

Curriculum Vitae of MAJEED M. HAYAT

Professor of Electrical and Computer Engineering
Associate Director, Center for High Technology Materials
General Chair, Optical Science & Engineering
University of New Mexico

TEL: (505) 272-7095, (505) 328-1826 (C); FAX: (505) 272-7801
E-mail: hayat@ece.unm.edu; www.ece.unm.edu/faculty/hayat/main.htm

EDUCATION

Ph.D., Dec. 1992, Electrical and Computer Engineering, University of Wisconsin-Madison
(Communications & Signal Processing)

M.S., May 1988, Electrical and Computer Engineering, University of Wisconsin-Madison

B.S. (Summa Cum Laude), Aug. 1985, Electrical Engineering, University of the Pacific,
Stockton, CA

EMPLOYMENT

- University of New Mexico, Center for High Technology Materials
Associate Director, 2012 – present
- University of New Mexico, Optical Science and Engineering Program
General Chair, 2011 – present
- University of New Mexico, Department of Electrical and Computer Engineering
Professor, 2007 – present
Associate Professor, 2001 – 2006
- University of Dayton, Electro-Optics Program and the Department of Electrical and Computer Engineering
Associate Professor: May 2001 – Aug. 2001
Assistant Professor: Aug. 1996 – May 2001
- U. S. Air Force Wright Laboratory, Avionics Directorate, Ohio
Faculty Research Associate, Faculty Summer Research Program: May 1997 – Aug. 1997
- University of Wisconsin-Madison, Department of Electrical and Computer Engineering
Research Associate (Project Co-Director) and Lecturer: Jan. 1993 – Aug. 1996

AWARDS, HONORS & AFFILIATIONS

- Fellow, OSA, 2013
- Fellow, SPIE, 2012
- Senior Faculty Research Excellence Award, School of Engineering, Univ. New Mexico, 2012
- 2012 Annual Creative Award for issued U.S. Patents No. 7,961,975 and 8,071,945, STC.UNM, University of New Mexico
- Outstanding Teacher Award, ECE Dept., University of New Mexico, 2010

- 2008 Annual Creative Award for issued U.S. Patents No. 7,217,951 and 7,271,405, STC.UNM, University of New Mexico
- 2007 Annual Creative Award for issued U.S. Patent No. 7,132,648, STC.UNM, University of New Mexico
- Chief Scientist Award for Excellence, 2006, National Consortium for MASINT Research (NCOM), the Defense Intelligence Agency
- Outstanding Researcher Award, Department of Electrical & Computer Engineering, University of New Mexico, 2005
- The Lawton-Ellis Award, Department of Electrical & Computer Engineering, University of New Mexico, 2003
- NSF CAREER Award, 1998
- AFOSR Faculty Summer Research Fellowship, 1997
- Bachelors degree with highest honors (Summa Cum Laude), University of the Pacific, 1985
- Scholarship for undergraduate studies from the Ministry of Education, Kuwait, 1981–1985
- Scholarship for graduate studies from the Ministry of Higher Education, Kuwait, 1987–1992
- Senior Member, IEEE

RESEARCH

Areas of interest

- **Algorithms and concepts for multidimensional imaging:** Algorithms for compressive spectral imaging; algorithms for co-registered vibrometry and imaging in synthetic-aperture radar; fundamental limits of photon information content and image fidelity in 3D imaging
- **Image processing:** Shutterless non-uniformity correction algorithms for thermal and spectral imagers; statistical modeling of spatial noise; motion estimation; speckle-noise modeling and compensation
- **Networked distributed computing:** Novel queuing models for distributed systems and networks with uncertain dynamic topologies; queuing models for cloud computing; performance and reliability; constrained optimal load balancing; fundamental rate-distortion limits of performance and information flow in networked computing
- **Smart grids:** Probabilistic modeling of cascading failures and their dynamics; characterization of blackout probability and precursors to blackouts, interdependencies between distribution and transmission layers; role of communication infidelity on grid control and cascading failures
- **Avalanche photodiodes:** Theory of impact ionization; impact ionization in nanoscale structures, novel concepts for ultrafast and low-noise avalanche photodiodes; impact-ionization–engineering concepts for linear and Geiger modes of operation; negative feedback for improved photon counting
- **Communication theory and optical communication:** Probabilistic analysis of ultrafast receivers and equalizer design for lightwave systems; intersymbol interference; large deviations, quick Monte-Carlo simulation of receiver performance

Summary of received research funds**Over \$12.4M in total as PI or Co-PI****Over \$7.5M as PI****History of annual research expenditure as PI since 2008**

2008: \$467,000; 2009: \$585,000; 2010: \$534,300;

2011: \$427,000; 2012: \$607,000; 2013 projection: >\$600,000

Research awards and contracts

1. Defense Threat Reduction Agency, “Probabilistic Characterization of Precursors to WMD-induced Cascading Failures in the Electric-cyber Infrastructure: An Integrated Physical-Social Network Approach,” **PI: M. M. Hayat**; Co-PIs: A. Mammoli and N. Ghani, **\$1,050,000**, estimated dates: Jan. 2013-Dec. 2015. (Award notification has been received.)
2. Department of Energy (NNSA, NA-22), “Remote Detection and Recognition of Concealed Machinery: A Co-registered Vibration-Estimation and Imaging Approach,” **PI: M. M. Hayat**; Co-PIs: B. Santhanam and W. Gerstle, **\$899,000**; estimated dates: 04/01/2013-3/31/2015. (Award pending.)
3. Defense Threat Reduction Agency, “Implementation of Paradigms for Survivability of Cyber-Infrastructure Backbone Networks Against WMD Attacks Over Real Network Environments,” **PI: N. Ghani, Co-PI: M. M. Hayat**; **\$1,050,000**, estimated dates: Dec. 2012–Dec. 2015. (Award notification has been received.)
4. Qatar National Research Foundation (via sub-award from Qatar University), “New Paradigm for Robust Cloud Networking Services,” **PI: N. Ghani, Co-PI: M. M. Hayat**, **\$262,500**, Nov. 2012–Nov. 2015.
5. Science and Technology Corporation (STC.UNM) GAP Funding, “At Last: Inexpensive Ultrafast Telecom Optical Receivers with Ultra Low-Cost Photodetector Technology,” **PI: M. M. Hayat**, Co-PI: P. Zarkesh-Ha, **\$25,000**, Dec. 2012–Nov. 2013.
6. Naval Postgraduate School (via Naval Supply Fleet Logistics Center), National Consortium for MASINT Research, Defense Intelligence Agency, “Co-registered Vibrometry and Imaging: A Combined Synthetic-Aperture Radar and Fractional-Fourier Transform Approach,” **PI: M. M. Hayat**; Co-PIs: B. Santhanam, W. Gerstle and T. Atwood; **\$393,000**, Oct. 2011–Mar. 2013.
7. Defense Threat Reduction Agency, “Modeling and Mitigating Cascading Failures in Coupled Distributed Power Grid and Communication Networks,” **PI: M. M. Hayat**; Co-PIs: A. Mammoli, Y. Mostofi and P. Bridges; **\$353,000.**, Aug. 2010–Feb. 2012.
8. National Science Foundation (Award ECCS-0925757), “A Reconfigurable Readout Circuit for Integrated Infrared Spectral Sensing,” **PI: P. Zarkesh-Ha, Co-PIs: M. M. Hayat and S. Krishna**; **\$450,000**; Aug. 2009 –Aug. 2012.
9. Department of Energy (NNSA), “Algorithms and Methodologies for Detecting Vibrations using Synthetic Aperture Radar: A Fractional-Fourier Transform Approach,” **PI: M. M. Hayat**; Co-PIs: B. Santhanam, W. Gerstle, and J. Simpson; **\$845,000**; Sep. 2008–Sep. 2012.

