

## Curriculum Vitae of MAJEED M. HAYAT

Professor and Department Chair  
Department of Electrical and Computer Engineering  
Marquette University  
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### 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

- Marquette University, Department of Electrical and Computer Engineering  
Professor and Department Chair, 2018 – present
- University of New Mexico, Department of Electrical and Computer Engineering  
Professor, 2007 – 2018  
Associate Professor, 2001 – 2006
- University of New Mexico, Optical Science and Engineering (Interdisciplinary) Program  
Co-Chair (representing ECE), 2015 – 2018  
General Chair, 2011 – 2015
- University of New Mexico, Center for High Technology Materials  
Associate Director, 2012 – 2016
- 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

- Annual Creative Award, STC.UNM, University of New Mexico, 2018
- IEEE Fellow, 2014; OSA Fellow, 2013; SPIE Fellow, 2012
- Senior Faculty Research Excellence Award, School of Engineering, Univ. New Mexico, 2012
- Annual Creative Award, STC.UNM, Univ. New Mexico, 2007, 2008, 2012–2014, and 2017
- Outstanding Teacher Award, ECE Dept., University of New Mexico, 2010
- Chief Scientist Award for Excellence, National Consortium for MASINT Research (NCMR), Defense Intelligence Agency, 2006
- 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

## RESEARCH

### Areas of interest

- **Interdependent cyber-physical systems:** Reliability and resiliency of cyber-electric systems comprising the power transmission network, underlying communication (SCADA) network and human-operator factors; probabilistic characterization of cascading failures; tradeoff between model scalability (due to abstraction) and fidelity; mapping physical operating characteristics to types of blackout distributions; effect of microgrids on system reliability and resiliency.
- **Signal processing:** Compressive sensing algorithms for smart-pixel spectral imaging systems; signal-processing techniques for remote vibration estimation using synthetic-aperture radar (SAR); information-theoretic optimization of reconfigurable imagers; scene-based non-uniformity correction algorithms for thermal and spectral imagers; statistical modeling of fixed-pattern noise; motion estimation algorithms; nonlinear filtering for speckle-noise compensation in SAR imagery; detection theory for skin-cancer diagnosis based on dynamic thermal imaging.
- **Modeling and optimization of heterogeneous distributed computing systems:** Novel queuing models for large-scale distributed computing systems; algorithms for load balancing in environments with delays and dynamic configurations; resource provisioning and optimal workload allocation for cloud services.

- **Statistical communication theory applied to optical communication:** Probabilistic modeling of optical receiver performance; bit-error rate bounds and testing for optical receivers; novel receiver concepts and equalizers for ultrafast lightwave systems; modeling and mitigation of intersymbol interference in optical receivers.
- **Avalanche photodiodes:** Stochastic modeling of electron and hole impact ionization and avalanche multiplication in time and space; noise modeling; time response and breakdown probability; novel device design concepts for linear- and Geiger-mode operation, novel optical-receiver design for high-speed communication.

### Summary of received research funds

**Over \$14M in total as PI or Co-PI**

**Over \$11M as PI**

### Active research grants

1. Sandia National Laboratories, “Analytical modeling of linear-mode InAs and InAs-InAsSb avalanche photodiodes,” **PI: M. M. Hayat; \$90,000;** 12/15/2016-9/30/2018.
2. Defense Threat Reduction Agency, “Probabilistic Characterization of Precursors to WMD-induced Cascading Failures in the Electric-cyber Infrastructure: An Integrated Physical–Human-Factor Approach,” **PI: M. M. Hayat;** Co-PIs: M. Rahnamay-Naeini (USF, Hayat’s former student), F. Sorrentino and N. Ghani (USF), **\$1,750,000;** Dec. 2012–Dec. 2018.
3. National Science Foundation, “Collaborative Research: CRISP Type 2: Revolution through Evolution: A Controls Approach to Improve How Society Interacts with Electricity,” PI: A. Mammoli; **Co-PIs: M. M. Hayat** and F. Sorrentino (Total award: \$2.6M, including USF, MTU and Fraunhofer Inst.) 10/01/15 – 09/30/19, **\$861,825.**
4. 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, **\$750,000;** 06/12/2014-6/11/2018.
5. National Science Foundation (via RPI), Smart-Lighting ERC, 09/01/10 – 08/31/18, ERC PI: Bob Karlicek, Hayat’s budget: **\$484,377.**

