEE International Workshop on Information Security and Forensics (WIFS), Seattle WA, 2010.
- Computational Color Imaging Workshop (CCIW) (sponsored by the International Association for Pattern Recognition (IAPR)), 2013.
- 2013 IEEE International Conference on Electronics, Computing, Communication Technologies (CONECCT2013), Bangalore, India.
- International Workshop on Activity Monitoring by Multiple Distributed Sensing (AMMDS 2013), part of the Tenth IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS) 2013, Krakow, Poland, Aug. 27, 2013.
- Eighth IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS) 2011, Klagenfurt University, Aug. 30 – Sept. 02, 2011.
- International ACM Workshop on Multimedia in Forensics and Intelligence (MiFor 2011),
- Media Forensics and Security XII, 2010 (part of IS&T/SPIE Electronic Imaging Symposium).
- Media Forensics and Security XI, 2009 (part of IS&T/SPIE Electronic Imaging Symposium).
- Security, Steganography and Watermarking of Multimedia Contents VIII (2006), IX (2007), X (2008) (part of the IS&T/SPIE Electronic Imaging Symposium).
- Visual Communications and Image Processing (VCIP), 2007, 2008, 2009, 2010 (part of IS&T/SPIE Electronic Imaging Symposium).
- IEEE International Conference on Multimedia and Expo (ICME) 2007, 2008, 2009, 2011.
- IS &T/SID Color Imaging Conference 2004, 2005, 2006, 2008, 2010.
- IEEE Signal Processing Society Rochester Chapter, Western New York Image Processing Workshop, 2011.
- International Conference on Signal Processing and Communications (SPCOM) 2010.
- Seventh International Symposium on Image and Signal Processing and Analysis (ISPA), September 4-6, 2011, Dubrovnik, Croatia.
- 2011 International Conference on Image Information Processing (ICIIP 2011), Shimla, Himachal Pradesh, India.
- IEEE Signal Processing Society 2017 International Workshop on Multimedia Signal Processing (MMSP 2017), London-Luton, UK.
- IEEE Signal Processing Society 2015 International Workshop on Multimedia Signal Processing (MMSP 2015), Xiamen, China.



- IEEE Signal Processing Society 2012 International Workshop on Multimedia Signal Processing (MMSP 2012), Banff, Canada.
- IEEE Signal Processing Society 2011 International Workshop on Multimedia Signal Processing (MMSP 2011), Hangzhou, China.
- IEEE Signal Processing Society 2007 International Workshop on Multimedia Signal Processing (MMSP 2007), Chania, Crete, Greece.
- IEEE Signal Processing Society 2006 International Workshop on Multimedia Signal Processing (MMSP 2006), Victoria, BC, Canada.
- 2015 Military Communications Conference (MILCOM), October 26–28, 2015, Tampa, FL.
- 2012 Military Communications Conference (MILCOM), October 29–November 1, 2012, Orlando, FL.
- International Conference on Signal Processing, Computing and Control (ISPCC)2012, Waknaghat, Himachal Pradesh, India.
- International Workshop on Multimedia Content Representation, Classification, and Security (MRCS), Sept 11-13, 2006, Istanbul, Turkey.
- ACM Multimedia Security Workshop, 2005.
- European Signal Processing Conference (EUSIPCO) 2005.
- Colour in Graphics, Imaging, and Vision (CGIV) 2004, 2006.
- IEEE International Conference Circuits and Systems (ISCAS) 2004.
- SAFE 2007: Workshop on Signal Processing Applications for Public Security and Forensics
- COMNETS 2005, 2<sup>nd</sup> IEEE/Create-Net International Workshop on Deployment Models and First/Last Mile Networking Technologies for Broadband Community Networks.
- Colour in Graphics and Image Processing 2000.
- Systems Cybernetics and Informatics (SCI) 2000.
- International Conference on Computer, Communication and Control Technologies: CCCT'03.
- IPSI-2005.
- Western NY Image Processing Workshop, Rochester, NY, 2005, 2007.
- IEEE Upstate New York Workshop on Communications and Networks, 2007.
- Member, CIE Technical Committee TC1-89, Enhancement of Images for Colour Defective Observers
- Member, CIE Technical Committee TC8-07, Multi-spectral Imaging
- Reviewer
  - IEEE Transactions on Image Processing
  - IEEE Transactions on Information Forensics and Security
  - Nucleic Acids Research (*Oxford Journals*).
  - IEEE Transactions on Signal Processing
  - IEEE Signal Processing Letters
  - IEEE Signal Processing Magazine
  - IEEE Transactions on Information Theory
  - Signal Processing (*EURASIP Journal*)
  - Signal Image and Video Processing (*Springer Journals*)
  - IEEE Transactions on Knowledge and Data Engineering
  - IEEE Transactions on Communications
  - IEEE Journal of Selected Areas in Communications
  - IEEE Transactions on Circuits & Systems for Video Technology (CSVT)
  - IEEE Transactions on Circuits & Systems II
  - IEE Proceedings on Information Security
  - IET Circuits, Devices & Systems
  - IET Computer Vision
  - Signal Processing: Image Communication (*EURASIP*)
  - Journal of Electronic Imaging
  - Color Research and Application
  - Journal of Optical Society of America (A)

- Computer Vision and Image Understanding
- Journal of Imaging Science and Technology
- Journal of Society for Information Display
- Image Communication Journal
- Optical Engineering
- ETRI Journal (Korea)
- Energies
- Security and Communication Networks (*Wiley*)
- Journal of Systems and Software
- Pattern-Recognition Letters
- Real-time Imaging
- Journal of Digital Libraries
- Springer-Verlag
- Cambridge University Press
- Oxford University Press
- John Wiley & Sons
- CRC Press
- SPIE Press

#### SELECTED ARTICLES FEATURING RESEARCH IN POPULAR PRESS/WEB

- “Colored Lights Reveal Hidden Images,” by Paula M. Powell, *Photonics Spectra*, September 2003.
- “Eyecatcher from Xerox,” article by Ben Rand, *Rochester Democrat and Chronicle*, July 18, 2003, pp. 12D, 8D.
- “Disappearing Act: Xerox Researchers Demonstrate Color Prints with Images that Switch Under Different Colored Lights,” featured article on [www.xerotechnology.com](http://www.xerotechnology.com), May 15, 2003.
- “Unretouched by human hand,” article by Michael Behar *The Economist*, December 14-20, 2002, pp. 8,10.
- “Reversible data hiding embeds data in pictures,” *E4Engineering.com*, Nov. 29, 2002.
- “Digital data hiding pulls a reverse,” report by Daniel C. McCarthy on reversible data hiding work, *Photonics Spectra*, November 2002, pp. 23.
- “Encryption method getting the picture,” by Sandeep Junnarkar, *CNet News.com*, October 23, 2002.
- “Researchers discover imaging technique,” by Smriti Jacob, *Rochester Business Journal*, Daily (online) edition, September 26, 2002.
- “Researchers discover better way to embed, remove hidden data in digital images,” *Vision Systems Design*, (online) September 24, 2002.
- “New technique promises better digital watermarks,” by Dan Orzech, *CIO Information Network*, published (online) September 24, 2002.
- “Xerox, University of Rochester Researchers Discover Better Way to Embed, Remove Hidden Data in Digital Images,” featured article on [www.xerotechnology.com](http://www.xerotechnology.com), September 23, 2002.