10. Defense Threat Reduction Agency, “Paradigms for Survivability of Cyber-Infrastructure Backbone Networks Against WMD Attacks, PI: N. Ghani, **Co-PI: M. M. Hayat**; **\$450,000**; Apr. 2009–Apr. 2012.
11. Defense Threat Reduction Agency, “An Adaptive Probabilistic Approach for Maximal Reliability of Distributed Networks in the Presence of WMD Stressors, **PI: M. M. Hayat**; Co-PIs: Y. Mostofi and P. Bridges, **\$880,000**; Aug. 2008–Aug. 14, 2010.
12. National Science Foundation (Award No. IIS-0813747) [from the Defense Intelligence Agency, National Consortium for Measures and Signatures Intelligence (MASINT) Research], “Co-registered Vibrometry and Imaging: A Combined Synthetic-Aperture Radar and Fractional-Fourier Transform Approach,” **PI: M. M. Hayat**; Co-PIs: B. Santhanam and W. Gerstle; **\$476,000** (including REU and Undergraduate Scholars supplements), Jun. 2008–Aug. 2012.
13. Defense Threat Reduction Agency, “Robust Functionality and Active Data Management for Cooperative Networks in the Presence of WMD Stressors,” **PI: M. M. Hayat**, Co-PI: P. Bridges, **\$400,000**, Jul. 2007–Jun. 2009.
14. National Consortium for Measures and Signatures Intelligence (MASINT) Research Partnership Program, “Intelligent and Adaptable Spectral-Sensing Systems Based on Tunable Infrared Super Quantum-dot Focal Plane Arrays,” , Lead PI: Dr. Elizabeth Cantwell (Los Alamos National Laboratory), **UNM PI: M. M. Hayat**, Co-PIs: S. Krishna, S. Brueck, and J. S. Tyo; **UNM’s budget: \$735,000**, total budget: \$850,000, Apr. 2007–Feb. 2009.
15. National Science Foundation (Award ECS-0601645), “Collaborative research: Impact ionization engineered and nanoscale quantum-dot based avalanche photodiodes for reliable near-to long-wave infrared photon counting,” **PI: M. M. Hayat**; Co-PIs: S. Krishna and J. C. Campbell (University of Virginia); total award: \$299,000; UNM’s budget: **\$200,000**, Jun. 2006–Jun. 2010.
16. Sandia National Laboratories, “Novel signal processing strategies for remote detection of vibrational signals,” **PI: M. M. Hayat**, **\$125,000**, May 2007–May 2009.
17. Sandia National Laboratories, “Image processing strategies for long-wavelength synthetic aperture radar,” **PI: M. M. Hayat**, **\$35,000**; Jul. 2006–Aug. 2007.
18. National Science Foundation (Award ECS-0334813), “Collaborative research on optical communication and ultrafast optical networks: Bandgap engineered ultrafast heterostructure avalanche photodiodes,” **PI: M. M. Hayat**; **\$163,000**; Sep. 2003–Dec. 2006.
19. National Science Foundation (Award ECS-0428756), “Sensors and sensor networks (SST): Mid infrared avalanche photodiodes based on nanoscale quantum dots,” PI: S. Krishna, **Co-PI: M. M. Hayat**, **\$400,000**, Oct. 2004–Sep. 2008.
20. National Science Foundation (Award CNS-0312611), “Collaborative research on information technology research: Modeling and mitigation of communication-delay effects on load balancing in large-scale distributed systems,” **PI: M. M. Hayat**; Co-PIs: C. T. Abdallah, J. D. Birdwell (U Tennessee), J. Chiasson (U Tennessee); total award: \$362,000; UNM’s portion: **\$192,246** (including REU supplements); Aug. 2003 – Dec. 2006.
21. National Science Foundation (Award ECS-0401154), “Spectrally adaptive smart sensors based on nanoscale quantum dots,” PI: S. Krishna; **Co-PIs: M. M. Hayat** and J. S. Tyo; **\$216,000** (including an REU supplement); May 2004–Apr. 2008.

22. National Science Foundation (Award IIS-0434102), [from the National Consortium for MASINT Research, Defense Intelligence Agency], “Quantum-dot sensors for MASINT applications,” PI: S. Krishna, **Co-PIs: M. M. Hayat** and J. S. Tyo; **\$562,816** (including an REU supplement); Aug. 2004–Aug. 2007
23. Air Force Research Laboratory [through OptiMetrics Inc., WPAFB, Ohio], “Instantaneous feature extraction for characterization of engine vibrations,” PI: B. Santhanam, **Co-PI: M. M. Hayat**, **\$60,030**, Aug. 2005–Dec. 2006
24. Air Force Office for Scientific Research, “Calibration and compensation of instrumental errors in imaging polarimeters,” PI: J. S. Tyo, **Co-PI: M. M. Hayat**, **\$175,485**, May 2005–Apr. 2008.
25. Air Force Office for Scientific Research, “DURIP: Infrared imaging polarimeter testbed at UNM,” PI: J. S. Tyo, **Co-PI: M. M. Hayat**, **\$177,951**, May 2005–Apr. 2006.
26. National Science Foundation (Award ECS-0196569), “Modeling and optimization of ultra-fast and low-noise avalanche photodiodes in optical communications,” **PI: M. M. Hayat**; **\$311,830** (including an REU supplement); Co-PIs: J. C. Campbell (UT-Austin) and Y. Pan (Georgia State University); Aug. 2001–Dec. 2004.
27. National Reconnaissance Organization, Director’s Innovative Initiative (DII) Program, “Spectrally adaptive focal plane arrays based on tunable quantum-dot infrared detectors,” PI: S. Krishna, Co-PIs: **M. M. Hayat** and J. S. Tyo; **\$350,000**, Oct. 2003– Oct. 2004.
28. Sandia National Laboratories, “Multispectral rock-type classification,” **PI: M. M. Hayat**, **\$49,935**; Mar. 2003–Oct. 2003.
29. National Science Foundation CAREER Award (Award MIP-9733308), “Statistical modeling and real-time correction of nonuniformity in array sensors,” **PI: M. M. Hayat**, **\$209,955**, Apr. 1998–Mar. 2002.
30. ITT Industries, Aerospace and Communications Division, Forte-Wayne, IN, “High performance Heterodyne detection of optical signals using photon-correlated beams,” **PI: M. M. Hayat**, **\$56,432**, Jul. 2000–Jun. 2001
31. Air Force Research Laboratory (through Wyle Laboratories, Dayton, OH), Wright-Patterson AFB, Ohio, “Model-based algorithms for nonuniformity correction in focal-plane array detectors,” **PI: M. M. Hayat**; **\$80,240**, Oct. 1997–Sep. 1999.
32. Air Force Office for Scientific Research (AFOSR/RDL), Faculty Summer Research Program, **\$8,000**, May–Aug. 1997.
33. Technology/Scientific Services, Inc., Dayton, OH, “Image intensity recovery from shot-noise data using projections on function spaces,” **PI: M. M. Hayat**, **\$18,547**, Oct. 1996–Aug. 1997.
34. Office of Naval Research, “Minefield modeling,” PI: John A. Gubner, **Co-PI: M. M. Hayat**, **\$322,120**, Jan. 1994–Dec. 1996.

Proposals under review

1. AFOSR, “Fundamental limits of networked computing over dynamic topology: Interplay between performance and communication overhead,” **PI: M. M. Hayat**, Co-PI: D. Dietz, **\$716,290**, 04/01/13–3/31/16.

2. NSF, “Collaborative Research: Three Dimensional Nanoscale Single Photon Avalanche Diodes,” **Co-PI: M. M. Hayat** (collaboration with UCLA, D. Huffaker, PI), **\$235,000** (UNM budget), 05/01/2013–04/30/2016.