### Completed research grants

1. Sandia National Laboratories, “Modeling of silicon-germanium APDs and their system-level performance for quantum communications (SECANT Grand Challenge LDRD Project),” **PI: M. M. Hayat; \$186,000;** 04/01/2015-9/30/2016.
2. Defense Threat Reduction Agency, “Implementation of Paradigms for Survivability of Cyber-Infrastructure Backbone Networks Against WMD Attacks Over Real Network Environments,” **PI: M. M. Hayat,** Co-PIs: N. Ghani (USF) and T. Lehman (Maryland); **\$1,050,000;** Feb. 2013–Feb. 2017.
3. Qatar National Research Foundation (via sub-award from Qatar University), “New Paradigm for Robust Cloud Networking Services,” **UNM PI: M. M. Hayat,** (Prime PI: Khaled Basheer, Qatar University); Hayat’s budget **\$135,000,** (total budget: \$450,000) Feb. 2013–Sep. 2016.

4. 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–Dec. 2013.
5. Naval Postgraduate School (via Naval Supply Fleet Logistics Center), on behalf of the 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–Jun. 2013.
6. 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.
7. 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. 2013.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. Sandia National Laboratories, “Novel signal processing strategies for remote detection of vibrational signals,” **PI: M. M. Hayat, \$125,000**, May 2007–May 2009.
  16. Sandia National Laboratories, “Image processing strategies for long-wavelength synthetic aperture radar,” **PI: M. M. Hayat, \$35,000**; Jul. 2006–Aug. 2007.
  17. 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.
  18. 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.
  19. 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.
  20. 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.
  21. 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
  22. 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
  23. 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.
  24. 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.
  25. National Science Foundation (Award ECS-0196569), “Modeling and optimization of ultrafast 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.

26. 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.
27. Sandia National Laboratories, "Multispectral rock-type classification," **PI: M. M. Hayat, \$49,935**; Mar. 2003–Oct. 2003.
28. 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.
29. 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
30. 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.
31. Air Force Office for Scientific Research (AFOSR/RDL), Faculty Summer Research Program, **\$8,000**, May–Aug. 1997.
32. 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.
33. Office of Naval Research, "Minefield modeling," PI: John A. Gubner, **Co-PI: M. M. Hayat, \$322,120**, Jan. 1994–Dec. 1996.

## Publications

### Summary

Over 103 peer-reviewed journal publications, over 126 (17 invited) reviewed conference proceedings, **H-Index= 33**, over 4,500 citations (see full record for Majeed Hayat on scholar.google.com)

### Top 15 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: 236.
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: 217.
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: 190.

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: 187.
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: 145.
6. 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: 139.
7. 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: 136.
8. 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: 118.
9. **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: 113.
10. S. N. Torres, J. E. Pezoa, and **M. M. Hayat**, "Scene-based nonuniformity correction for focal plane arrays using the method of the inverse covariance form" *Applied Optics*, vol. 42, pp. 5872–5881, Oct. 2003. Citations: 88.
11. 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: 86.
12. 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: 83.
13. **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: 82.
14. B. M. Ratliff, **M. M. Hayat**, and J. S. Tyo, "Generalized algebraic scene-based nonuniformity correction algorithm," *Journal of the Optical Society of America A*, vol. 22, pp. 239-249, Feb., 2005. Citations: 80.
15. M. A. Saleh, **M. M. Hayat**, B. E. A. Saleh, and M. C. Teich, "Dead-space-based theory correctly predicts excess noise factor for thin GaAs and AlGaAs avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 47, no. 3, pp. 625–633, 2000. Citations: 80.

#### Refereed journal publications (103)

1. Z. Wang, M. Rahnamay-Naeini, J. M. Abreu, R. A. Shuvro, P. Das, A. A. Mammoli, N. Ghani, and M. M. Hayat, "Impacts of Operators Behavior on Reliability of Power Grids during Cascading Failures," *IEEE Transactions on Power Systems*, 2018, accepted.