Publications

Summary

Total peer reviewed journal publications: 82

Total conference proceeding: over 99

Total citations: over 2,650, including 4 research articles with over 100 citations

H-Index: 27

For detailed citation analysis see scholar.google.com/citations?user=dHG-J2cAAAAJ&hl=en

Top 12 cited publications: (underlined authors are Hayat's students)

1. S. N. Torres and M. M. Hayat, "Kalman filtering for adaptive nonuniformity correction in infrared focal plane arrays," *Journal of the Optical Society of America A*, vol. 20, pp. 470–480, 2003. Citations: 162.
2. M. M. Hayat, B. E. A. Saleh, and M. C. Teich, "Effect of dead space on gain and noise of double-carrier multiplication avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 39, pp. 546–552, 1992. Citations: 149, including a citation in *Nature*.
3. M. M. Hayat, S. N. Torres, E. E. Armstrong, S. Cain, and B. Yasuda, "Statistical algorithm for nonuniformity correction in focal-plane arrays," *Applied Optics*, vol. 38, no. 8, pp. 772–780, 1999. Citations: 137.
4. R. C. Hardie, M. M. Hayat, E. Armstrong and B. Yasuda, "Scene based non-uniformity correction using video sequences and registration," *Applied Optics*, vol. 39, no. 8, pp. 1241–1250, 2000. Citations: 117.
5. B. M. Ratliff, M. M. Hayat, and R. C. Hardie, "An algebraic algorithm for nonuniformity correction in focal-plane arrays," *The Journal of the Optical Society of America A*, vol. 19, pp. 1737–1747, September 2002. Citations: 90.
6. S. C. Cain, M. M. Hayat, and E. E. Armstrong, "Projection-based image registration in the presence of fixed-pattern noise," *IEEE Trans. Image Processing*, vol. 10, no. 12, pp. 1860–1872, 2001. Citations: 82.
7. S. Dhakal, M. M. Hayat, J. E. Pezoa, C. Yang, and D. A. Bader, "Dynamic load balancing in distributed systems in the presence of delays: A regeneration-theory approach," *IEEE Trans. Parallel and Distributed Systems*, vol. 18, pp. 485–497, 2007. Citations: 82.
8. M. M. Hayat, W. L. Sargeant, and B. E. A. Saleh, "Effect of dead space on gain and noise in Si and GaAs avalanche photodiodes," *IEEE J. Quantum Electronics*, vol. 5, pp. 1360–1365, 1992. Citations: 76.
9. Ü. Sakoğlu, J. S. Tyo, M. M. Hayat, S. Raghavan, and S. Krishna, "Spectrally adaptive infrared photodetectors using bias-tunable quantum dots," *J. Optical Society of America B*, vol. 21, pp. 7-17, 2004. Citations: 71.
10. B. E. A. Saleh, M. M. Hayat, and M. C. Teich, "Effect of dead space on the excess noise factor and time response of avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 37, pp. 1976–1984, 1990. Citations: 69.
11. M. A. Saleh, M. M. Hayat, P. Sotirelis, A. L. Holmes, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Impact-ionization and noise characteristics of thin III–V avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 48, pp. 2722–2731, 2001. Citations: 69.
12. M. M. Hayat and B. E. A. Saleh, "Statistical properties of the impulse response function of double-carrier multiplication avalanche photodiodes including the effect of dead space," *IEEE J. Lightwave Technology*, vol. 10, pp. 1415–1425, 1992. Citations: 64.

Refereed journal publications

1. Q. Wang, M. Pepin, Member, A. Wright, R. Dunkel, T. Atwood, B. Santhanam, W. Gerstle, A. W. Doerry, and M. M. Hayat, "Reduction of Vibration-induced Artifacts in Synthetic Aperture Radar Imagery," *IEEE Trans. Geoscience & Remote Sensing*, in press, 2013.
2. J. E. Pezoa and M. M. Hayat, "Reliability of Heterogeneous Distributed Computing Systems in the Presence of Correlated Failures," *IEEE Trans. Parallel and Distributed Systems*, in press, 2013.
3. G. M. Williams, D. A. Ramirez, M. M. Hayat, and A. S. Huntington, "Discrimination of Photon- and Dark-Initiated Signals in Multiple Gain Stage Avalanche Photodiode Receivers," *IEEE Trans. Electron Devices*, in press, 2013.
4. G. M. Williams, D. A. Ramirez, M. M. Hayat, and A. S. Huntington, "Time resolved gain and excess noise properties of InGaAs/InAlAs avalanche photodiodes with cascaded discrete gain layer multiplication regions," *Journal of Applied Physics*, vol. 113, pp. 093705-1–093705-11, 2013.
5. G. M. Williams, M. Compton, D. A. Ramirez, M. M. Hayat, and A. S. Huntington, "Multi-gain-stage InGaAs Avalanche Photodiode with Enhanced Gain and Reduced Excess Noise," *IEEE Journal of Electron Devices Society*, vol. 1, pp. 54–65, 2013.
6. Q. Wang, M. Pepin, A. Wright, R. Dunkel, T. Atwood, B. Santhanam, "Reduction of vibration-induced artifacts in synthetic aperture radar imagery," *IEEE Trans. Geoscience & Remote Sensing*, vol. 50, pp. 4145–4156, 2012.
7. P. Senanayake, C-H. Hung, A. Farrell, D. A. Ramirez, J. Shapiro, C-K. Li, Y-R. Wu, M. M. Hayat, and D. L. Huffaker, "Thin 3D Multiplication Regions in Plasmonically Enhanced Nanopillar Avalanche Detectors," *Nano Lett.*, vol. 12, pp. 6448–6452, 2012.
8. W-Y Jang, M. M. Hayat, P. Zarkesh-Ha, and S. Krishna, "Continuous time-varying biasing approach for spectrally tunable infrared detectors," *Optics Express*, vol. 20, no. 28, pp. 29823–29836, 2012.
9. M. M. Hayat, S. Narravula, M. Peppin, B. Javidi, "Information content per photon versus image fidelity in 3D photon-counting integral imaging," *J. Optical Society of America A*, vol. 29, pp. 2048-2057, 2012.
10. M. M. Hayat, and D. A. Ramirez, "Multiplication Theory for Dynamically Biased Avalanche Photodiodes: New Limits for Gain Bandwidth Product," *Optics Express*, vol. 20, no. 7, pp. 8024–8040, 2012.
11. Q. Wang, M. Pepin, R. J. Beach, R. Dunkel, T. Atwood, B. Santhanam, W. Gerstle, and M. M. Hayat, "SAR-based Vibration Estimation using the Discrete Fractional Fourier Transform," *IEEE Trans. Geoscience & Remote Sensing*, vol. 50, pp. 4145–4156, 2012.
12. J. E. Pezoa and M. M. Hayat, "Performance and Reliability of Non-Markovian Heterogeneous Distributed Computing Systems," *IEEE Trans. Parallel and Distributed Systems*, vol. 23, pp. 1288-1301, 2012.
13. D. A. Ramirez, M. M. Hayat, G. J. Rees, X. Jiang, and M. A. Itzler, "New perspective on passively quenched single photon avalanche diodes: effect of feedback on impact ionization," *Optics Express*, vol. 20, no. 2, pp. 1512–1529, 2012.
14. W-Y Jang, M. M. Hayat, S. E. Godoy, S. C. Bender, P. Zarkesh-Ha, and S. Krishna, "Data compressive paradigm for multispectral sensing using tunable DWELL mid-infrared detectors," *Optics Express*, vol. 19, no. 20, 19454, 2011.

15. D. S. G. Ong, M. M. Hayat, J. P. R. David, and J. S. Ng, "Sensitivity of High-Speed Lightwave System Receivers Using InAlAs Avalanche Photodiodes," *IEEE Photonic Technology Lett.*, vol. 23, no. 4, pp. 233–236, Feb. 2011.
16. P. Vines, C. H. Tan, J. P. R. David, R. S. Attaluri, T. E. Vandervelde, S. Krishna, W. Jang, and M. M. Hayat, "Versatile Spectral Imaging With an Algorithm-Based Spectrometer Using Highly Tuneable Quantum Dot Infrared Photodetectors," *IEEE J. Quantum Electronics*, vol. 47, no. 2, pp. 190–197, Jan. 2011.
17. M. Madrid, J. J. Simpson, and M. M. Hayat, "FDTD calculations of the diffraction coefficient of vibrating wedges," *IEEE Ant. & Wireless Prop. Lett.*, vol. 10, pp. 163–166, 2011.
18. J. E. Pezoa, S. Dhakal, and M. M. Hayat, "Maximizing service reliability in distributed computing systems with random failures: Theory and implementation," *IEEE Trans. Parallel and Distributed Systems*, vol. 21, pp. 1531–1544, 2010.
19. B. S. Paskaleva, W-Y. Jang, S. C. Bender, Y. D. Sharma, S. Krishna, and M. M. Hayat, "Multispectral Classification with Bias-tunable Quantum Dots-in-a-Well Focal Plane Arrays," *IEEE Sensors Journal*, vol. 11, pp. 1342–1351, 2011.
20. D. A. Ramirez, J. Shao, M. M. Hayat, and S. Krishna, "Midwave infrared quantum dot avalanche photodiode," *Appl. Phys. Lett.*, vol. 97, 221106, Dec. 2010.
21. S. Narravula, M.M. Hayat, and B. Javidi, "Information theoretic approach for assessing image fidelity in photon-counting arrays," *Optics Express*, vol. 18, no. 3, pp. 2449–2466, Feb. 2010.
22. T. M. Giles, M. M. Hayat, and S. Krishna, "Shift estimation algorithm for dynamic sensors with frame-to-frame variation in their spectral response," *IEEE Sensors Journal*, vol. 10, pp. 686–692, 2010.
23. J. O. Jensen, R. J. Trew, D. Woolard, N. Gupta, J-M. Theriault, M. M. Hayat, Y. Li, P. Gillespie "Editorial: Special Issue on Enhancement Algorithms, Methodologies and Technology for Spectral Sensing," *IEEE Sensors Journal*, vol. 10, pp. 373–378, 2010.
24. J. Andrews, W-Y. Jang, J.E. Pezoa, Y.D. Sharma, S.J. Lee, S. K. Noh, M.M. Hayat, S. Restaino, S.W. Teare, and S. Krishna, "Demonstration of a bias tunable quantum dots-in-a-well focal plane array," *Infrared Physics & Technology*, vol. 52, pp. 380–384, Nov. 2009.
25. P. Sun, M. M. Hayat, A. K. Das, "Bit Error Rates for Ultrafast APD Based Optical Receivers: Exact and Large Deviation Based Asymptotic Approaches," *IEEE Transactions on Communications*, vol. 57, pp. 2763–2770, 2009.
26. D. S. G. Ong, J. S. Ng, M. M. Hayat, P. Sun, and J. P. R. David, "Optimization of InP APDs for High-Speed Lightwave Systems," *IEEE J. Lightwave Technology*, vol. 27, pp. 3294–3302, 2009.
27. W-Y. Jang, M. M. Hayat, J. S. Tyo, R. S. Attaluri, T. E. Vandervelde, Y. D. Sharma, R. Sheno, A. Stintz, E. R. Cantwell, S. Bender and S. Krishna, "Demonstration of bias controlled algorithmic tuning of quantum Dots in a well (DWELL) mid-infrared detectors," *IEEE J. Quantum Electronics*, vol. 45, pp. 674–683, 2009.
28. D. A. Ramirez, M. M. Hayat, and M. A. Itzler, "Dependence of the performance of single photon avalanche diodes on the multiplication region width," *IEEE J. Quantum Electronics*, vol. 44, pp. 1188–1195, 2008.
29. B. Paskaleva, M. M. Hayat, Z. Wang, and J. S. Tyo, "Canonical correlation feature selection for sensors with overlapping bands: Theory and application," *IEEE Trans. Geoscience & Remote Sensing*, vol. 46, pp. 3346–3358, 2008.