2. E. Jamil, M. M. Hayat, and G. A. Keeler, "Analytical formulas for mean gain and excess noise factor in InAs avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 65, pp. 610–614, 2018.
3. D. Olivera<sup>1</sup>, N. Ghani<sup>1</sup>, T. Lehman, X. Yang, M. M. Hayat, J. Crichigno, E. Bou-Harb, "Software-defined networking (SDN) testbed for evaluation of large-scale electro-magnetic pulse (EMP) attacks," *IEEE Communications Magazine*, 2018, accepted.
4. J. B. Campbell, F. Perez, Q. Wang, B. Santhanam, R. Dunkel, A. Doerry, T. Atwood, and M. M. Hayat, "Remote vibration estimation using displaced phase center antenna SAR for strong clutter environment," *IEEE Transactions on Geoscience and Remote Sensing*, vol. PP, no. 99, 2018, pp. 1–6.
5. Md. M. Hossain, S. Ray, J. S. Cheong, L. Qiao, A. N. A. P. Baharuddin, M. M. Hella, J. P. R. David, and M. M. Hayat, "Low-noise speed-optimized large area CMOS avalanche photodetector for visible light communication," *IEEE J. Lightwave Technology*, vol. 35, pp. 2315–2324, June 2017.
6. F. Perez, B. Santhanam, R. Dunkel, and M. M. Hayat, "Clutter suppression via Hankel rank reduction for DFrFT-based vibrometry on SAR," *IEEE Geoscience and Remote Sensing Letters*, vol. 14, pp. 2052–2056, Nov. 2017.
7. Md. M. Hossain, S. Ray, J. S. Cheong, L. Qiao, A. N. A. P. Baharuddin, M. M. Hella, J. P. R. David, and M. M. Hayat, "Low-noise speed-optimized large area CMOS avalanche photodetector for visible light communication," *IEEE J. Lightwave Technology*, vol. 35, pp. 2315–2324 June, 2017.
8. J. Ghasemi, M. Bhattarai, G. R.C. Fiorante, P. Zarkesh-Ha, S. Krishna, and M. M. Hayat, "A CMOS approach to compressed-domain image acquisition," *Optics Express*, vol. 25, pp. 4076–4096, 2017.
9. S. E. Godoy, M. M. Hayat, D. A. Ramirez, S. A. Myers, R. S. Padilla, and S. Krishna, "Detection theory for accurate and non-invasive skin cancer diagnosis using dynamic thermal imaging," *Biomedical Optics Express*, vol. 8, pp. 2301–2323, 2017.
10. Z. Wang, M. M. Hayat, N. Ghani, and K. B. Shaban, "Optimizing cloud-service performance: efficient resource provisioning via optimal workload allocation," *IEEE Trans. Parallel & Distributed Systems*, vol. 28, pp. 1689–1702, 2017.
11. E. Jamil, J. S. Cheong, J. P. R. David, and M. M. Hayat, "On the analytical formulation of excess noise in avalanche photodiodes with dead space," *Optics Express*, vol. 24, Issue 19, pp. 21597–21608, 2016.
12. M. Rahnamay-Naeini and M. M. Hayat, "Cascading failures in interdependent infrastructures: An interdependent Markov-chain approach," *IEEE Transactions on Smart Grid: Special Issue on Theory of Complex Systems with Applications to Smart Grid Operations*, vol. 7, no. 4, pp. 1997–2006, 2016.
13. A. C. Farrell, P. Senanayake, C-H Hung, G. El-Howayek, A. Rajagopal, M. Currie, M. M. Hayat and D. L. Huffaker, "Plasmonic field confinement for separate absorption-multiplication in InGaAs nanopillar avalanche photodiodes," *Scientific Reports* 5, Article No. 17580, 2015.