30. Z. Tang, J. D. Birdwell, J. Chiasson, C. T. Abdallah, and M. M. Hayat, "Resource-constrained load balancing controller for a parallel database," *IEEE Transactions on Control Systems Technology*, vol. 16, pp. 834–840, 2008.
31. Z. Wang, J. S. Tyo, and M. M. Hayat, "Generalized signal-to-noise ratio for spectral sensors with correlated bands," *J. Optical Society of America A*, vol. 25, pp. 2528–2534, 2008.
32. S. Dhakal, M. M. Hayat, J. E. Pezoa, C. Yang, and D. A. Bader, "Dynamic load balancing in distributed systems in the presence of delays: A regeneration-theory approach," *IEEE Trans. Parallel and Distributed Systems*, vol. 18, pp. 485–497, 2007.
33. Z. Wang, J. S. Tyo, and M. M. Hayat, "Data interpretation for spectral sensors with correlated bands," *J. Optical Society of America A*, vol. 29, pp. 2864–2870, 2007.
34. B. Choi and M. M. Hayat, "Computation of bit-error probabilities for optical receivers using thin avalanche photodiodes," *IEEE Communications Lett.*, vol. 10, pp. 56–58, Jan. 2006.
35. P. Sun and M. M. Hayat, "A linear equalizer for high-speed APD-based integrate-and-dump receivers," *IEEE Communications Lett.*, vol. 9, pp. 1073–1075, Dec. 2005.
36. U. Sakoglu, M. M. Hayat, J. S. Tyo, P. Dowd, S. Annamalai, K. T. Posani, and S. Krishna, "A statistical method for adaptive sensing using detectors with spectrally overlapping bands," *Applied Optics*, vol. 45, pp. 7224–7234, 2006.
37. O. Lankoande, M. M. Hayat, and B. Santhanam, "Scene estimation from speckled synthetic aperture radar imagery: A Markov random field approach," *J. Optical Society of America A*, vol. 23, pp. 1269–1281, 2006.
38. J. E. Pezoa, M. M. Hayat, S. N. Torres, and Md. Saifur Rahman, "Multi-model Kalman filtering for adaptive nonuniformity correction in infrared sensors," *J. Optical Society of America A*, vol. 23, pp. 1281–1291, 2006.
39. D. A. Ramirez, M. M. Hayat, S. N. Torres, B. E. A. Saleh, and M. C. Teich, "Information-theoretic criterion for the performance of single-photon avalanche photodiodes," *IEEE Photonic Technology Lett.*, vol. 17, pp. 2164–2166, Oct. 2005.
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50. B. Paskaleva, M. M. Hayat, M. L. Martinez, Z. Wang, and J. S. Tyo, "Feature selection for spectral sensors with overlapping noisy spectral bands," *The SPIE Defense and Security Symposium, "Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XII."*, Orlando, Florida, April 2006.
51. M. M. Hayat, O-H. Kwon, J. Shao, and S. Krishna, "Quantum-dot based avalanche photodiodes for mid-infrared sensing," (**invited**), *SPIE Optics East 2005: Nanosensing: Materials and Devices II*, (M. Saif Islam, Achyut K. Dutta; Eds.), Philadelphia, Proc. SPIE, vol. 6008, pp. 164–176, Oct. 2005.
52. O. Lankoande, M. M. Hayat and B. Santhanam, "Segmentation of SAR images based on a Markov-random-field model," *IEEE International Conference on Systems, Man, and Cybernetics (SMC-2005)*, vol. 3, pp. 2956–2961, Waikoloa, Hawaii, October 10–12, 2005.
53. O. Lankoande, M. M. Hayat, and B. Santhanam, "Speckle modeling and reduction in synthetic aperture radar imagery," *The IEEE International Conference on Image Processing, ICIP-2005*, pp. 317–320, September 11–14, 2005, Genoa, Italy.
54. P. Sun, M. M. Hayat, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Correlation between gain and buildup-time fluctuations in ultrafast avalanche photodiodes and its effect on receiver sensitivity," *IEEE/OSA 2005 OFC/NFOEC Meeting*, vol. 1, pp. 118–120, Anaheim, CA, 2005.
55. B. Paskaleva and M. M. Hayat, "Optimized algorithm for spectral band selection for rock-type classification," *Proc. SPIE Defense and Security Conference, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XI*, (Sylvia S. Shen, Paul E. Lewis; Eds.), vol. 5806, pp. 131–138, Orlando, FL, March 2005.
56. S. Pellicer, Y. Pan, and M. M. Hayat, "Avalanche photodiode gain and impulse response calculation on a public computing platform," *Proc. 19th IEEE International Parallel and Distributed Processing Symposium, 2005*, pp. 256a– 256a, April 4–8, 2005.
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- Communication & Networking Conference (WCNC-2005)*, New Orleans, LA, vol. 3, pp. 1755–1760, March 13–17, 2005.
58. Z. Wang, B. S. Paskaleva, J. S. Tyo, and M. M. Hayat, “Canonical correlations analysis for assessing the performance of adaptive spectral imagers,” *Proc. SPIE Defense and Security Conference, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XI*, (Sylvia S. Shen, Paul E. Lewis; Eds.), vol. 5806, pp. 23–34, Orlando, FL, March 28 – April 1, 2005.
 59. J. D. Birdwell, J. N. Chiasson, C. T. Abdallah, M. M. Hayat, T. Tang, and J. White, “The information age: challenges and opportunities for control and engineering,” *29th IEEE Annual International Computer Software and Applications Conference, 2005, (COMPSAC 2005)*, vol. 2, pp. 77–82, July 2005.
 60. Z. Tang, J. White, J. Chiasson, D. J. Birdwell, C. T. Abdallah, and M. M. Hayat, “Closed-loop load balancing: comparison of a discrete event simulation with experiments,” *Proceedings of the 2005 American Control Conference*, vol. 4, pp. 2721–2726, Jun. 2005.
 61. O. Lankoande, M. M. Hayat, and B. Santhanam, “Speckle reduction of SAR images using a physically based Markov random field model and simulated annealing,” *Proc. SPIE Defense and Security Conference: Algorithms for Synthetic Aperture Radar Imagery XII*, (Edmund G. Zelnio, Frederick D. Garber; Eds.), vol. 5808, pp. 210–221, Orlando, FL, March 2005.
 62. O-H. Kwon, A. Grine, A. Haji, M. M. Hayat, J. C. Campbell, B. E. A. Saleh and M. C. Teich, “Breakdown characteristics of In_{0.52}Al_{0.48}As-InP heterojunction APDs,” *IEEE-LEOS 2004 Annual Meeting: Photodetectors and Imaging*, vol. 1, pp. 76–77, Puerto Rico, Nov. 7–11, 2004.
 63. J. Ghanem, C. T. Abdallah, M. M. Hayat, S. Dhakal, J. D. Birdwell, J. Chiasson and Z. Tang, “Implementation of load balancing algorithms over a local area network and the Internet,” *Proceedings of the IEEE Conference on Decisions and Controls (CDC-04)*, Atlantis, Paradise Island, Bahamas, vol. 4, pp. 4199–4204, Dec. 14–17, 2004.
 64. Z. Tang, J. D. Birdwell, J. Chiasson, C. T. Abdallah and M. M. Hayat, “A time delay model for load balancing with processor resource constraints,” *Proceedings of the IEEE Conference on Decisions and Controls (CDC-04)*, Atlantis, Paradise Island, Bahamas, vol. 4, pp. 4193–4198, Dec. 14–17, 2004.
 65. U. Sakoglu, Z. Wang, M. M. Hayat, J. S. Tyo, S. Annamalai, P. Dowd, and S. Krishna, “Quantum-dot detectors for mid-infrared sensing: Bias controlled spectral tuning and matched filtering,” **(Invited)**, *Proc. SPIE International Symposium on Optics East: Nanosensing, Materials and Devices*, SPIE vol. 5593, pp. 396–407, Philadelphia, PA, Oct. 25–29, 2004.
 66. B. S. Paskaleva, M. M. Hayat, M. M. Moya and R. J. Fogler, “Multispectral rock type separation and classification,” *Proc. 49th Annual Meeting of the SPIE: Infrared Spaceborne Remote Sensing XII (Marija Strojnik, Ed.)*, Proc. SPIE vol. 5543, pp. 152–163, Denver, CO, Aug. 2–6, 2004.
 67. U. Sakoglu, R. C. Hardie, M. M. Hayat, B. M. Ratliff and J. S. Tyo, “An algebraic restoration method for estimating fixed pattern noise in infrared imagery from a video sequence,” *Proc. 49th Annual Meeting of the SPIE: Applications of Digital Image Processing XXVII*, vol. 5558, pp. 69–79, Denver, CO, Aug. 2–6, 2004.
 68. Z. Wang, U. Sakoglu, S. Annamalai, N-R. Weisse-Bernstein, P. Dowd, J. S. Tyo, M. M. Hayat and S. Krishna, “Real-time implementation of spectral matched filtering algorithms using adaptive focal plane array technology,” *Proc. 49th Annual Meeting of the SPIE: Imaging Spectrometry X*, vol. 5546, pp. 73–83, Denver, CO, Aug. 2–6, 2004.

69. M. M. Hayat, B. M. Ratliff and J. S. Tyo, "Generalized algebraic algorithm for scene-based nonuniformity correction," **(Invited)**, *49th Annual Meeting of the SPIE: Photonic Devices and Algorithms for Computing VI*, vol. 5556, pp. 122–136, Denver, CO, Aug. 2–6, 2004.
70. J. Ghanem, S. Dhakal, M. M. Hayat, H. Jerez, C. T. Abdallah and J. Chiasson, "Load balancing in distributed systems with large time delays: theory and experiment," *12th Mediterranean Conference on Control and Automation*, Kusadasi, Turkey, Jun. 6–9, 2004.
71. O-H. Kwon, P. Sun, M. M. Hayat, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Enhanced gain-bandwidth product and performance in thin heterostructure avalanche photodiodes," *IEEE-LEOS Annual Meeting: High-Speed Photodetectors*, Tucson, AZ, vol. 2, pp. 997–998, Nov., 2003.
72. M. M. Hayat and O-H. Kwon, "High speed heterostructure avalanche photodiodes," **(Invited)**, *Active and Passive Optical Components for WDM Communications III, part of the International Symposium on ITCom 2003, SPIE Vol. 5246*, Orlando, FL, September 2003.
73. S. Dhakal, B.S. Paskaleva, M.M. Hayat, E. Schamiloglu, C.T. Abdallah "Dynamical Discrete-time load balancing in distributed systems in the presence of time delays," *IEEE Conference on Decisions and Controls (CDC-03)*, vol. 5, pp. 5128–5134, Maui, Hawaii, Dec. 2003.
74. B. M. Ratliff, M. M. Hayat, and J. S. Tyo, "An algorithm for two-dimensional, radiometrically accurate nonuniformity correction," *SPIE AereoSense'2003: Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XIV, SPIE Proceedings*, vol. 5076, pp. 82-91, Orlando, FL, April 2003.
75. O-H. Kwon, M. M. Hayat, S. Wang, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "On the optimization of heterostructure APDs," *IEEE-LEOS Annual Meeting: High-Speed Photodetectors & Receivers II*, Glasgow, Scotland, vol. II, pp. 492–493, Nov., 2002.
76. S. Krishna, P. Rotella, S. Raghavan, A. Stintz, M. M. Hayat and S. J. Tyo, "Bias-dependent tunable response of normal incidence long wave infrared quantum dot detectors," *Proceedings of the IEEE-LEOS 2002 Annual Meeting: Photodetectors and Arrays for Long Wavelength Imaging*, vol. II, pp. 754–755, Glasgow, Scotland, Nov., 2002.
77. Y. Pan, C. S. Ierotheou, and M. M. Hayat, "Parallel implementation of the recurrence method for computing the power-spectral density of thin avalanche photodiodes," *Proceedings of the IEEE International Conference on Parallel Processing Workshops*, pp. 298–305, 2002.
78. B. M. Ratliff, M. M. Hayat, and S. Tyo, "Radiometrically-calibrated scene-based nonuniformity correction for infrared array sensors," *Annual Meeting of the SPIE: Infrared Technology and Applications XXVIII, SPIE Proceedings vol. 4820*, pp. 359–367, Seattle, WA, July 7–11, 2002.
79. M. M. Hayat, O-H. Kwon, and M. A. Saleh, **(Invited)**, "Theory of impact ionization in thin multiplication layers," *IEEE-LEOS 2001 Annual Meeting: Photodetectors and Imaging*, vol. II, pp. 695–696, San Diego, CA, Nov. 2001.
80. S. C. Cain and M. M. Hayat, "Exploiting the temporal statistics of atmospheric tilt for improved short-exposure imaging," *Technical Digest of the OSA/IEEE Signal Recovery and Synthesis and Integrated Computational Imaging Systems*, pp. 65–67, Albuquerque, NM, Nov. 2001.
81. B. M. Ratliff, M. M. Hayat, and R. C. Hardie, "Algebraic scene-based nonuniformity correction in focal-plane arrays," *SPIE AereoSense'2001, in Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XII*, SPIE vol. 4372, pp. 114–124, Orlando, FL, April 2001.

82. R. C. Hardie and M. M. Hayat, "A nonlinear-filter based approach to detector nonuniformity correction," **(Invited)**, *Proceedings of the 2001 IEEE-EURASIP Workshop on Nonlinear Signal and Image Processing*, June 2001, Baltimore, MD.
83. M. M. Hayat, M. A. Saleh, M. C. Teich, and B. E. A. Saleh, "Dead-space-theory predictions of excess-noise factor, breakdown voltage, and frequency response for thin avalanche photodiodes," *Photonics West 2001, Physics and Simulation of Optoelectronic Devices IX (OE09)*, SPIE vol. 4283, pp. 519–527, San Jose, CA, Jan. 2001.
84. M. M. Hayat, M. A. Saleh, M. C. Teich, and B. E. A. Saleh, "Prediction of excess noise factor and frequency response for thin avalanche photodiodes," *Proceedings of the IEEE LEOS 2000 Annual Meeting, Photodetectors and Imaging*, vol. I, pp. 11–12, Nov. 2000.
85. S. N. Torres, M. M. Hayat, E. E. Armstrong, and B. Yasuda, "A Kalman-filtering approach for non-uniformity correction in focal-plane array sensors," *Proc. SPIE AeroSense'2000 (Orlando, FL), Infrared Imaging Systems: Design, Analysis, Modeling, and Testing*, vol. 4030, pp. 196–203, April 2000.
86. S. N. Torres, M. M. Hayat, E. E. Armstrong, and B. Yasuda, "On the performance analysis of a recent statistical algorithm for nonuniformity correction in focal-plane arrays," *Proceedings of the International Conference on Image Science, Systems, and Technology CISST'2000*, vol. I, pp. 49–54, June 2000.
87. S. C. Cain, M. M. Hayat, and E. E. Armstrong, "An efficient projection-based technique for registering images in the presence of fixed-pattern noise," *Proc. SPIE AeroSense'2000*, SPIE vol. 4044, pp. 10–18, Orlando, FL, April 2000.
88. E. E. Armstrong, M. M. Hayat, R. C. Hardie, S. N. Torres, and B. Yasuda, "Non-uniformity correction for improved registration and high-resolution image reconstruction in IR imagery," *Proceedings of the Annual Meeting of the SPIE, Application of Digital Image Processing XXII*, vol. 3808, pp. 150–161, Denver, Colorado, July 1999.
89. M. M. Hayat, S. N. Torres, S. C. Cain, and E. Armstrong, "Model-based real-time nonuniformity correction in focal plane array detectors," *Proceedings of the SPIE AeroSense '98*, Orlando, FL, vol. 3377, pp. 122–132, 1998.
90. J. A. Gubner, W.-B. Chang, and M. M. Hayat, "Performance analysis of hypothesis testing for pairwise interaction point processes," **(Invited)**, *Proceedings of the 31st Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, November 1997.
91. M. M. Hayat, J. A. Gubner, and W.-B. Chang, "Performance evaluation for detection of minefields modeled by interaction point processes," *Proceedings of the SPIE AeroSense '97*, vol. 3079, pp. 531–534, 1997.
92. M. M. Hayat, B. E. A. Saleh, and J. A. Gubner, "Quantum-limited image estimation using twin-photon beams," *Proceedings of SPIE's International Symposium on Optical Sciences, Engineering, & Instrumentation*, Denver, CO, vol. 2827, pp. 44–48, 1996.
93. M. M. Hayat and J. A. Gubner, "A two-step Markov point process," *Proceedings of the 1995 IEEE International Symposium on Information Theory*, Whistler, British Columbia, Canada, p. 421, Sep. 1995.
94. B. E. A. Saleh and M. M. Hayat, "Quantum noise in optical neural networks," **(Invited)**, *Proceedings of the IEEE Lasers and Electro-Optics Soc. Ann. Meeting*, Boston, Oct. 1994.
95. M. M. Hayat and J. A. Gubner, "Markov-type spatial point processes with an application to minefield modeling," *Proceedings of the Twenty-Eighth Annual Conf. Inform. Sci. Syst.*, Princeton University, Princeton, NJ, pp. 1138–1139, Mar. 1994.

96. M. M. Hayat, J. A. Gubner, and B. Saleh, "Quantum-limited-performance of optical neural networks," *Opt. Soc. America Ann. Meeting*, Dallas, Texas, Oct. 1994.
97. M. M. Hayat, B. E. A. Saleh, and M. C. Teich, "Effect of dead space on gain and noise of double-carrier multiplication avalanche photodiodes," *Opt. Soc. America Ann. Meeting*, San Jose, Nov. 1991.
98. W. L. Sargeant, M. M. Hayat, and B. E. Saleh, "Effect of dead space on the mean, the excess noise factor, and the avalanche breakdown voltage in Si and GaAs avalanche photodiodes," *Opt. Soc. America Ann. Meeting*, San Jose, Nov. 1991.
99. B. E. A. Saleh, M. M. Hayat, and M. C. Teich, "Effect of energy buildup on noise in avalanche photodiodes," *Opt. Soc. America Ann. Meeting*, Orlando, Oct. 1989.

TEACHING

Teaching interests

Signals and systems, optical communication, digital communications, signal detection and estimation, photonic devices and systems, optoelectronic devices, spread-spectrum systems, wireless communications, statistical optics, information theory, digital signal processing, digital image processing, pattern recognition, advanced probability theory and stochastic processes, linear systems.

New courses developed

- ECE595 Algorithms for spectral imaging and sensing: 2010
- ECE642 Detection and estimation theory: 2005.
- ECE595 Special topics: Probabilistic methods for signal processing and communications: 2004.
- ECE565-400: Web-CT version of ECE565 optical communications: components and subsystems. This course was jointly developed by Professors Lester and Jain.
- EOP-595 Optical communications: 2000 (U Dayton). This course was jointly developed with Professor J. Haus.

Educational programs developed

- Joint PhD and MS programs with Universidad de Concepcion, Chile 2006 (with UNM).
- Contributed in creating a summer internship program with the Indian Institute of Technology; (effort was lead by Professor Krishna); 2005 and 2006

Courses taught

- **Graduate—regular:** Detection and estimation theory, optical communication (including a Web-CT version), electro-optical devices and systems, digital image processing, digital communication theory, spread spectrum systems, probability and stochastic processes (including a Web-CT version).
- **Graduate—reading:** Optical networks, information theory, mathematical analysis.
- **Undergraduate:** Signals and systems, probability and statistics, digital signal processing, random processes, analog modulation laboratory, electrical devices laboratory.