14. M. M. Hayat, P. Zarkesh-Ha, G. El-Howayek, R. Efroymsen, and J. C. Campbell, "Breaking the buildup-time limit of sensitivity in avalanche photodiodes by dynamic biasing," *Optics Express*, vol. 23, no. 18, pp. 24035–24041, 2015.
15. G. Feng, K. Shaban, N. Ghani, S. Khan, M. R. Naeini, M. M. Hayat, and C. Assi, "Survivable cloud network mapping for disaster recovery support," *IEEE Transactions on Computers*, vol. 64, no. 8, pp. 2353–2366, 2015.
16. G. El-Howayek and M. M. Hayat, "Error probabilities for optical receivers that employ dynamically biased avalanche photodiodes," *IEEE Transactions on Communications*, vol. 39, pp. 3325–3335, 2015.
17. J. S. Cheong, M. M. Hayat, X. Zhou, and J. P. R. David, "Relating the experimental ionization coefficients in semiconductors to the nonlocal ionization coefficients," *IEEE Transactions on Electron Devices*, vol. 62, no. 6, pp. 1946–1952, June 2015.
18. B. Paskaleva, S. E. Godoy, W-Y Jang, S. C. Bender, S. Krishna, and M M. Hayat, "Model-based Edge Detector for Spectral Imagery Using Sparse Spatio-spectral Masks," *IEEE Trans. Image Proc.*, vol. 23, no. 5, pp. 2315-2327, May 2014.
19. M. Rahnamay-Naeini, Z. Wang , A. Mammoli, N. Ghani, and M. M. Hayat, "Stochastic analysis of cascading-failure dynamics in power grids," *IEEE Trans. Power Systems*, vol. 29, no. 4, pp. 1767–1779, July 2014.
20. G. El-Howayek, C. Zhang, Y. Li, J. S. Ng, J. P. R. David, and M. M. Hayat, "On the use of Gaussian approximation in analyzing the performance of optical receivers," *IEEE Photonics Journal*, vol. 6, no. 1, Feb. 2014.
21. D. A. Ramirez, M. M. Hayat, A. S. Huntington, and G. M. Williams, "Non-local model for the spatial distribution of impact ionization events in avalanche photodiodes," *IEEE Photonics Technology Lett.*, vol. 26, pp. 25–28, 2014.
22. Q. Wang, M. Pepin, 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*, vol. 52, pp. 3063–3073, June 2014.
23. 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*, vol. 25, pp. 1034–1043, April 2014.
24. 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 J. Electron Device Society*, vol. 1, pp. 99–110, 2013.
25. J. Huang, K. Banerjee, S. Ghosh, and M. M. Hayat, "Dual-carrier high-gain low-noise superlattice avalanche photodiode," *IEEE Trans. Electron Devices*, vol. 60, pp. 2296–2307, 2013.
26. 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.

27. 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.
28. 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.
29. 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.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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.
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#### **Representative reviewed conference proceedings and abstracts (over 126, 17 invited)**

1. R. A. Shuvro, Z. Wang, P. Das, M. Rahnamay-Naeini, and M. M. Hayat, "Modeling impact of communication network failures on power grid reliability," *2017 North America Power Symposium (NAPS)*, Morgantown, WV, Sep. 2017.
2. P. Das, M. Rahnamay-Naeini, N. Ghaniz, and M. M. Hayat, "On the vulnerability of multi-level communication network under catastrophic events," *ICNC 2017 (International Conference on Computing, Networking and Communications)*, January 26–29, 2017, Silicon Valley, USA.
3. P. Das, R. A. Shuvro, Z. Wang, M. Rahnamay-Naeini, N. Ghani, and M. M. Hayat, "Stochastic failure dynamics in communication network under the influence of power failure," *The 13th IEEE International Conference on Wireless and Mobile Computing, Networking and Communication (WiMob17)*, Oct. 9–11, Rome, Italy, 2017.
4. R. A. Shuvro, Z. Wang, P. Das, M. Rahnamay-Naeini, and M. M. Hayat, "Characterize cascading failure dynamics in the power grid including impact of communication network and human operator response," *IEEE Green Energy and Smart Systems Conference (IGESSC 2017)*, Nov. 6–7, 2017, Long Beach, CA.
5. D. Oliveira, M. Pourvali, H. Bai, N. Ghani, T. Lehman, X. Yang, and M. M. Hayat, "A novel automated SDN architecture and orchestration framework for resilient large-scale networks," *IEEE Southeast Conference*, March 30–April 2, 2017, Charlotte, NC, USA.
6. M. Rahnamay-Naeini and M. M. Hayat, "On the Influences of Power-Grid Operating Characteristics on Self-Organized Criticality," *2016 Proceedings of the IEEE Power and Energy Society (PES) General Meeting*, 17–21, July 2016.
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4. Z. Tang, J. D. Birdwell, J. Chiasson, C. T. Abdallah, and M. M. Hayat, *Closed loop control of a load balancing network with time delays and processor resource constraints*. In *Advances in Communication Control Networks*, Springer series on Lecture Notes in Control and Information Sciences (LCNCIS), (S. Tarbouriech, C. T. Abdallah, and J. Chiasson, Editors), LNCSE vol. 308, pp. 245–263, Springer-Verlag, 2004 (ISBN 3-540-22819-5).
5. S. Dhakal, M. M. Hayat, J. Ghanem, C. T. Abdallah, H. Jerez, J. Chiasson, and J. D. Birdwell, *On the optimization of load balancing in distributed networks in the presence of delay*. In *Advances in Communication Control Networks*, Springer series Lecture Notes in Control and Information Sciences (LCNCIS), (S. Tarbouriech, C. T. Abdallah, and J. Chiasson, Editors) LNCSE vol. 308, pp. 223–244, Springer-Verlag, 2004 (ISBN 3-540-22819-5).
6. M. M. Hayat, J. E. Pezoa, S. Dhakal, and D. Dietz, “Dynamic load balancing for robust distributed computing in the presence of topological impairments,” *The Wiley Handbook of Science and Technology for Homeland Security*, 2008.
7. W-Y. Jang, B. Paskaleva, M. M. Hayat, and S. Krishna, “Spectrally adaptive nanoscale quantum-dot sensors,” *Wiley Handbook of Science and Technology for Homeland Security*, 2008.
8. M. M. Hayat, *Advances in III-V Avalanche Photodiodes*. In *Comprehensive Semiconductor Science and Technology Publications: Devices*. Eds: P. Bhattacharya, Roberto Fornari and Hiroshi Kamimura, ISBN 978-0-444-53143-8, Elsevier Publishing, March, 2011.

### Issued patents

1. “Uniform, Non-disruptive, and Radiometrically Accurate Calibration of Infrared Focal-Plane Arrays Using Global Scene Motion,” (with B. Ratliff [Hayat’s student], J. S. Tyo, and T. Turner), United States Patent No. 7,132,648, Nov. 2006. (Previously licensed.)
2. “Spectrally Adaptive Quantum Dot Infrared Sensors for Focal Plane Arrays,” (with S. Krishna, U. Sakoglu [Hayat’s student], J. S. Tyo, and S. Raghavan), United States Patent No. 7,217,951, May 2007. (Previously licensed.)
3. “Intersubband detector with avalanche multiplier region,” (with S. Krishna and J.P.R. David), United States Patent No. 7,271,405, Sep. 2007. (Previously licensed.)
4. “System and Method for Reduction of Speckle Noise in an Image,” (with O. Lankoande [Hayat’s student] and B. Santhanam), United States Patents No. 7,961,975, issued June 14, 2011.
5. “System and Method for Reduction of Speckle Noise in an Image,” (with O. Lankoande [Hayat’s student] and B. Santhanam), United States Patents No. 8,184,927, issued 2012.
6. “System and Method for Reduction of Speckle Noise in an Image,” (with O. Lankoande [Hayat’s student] and B. Santhanam), United States Patents No. 8,208,724, issued 2012.