Students completing doctoral degrees and their placement

1. Qi Wang (with Distinction), University of New Mexico, Dec. 2012, “Time-frequency Methods for Vibration Estimation Using Synthetic Aperture Radar.” Currently employed at Bloomberg Inc., NY.
2. Woo Yong Jang, University of New Mexico, Aug. 2012, “Data Compressive Paradigm for Spectral Sensing and Classification Using Electrically Tunable Detectors.” Currently employed at AFRL (NRC Scholar), Dayton, OH.
3. David A. Ramirez, University of New Mexico, Dec. 2011, “Modeling and Engineering Impact Ionization in Avalanche Photodiodes for Near and Mid Infrared Applications.” Currently holding a post-doc position at UNM working with Hayat and Krishna.

4. Jorge E. Pezoa, University of New Mexico, Dec. 2010, "Theory of Resource Allocation for Robust Distributed Computing." Currently Assistant Professor of Electrical Engineering at the Universidad de Concepcion, Chile.
5. Biliiana N. Paskaleva, University of New Mexico, Dec. 2009, "Algorithms for Spectral and Spatio-Spectral Feature Selection and Classification for Tunable Sensors: Theory and Application." Currently employed as Senior Technical Staff Member at Sandia National Laboratories, NM.
6. Peng Sun (Distinction), University of New Mexico, May 2008, "Mathematical Theory of Modern Avalanche Photodiodes and Its Application to Ultrafast Communications." Currently employed at Western Digital, CA.
7. Sagar Dhakal; University of New Mexico, Oct. 2006, "Stochastic model-based optimization of load balancing policies in distributed systems." Currently employed at Research in Motion, Irving, Texas.
8. Ousseini Lankoande (Distinction), University of New Mexico, Feb. 2006, "A Markov random field-based approach to speckle reduction." Currently employed at Instrument Technology Inc., Westfield, MA.
9. Unal Sakoglu; University of New Mexico, May 2006, "Signal-processing strategies for spectral tuning and chromatic nonuniformity correction for quantum-dot IR sensors." Currently Assistant Professor at Texas A&M University–Commerce.
10. Oh-Hyun Kwon, University of New Mexico, Dec. 2004, "Modeling and optimization of heterojunction avalanche photodiodes: Noise, speed and breakdown." Currently employed at the Navy Electro-Optic Technology Division, NAVSEA Crane, Indiana.
11. Bradley M. Ratliff, University of New Mexico, Dec. 2004, "A generalized algebraic scene-based nonuniformity correction algorithm for infrared focal plane arrays." Currently employed at Space Computer Corporation, Beavercreek, OH.

In 2006, Dr. Ratliff's dissertation won the Tom L. Popejoy Dissertation Prize, which is the highest honor offered each year by the University of New Mexico to a graduate student. In 2004, Bradley was selected as one of eight finalists in the graduate student category in the Collegiate Inventors Competition (held at the City Library, New York City). This event was organized by The National Inventors Hall of Fame (Akron, OH).

12. Sergio N. Torres, University of Dayton, May 2001, "A Kalman-filtering approach for nonuniformity correction in focal-plane array sensors." Currently Professor of Electrical Engineering at the Universidad de Concepcion, Chile.
13. Steven C. Cain, University of Dayton, Aug. 2001, "Improved atmospheric-turbulence tilt estimation through the use of a temporal transition model." Currently Associate Professor of ECE at the Air Force Institute of Technology, Ohio.
14. Guoquan Dong, University of Dayton, Dec. 2000, "Channel-coded optical-code-division multiple-access networks."

Students completing masters theses

1. Zhuoyao Wang, University of New Mexico, Dec. 2011, "Consensus-based Estimation Protocol for Decentralized Dynamic Load Balancing over Partially Connected Networks." Currently a Ph.D. student with Hayat.
2. Srikanth R. Narravula, University of New Mexico, Dec. 2009, "Information-theoretic Approach in Assessing Image Fidelity in Photon-counting Imagers." Currently a Ph.D. student in the Optical Science and Engineering Program.

3. Todd Giles, University of New Mexico, Aug. 2008, "Shift Estimation Algorithm for Dynamic Sensors With Frame-to-Frame Variation in Their Spectral Response." Currently employed at Google.
4. Sripuram Lakshmikaulth Reddy (Primary adviser: Prof. Balu Santhanam), University of New Mexico, May 2007, "Multicomponent Chirp Demodulation Using the Fractional Fourier Transform."
5. Biliiana Paskaleva, University of New Mexico, Aug. 2004, "A Study of Multispectral Rock Separation and Classification."
6. Sagar Dhakal (Distinction), M.S., ECE, University of New Mexico, Dec. 2003, "Load Balancing in Delay-Limited Distributed Systems."
7. Balaji Narayanan, University of Dayton, Aug. 2002, "Coherent detection of optical signals using photon-correlated beams."
8. Bradley M. Ratliff, University of Dayton, Dec. 2001, "An algebraic algorithm for nonuniformity correction in focal-plane arrays."
9. Mohammad Sajjad Abdullah, University of Dayton, May 2000, "Image estimation using photon-correlated beams."
10. Oh-Hyun Kwon, University of Dayton, Dec. 1999, "An algorithm for computing the bit-error rate in thin avalanche-photodiode receivers."
11. Guoquan Dong, M.S., University of Dayton, Dec. 1998, "Statistics of the bandwidth of avalanche photodiodes: A renewal theory approach."
12. Mohammad A. Saleh, University of Dayton, Aug. 1999, "Prediction of excess noise factor for thin GaAs and AlGaAs avalanche photodiodes using dead-space-based theory."
13. Sergio N. Torres, University of Dayton, Dec. 1997, "Bit-error rates for communication systems using twin-photon beams."
14. David A. Persing, University of Dayton, Aug. 1997, "An algorithm for boundary location estimation and detection from ultrasonic B-scan data using a multiple independent transducer architecture."

Current doctoral graduate students

1. Zhuoyao Wang; research area: modeling and optimization of distributed power grids; expected graduation: 2014.
2. Sebastian Godoy (co-advised with S. Krishna); research area: compressive spectral sensing, imaging and recognition: expected graduation: 2015.
3. Mahshid Rahnamay-Naeini; research area: smart-grid modeling and networked computing; expected graduation: 2014.
4. Amir Nafchi; research area: time-frequency signal processing; expected graduation: 2015.
5. Georges El-Howayek; research area: photodetectors and optical communications; expected graduation: 2015.
6. Justin Campbell (MS+PhD); research area: time-frequency signal processing; expected graduation: 2016.
7. Mottaleb Hossain (MS+PhD); research area: detectors for smart lighting; expected graduation: 2016.
8. Monica Madrid (PhD); research area: synthetic-aperture radar vibrometry; expected graduation: 2015.

Post-doctoral associates supervised

1. David Ramirez, UNM, Jan. 2012–present, research area: Avalanche photodiodes, photon-counting arrays, and IR imaging.
2. Matthew Pepin, UNM, Jan. 2009–present; research area: Synthetic aperture radar imaging.
3. O-H. Kwon, UNM, August-04–May-05; research area: Avalanche photodiodes.
4. Z. Chen: University of Dayton, May 1998 to Dec. 1998; research area: Image processing.