7. "Infrared Retina," (with S. Krishna, W-Y Jang [Hayat's student], J. S. Tyo), United States Patent No. 8,071,945 B2, Dec. 2011.
8. "Detector with Tunable Spectral Response," (with S. Krishna, J. S. Tyo, S. Raghavan, Sunil and U. Sakoglu [Hayat's student]), United States Patent No. 8,134,141, March 13, 2012.
9. "Lens-less digital microscope," (with S. Hersee and P. Sen), United States Patent No. 8,624,968 B1, January 7, 2014.
10. "Spectral Ratio Contrast for Edge Detection in Spectral Images," United States Patent US-13/013,744, M. M. Hayat, S. Krishna, and B. S. Paskaleva [Hayat's student], February 2014.
11. "Method and System for Feature Extraction and Decision Making from Series of Images," United States Patent US-2015-0187068-A1 S. Krishna, S. Krishna, M. M. Hayat, P. Sen, Y. Maziar, S. Godoy (Hayat's student), A. Barve, U.S. Patent 2015/0187068, October 2016.
12. "Impact Ionization Devices Under Dynamic Electric Fields." M. M. Hayat, D. A. Ramirez, J. P. David, L. Lester, S. Krishna, and P. Zarkesh-Ha, U.S. Patent 9,354,113, May 2016. (Licensed.)
13. "Method and System for Feature Extraction and Decision Making from Series of Images," S. Krishna, S. Krishna, M. M. Hayat, P. Sen, Y. Maziar, S. Godoy (Hayat's student), A. Barve, U.S. Patent Continuation 2017/0011513 A1, January 2017.
14. "Material Classification Fused with Spatio-Spectral Edge Detection in Spectral Imagery," M. M. Hayat, S. Krishna, and S. E. Godoy, U.S. Patent 14/334,446, August, 2016.

## TEACHING

### Courses taught

- **Graduate:** Detection and estimation theory, queuing theory for computer networks, optical communication (including an online version), electro-optical devices and systems, digital image processing, digital communication theory, spread spectrum systems, probability and stochastic processes (including online version), advanced probability and stochastic processes.
- **Graduate–reading courses:** Optical networks, information theory, mathematical analysis.
- **Undergraduate:** Signals and systems, probability and statistics, digital signal processing, random processes, analog-modulation laboratory, electrical-devices laboratory.

### New courses developed

- ECE595 Queuing theory for computer networks: 2017.
- ECE595 Algorithms for spectral imaging and sensing: 2010
- ECE642 Detection and estimation theory: 2005.
- ECE595 Probabilistic methods for signal processing and communications: 2004, 2015.
- ECE565 Optical communications (online): components and subsystems. This online 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

### Students completing doctoral degrees and their placement (19 PhD graduates; 8 holding tenured or tenure-track faculty positions)

1. Erum Jamil, Optical Science and Engineering, University of New Mexico, July 2017, “Analytical Modeling and Characterization for Avalanche Photodiodes.” Currently she is employed as an assistant professor at the International Islamic University, Islamabad, Pakistan.
2. Zhuoyao Wang, ECE, University of New Mexico, April 2016, “Optimizing Cloud-Service Performance: Efficient Resource Provisioning Via Optimal Workload Allocation.” Currently employed at ZTE Corporation (Multinational telecommunications equipment and systems company), Shenzhen, China.
3. Sebastian E. Godoy (with Distinction), ECE, University of New Mexico, February 2015, “Detection Theory for Skin Cancer Diagnosis using Dynamic Thermal Imaging,” Employed as an assistant professor of electrical engineering at Universidad de Concepcion, Chile.