Undergraduate students participating in research

1. Ghady Azar, June 2010 – August 2010. Mr. Azar is from the Department of Electrical Engineering, American University of Beirut. He participated in Dr. Hayat’s research in resource allocation in distributed systems.
2. Ryan J. Beach (Mechanical Engineering student at UNM), June 2009 – present; SAR based vibrometry.
3. Alec Wright, (ECE student at UNM), June 2011–June 2012; SAR based vibrometry.
4. Monica Martinez, August 2005–Dec. 2005; Enrolled in honors program; Research area: Multispectral classification; currently at Sandia National Laboratories.
5. Zachary Dios. His project was on a hardware implementation of a nonuniformity correction algorithm. Mr. Dios entered a technical-project competition by Intel and became a finalist. He won a \$1000 prize and was flown to San Jose with all the finalists.
6. Alejandro Grine, August 2003 – August 2005; Enrolled in honors program; Research area: Photodetectors; he recently completed a masters degree from MIT. He is currently employed at Sandia National Laboratories. Alex was supported by an NSF REU program.
7. Alim Haji, August 2003–August 2005; Enrolled in honors program; Research area: Photodetectors and optical receivers; he is currently enrolled in a PhD program in Optical Science and Engineering. Alim was also supported by an NSF REU program.
8. Mohammad Elyas, May 2004 – present; Research area: Distributed computing, networking. Mohammad was also supported by an NSF REU program.
9. Md. Saifu Rahman, May 2005 – July 2005. Mr. Rahman is from the Department of Electrical Engineering Indian Institute of Technology, Kharagpur. He participated in Dr. Hayat’s research in image processing (participant in the EYES program).
10. Deepak Kumar Garg, May 2006 – July 2006. Mr. Garg is from the Department of Electrical Engineering Indian Institute of Technology, Madras. He worked on developing equalizers for ultra-fast avalanche photodiode-based receivers (participant in the EYES program).
11. Sebastian Godoy, January 2006 – April 2006. Sebastian was a visitor from the Universidad de Concepcion. He worked on image processing for infrared sensors.
12. Bradley M. Raliff, May 1999–Aug. 2000 (University of Dayton); Research area: Infrared image processing.

SERVICE & SYNERGISTIC ACTIVITIES**Services to Professional Society**

- Associate Editor, Optics Express; Area: Photodetectors and Image Processing, Jan. 04 – Jan. 2010. [ISI Impact Factor = 3.75, ranked #3 among all (71) journals that are categorized within the field of “Optics.”]

- Chair: Technical Committee for Photodetectors, Sensors, Systems and Imaging, IEEE Photonics Society, 2009 – present.
- Chair, Special Symposium on “Photovoltaics based on Plasmonics and Nanophotonics,” IEEE Photonics Society Conference, San Francisco, CA, Oct. 2012.
- Chair, Special Symposium on “Plasmonics for enhanced detection and solar cells,” IEEE Photonics Society Conference, Arlington, VA, Nov. 2011.
- Guest Editor, IEEE Sensors Journal: Special Issue on Enhancement Algorithms, Methodologies and Technology for Spectral Sensing, 2009/10.
- Associate Editor and member of conference editorial board, IEEE Control Systems Society, 2003 – 2008.
- Technical Committee Member, SPIE Conference on Advanced Photon Counting Techniques, part of the SPIE Defense, Security & Sensing Symposium (Orlando FL) 2009-2012.
- Co-Chair, Data and Imaging Processing Techniques and Display Technologies, 2009 Nano-electronic Devices for Defense & Security (NANO-DDS) Conference, Fort Lauderdale, FL, Sep. 2009.
- Member of Program Committee for SPIE Conference on Radar Sensor Technology conference, part of 2010 SPIE Defense, Security & Sensing Symposium. (Sessions Chairs: Armin Doerry and Ken Ranney.)
- Session Chair (Photodetectors, Sensors, Systems and Imaging), IEEE Photonics Society, Nov. 2010.
- Chair, IEEE/LEOS Albuquerque Chapter, July 2006–2011; Treasurer: July 2005 – July 2006.
- Program Committee Organizer and Member of Publication Committee; 2008 International Symposium on Spectral Sensing Research (ISSSR-2008).
- Member of Technical Committee (Photodetectors and Image Processing), IEEE LEOS, 2007-present.
- Associate Editor, The Dekker Encyclopedia of Optical Engineering, Image Processing, 2001-2003.
- Member of the Publication Committee and the Technical Guidance Committee; 2008 International Symposium on Spectral Sensing Research, Hoboken, NJ, June 2008.
- Reviewer: IEEE Journal of Lightwave Technology, IEEE J. Quantum Electronics, IEEE Trans. Signal Processing, IEEE Trans. Image Processing, IEEE Trans. Electron Devices, IEEE Photonics Technology Letters, IEEE Electron Device Letters, J. Optical Society of America A & B, Optical Engineering, J. Applied Physics, Applied Physics Letters, and a number of other journals.

Service to the University of New Mexico

- General Chair, Optical Science and Engineering, UNM, 2011 – present.
- Associate Director, Center for High Technology Materials, UNM, 2012 – present.
- Chair, School of Engineering ad hoc committee on governance, 2011–present.

- Chair, ECE Promotion Committee, 2012.
- Chair, ECE Publicity Committee, 2010
- Leading campus-wide effort in making SGID (Small Group Instructional Diagnosis) available to UNM faculty. Voluntary effort included offering training sessions and matching SGID facilitators with instructors, 2009–present.
- Member, ECE Chair Selection Committee, 2012.
- Member, UNM Research Allocation Committee, Aug. 2006–present.
- Member, UNM Research Policy Committee, Aug. 2006–2008.
- Member, ECE Strategic Planning Committee, 2008–2009.
- Chair, ECE Faculty Search Committee, 2003/04.
- Chair, ECE Promotion and Tenure Committee, 2005/6.
- Chair, Signal Processing and Communications Area, 2001–2004, 2008–2011.
- Member, ECE Faculty Search Committee, 2002/03.
- Member, committee for ECE’s Expand Your Engineering Skills (EYES) Program, 2005 – 2007.
- Member, ECE faculty Search Committee , 2005/06.
- Member, ECE Faculty Search Committee, 2001/02.
- Member, ECE Graduate Committee, 2002 – present.
- Member, ECE Undergraduate Committee, 2005 – 2006.
- Member, ECE Promotion and Tenure Committee 2002 – 2006.
- Member, ECE Awards Committee, 2003, 2005, 2011.
- Member, OSE Graduate Committee, 2001 – 2002, 2010 – present.

Consulting service to industry

- Voxel, Inc. (Beaverton, OR): modeling high performance avalanche photodiodes, 2011–present.
- Princeton Lightwave Inc. (Princeton NJ): modeling high performance avalanche photodiodes for photon counting, 2006–present.
- Vega Technology and Systems, Inc. (Hanover, IL): modeling and optimization of novel IR sensors (active SBIR program), 2006–present.
- K&A Wireless LLC (Albuquerque, NM): development and commercialization of image processing algorithms for infrared sensors, 2003–2008.
- Esquel Corporation (Wheaton, IL): consultant and member of the advisory board; performed modeling and performance analysis for technologies related to optical, 2000–2003.

REFERENCES

Bahaa E. A. Saleh, Dean, College of Optics and Photonics
Director, CREOL & FPCE
University of Central Florida
P.O. Box 162700 4000
Central Florida Blvd.
Orlando, FL 32816-2700
TEL (407) 882-3326 (DEAN); FAX (407) 823-6966; EMAIL: besaleh@creol.ucf.edu

Joe C. Campbell, Lucien Carr III Professor
Department of Electrical and Computer Engineering
University of Virginia
351 McCormick Rd., PO Box 400743
Charlottesville, VA 22904
TEL: (434) 243-2068; FAX: (434) 924-8818; E-Mail: jcc7s@virginia.edu

Dr. Armin W. Doerry
Distinguished Member of Technical Staff
Radar System Design and Analysis
Sandia National Laboratories
Albuquerque, New Mexico 87185-0519
(505) 845-8165, awdoerr@sandia.gov

Malvin C. Teich, Professor Emeritus
Department of Electrical and Computer Engineering
Boston University, 8 St. Mary's St.,
Boston, MA 02215-2421; TEL (617) 353-1236; FAX (617) 353-1459, E-Mail: teich@bu.edu

John P. R. David, Professor and Chair
Department of Electronic & Electrical Engineering
University of Sheffield
Sir Frederick Mappin Building Mappin Street
Sheffield S1 3JD, U.K.
TEL: 44-(0)114-2225185; Fax:44-(0)114-2726391; E-Mail: j.p.david@sheffield.ac.uk

Bahram Javidi, Board of Trustees Distinguished Professor
University of Connecticut, Electrical & Computer Engineering
371 Fairfield Road U-2157
Storrs, CT 06269-2157
TEL: (860) 486-2867; FAX: (860) 486-1273; E-Mail: bahram@engr.uconn.edu