4. Mahshid Rahnamay-Naeini (with Distinction), ECE, University of New Mexico, July 2014, "Stochastic Dynamics of Cascading Failures in Electric-Cyber Infrastructures." Currently she is employed as tenure-track assistant professor of electrical and computer engineering at University of South Florida.
5. Georges El-Howayek, ECE, University of New Mexico, Dec. 2014, "Communication-Theoretic Foundations for Optical Receivers Using Dynamically Biased Avalanche Photodiodes." Currently employed as tenure-track assistant professor of electrical engineering at Valpariso University, Indiana.
6. Qi Wang (with Distinction), ECE, University of New Mexico, Dec. 2012, "Time-frequency Methods for Vibration Estimation Using Synthetic Aperture Radar." Currently employed at Cisco, CA.
7. Woo Yong Jang, ECE, University of New Mexico, Aug. 2012, "Data Compressive Paradigm for Spectral Sensing and Classification Using Electrically Tunable Detectors." Currently employed at AFRL, Dayton, OH.
8. David A. Ramirez, ECE, University of New Mexico, Dec. 2011, "Modeling and Engineering Impact Ionization in Avalanche Photodiodes for Near and Mid Infrared Applications." Currently employed at Lockheed Martin, CA.
9. Jorge E. Pezoa, ECE, University of New Mexico, Dec. 2010, "Theory of Resource Allocation for Robust Distributed Computing." Currently employed as associate professor of electrical engineering at the Universidad de Concepcion, Chile.
10. Biliانا N. Paskaleva, ECE, 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.
11. Peng Sun (Distinction), ECE, University of New Mexico, May 2008, "Mathematical Theory of Modern Avalanche Photodiodes and Its Application to Ultrafast Communications." Currently employed at Western Digital, CA.
12. Sagar Dhakal; ECE, University of New Mexico, Oct. 2006, "Stochastic model-based optimization of load balancing policies in distributed systems." Currently employed at Intel Corp.
13. Ousseini Lankoande (Distinction), ECE, University of New Mexico, Feb. 2006, "A Markov random field-based approach to speckle reduction." Currently employed at Instrument Technology Inc., Westfield, MA.
14. Unal Sakoglu; ECE, University of New Mexico, May 2006, "Signal-processing strategies for spectral tuning and chromatic nonuniformity correction for quantum-dot IR sensors." Currently employed as a tenure-track assistant professor in computer engineering at the University of Houston - Clear Lake.
15. Oh-Hyun Kwon, ECE, 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.
16. Bradley M. Ratliff, ECE, University of New Mexico, Dec. 2004, "A generalized algebraic scene-based nonuniformity correction algorithm for infrared focal plane arrays." Currently employed as a research professor at the University of Dayton, Dayton, 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).

17. Sergio N. Torres, ECE, University of Dayton, May 2001, "A Kalman-filtering approach for nonuniformity correction in focal-plane array sensors." Currently employed as professor of electrical engineering at the Universidad de Concepcion, Chile.
18. Steven C. Cain, ECE, University of Dayton, Aug. 2001, "Improved atmospheric-turbulence tilt estimation through the use of a temporal transition model." Currently employed as an associate professor of electrical and computer engineering at the Air Force Institute of Technology, Ohio.
19. Guoquan Dong, Electro Optics, University of Dayton, Dec. 2000, "Channel-coded optical-code-division multiple-access networks."

### Students completing masters theses

1. Manish Bhattarai, ECE, University of New Mexico, Nov. 2017, "Algorithm for Computational Imaging on a Real-Time Hardware."
2. Mahdi Zerara, ECE, University of New Mexico, July 2017, "Projection-based Rotation Estimation for Video Stabilization."
3. Justin B. Campbell, ECE, University of New Mexico, July 2016, "Remote Vibration Estimation Using Displaced Phase Center Antenna SAR in a Strong Clutter Environment."
4. Md. Mottaleb Hossain, Optical Science and Engineering, University of New Mexico, May. 2015, "CMOS compatible avalanche silicon photodiodes for smart lighting." Currently a Ph.D. student with Hayat.
5. Zhuoyao Wang, ECE, 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.
6. Srikanth R. Narravula, ECE, 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.
7. Todd Giles, ECE, 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.
8. Sripuram Lakshmikaulth Reddy (Primary adviser: Prof. Balu Santhanam), ECE, University of New Mexico, May 2007, "Multicomponent Chirp Demodulation Using the Fractional Fourier Transform."
9. Biliana Paskaleva, ECE, University of New Mexico, Aug. 2004, "A Study of Multispectral Rock Separation and Classification."
10. Sagar Dhakal (Distinction), ECE, University of New Mexico, Dec. 2003, "Load Balancing in Delay-Limited Distributed Systems."

11. Balaji Narayanan, ECE, University of Dayton, Aug. 2002, “Coherent detection of optical signals using photon-correlated beams.”
12. Bradley M. Ratliff, ECE, University of Dayton, Dec. 2001, “An algebraic algorithm for nonuniformity correction in focal-plane arrays.”
13. Mohammad Sajjad Abdullah, ECE, University of Dayton, May 2000, “Image estimation using photon-correlated beams.”
14. Oh-Hyun Kwon, Electro Optics, University of Dayton, Dec. 1999, “An algorithm for computing the bit-error rate in thin avalanche-photodiode receivers.”
15. Guoquan Dong, Electro Optics, University of Dayton, Dec. 1998, “Statistics of the bandwidth of avalanche photodiodes: A renewal theory approach.”
16. Mohammad A. Saleh, Electro Optics, University of Dayton, Aug. 1999, “Prediction of excess noise factor for thin GaAs and AlGaAs avalanche photodiodes using dead-space-based theory.”
17. Sergio N. Torres, ECE, University of Dayton, Dec. 1997, “Bit-error rates for communication systems using twin-photon beams.”
18. David A. Persing, ECE, 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 graduate students**

1. Pankaz Das (PhD); research area: modeling of multilayer networks; expected graduation: August 2018.
2. Rezoan Shruvo (PhD); research area: Probabilistic analysis of cascading failures in coupled communication and power networks, expected graduation: Dec. 2018.
3. Francisco Perez Venegas (PhD); research area: SAR based vibrometry; expected graduation: August 2018.
4. Md. Mottaleb Hossain (PhD); research area: detectors for smart lighting; expected graduation: August 2018.
5. Monica Madrid (PhD, funded by Fellowship from Sandia National Laboratories); research area: classification algorithms for multi-sensor data; expected graduation: 2019.

#### **Post-doctoral associates supervised**

1. Zhyuoyao Wang, UNM, May 2016–Aug. 2017, research area: Resource provisioning via optimal workload allocation in cloud services.
2. David Ramirez, UNM, Jan. 2012–2013, research area: Avalanche photodiodes, photon-counting arrays, and IR imaging.
3. Matthew Pepin, UNM, Jan. 2009–2013; research area: Synthetic aperture radar imaging.
4. O-H. Kwon, UNM, August-04–May-05; research area: Avalanche photodiodes.
5. Z. Chen: University of Dayton, May 1998 to Dec. 1998; research area: Image processing.

**Undergraduate students participating in research**

1. Blake Milner, June 2013 – August 2013; Mr. Milner was an REU student from Purdue University. He worked on the topic of modeling of nanopillar single photon avalanche diodes.
2. Rebecka Ann Diaz, August 2013 - present; REU student, UNM. Rebecka worked on the topic of modeling of impact ionization in nanopillar single photon avalanche diodes.
3. Ghady Azar, June 2010 – August 2010. Mr. Azar was from the Department of Electrical Engineering, American University of Beirut. He participated in Dr. Hayat's research in resource allocation in distributed systems.
4. Ryan J. Beach (Mechanical Engineering student at UNM), June 2009 – 2010; Ryan worked on the project of SAR-based vibrometry.
5. Alec Wright, (ECE student at UNM), June 2011–June 2012; Alec worked on the project of SAR-based vibrometry.
6. Monica Martinez, August 2005–Dec. 2005; Monica worked on the project of multispectral classification.
7. 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.
8. Alejandro Grine, August 2003 – August 2005. Alex worked on a project on avalanche photodiodes; he went on to complete his MS and Ph.D. degrees from MIT and UC Berkeley, respectively. He is currently employed at Sandia National Laboratories. Alex was supported by an NSF REU program.
9. Alim Haji, August 2003–August 2005. Alim worked on a project on optical receivers. He was supported by an NSF REU program. He is currently self employed.
10. Mohammad Elyas, May 2004 – 2005. Mohammad worked on a project on distributed computing, networking. Mohammad was also by an NSF REU program.
11. Md. Saifu Rahman, May 2005 – July 2005. Mr. Rahman was from the Indian Institute of Technology, Kharagpur. He worked on a project on image processing.
12. Deepak Kumar Garg, May 2006 – July 2006. Mr. Garg was from the Indian Institute of Technology, Madras. He worked on developing equalizers for ultra-fast avalanche photodiode-based receivers.
13. Sebastian Godoy, January 2006 – April 2006. Sebastian was a visitor from the Universidad de Concepcion. He worked on image processing for infrared sensors.
14. Bradley M. Raliff, May 1999–Aug. 2000 (University of Dayton); Brad worked on infrared video processing.

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

- Associate Editor, IEEE Trans. Parallel & Distributed Systems, 2014-present.
- Guest Editor: SPIE Optical Engineering: Special Issue on “Photon Counting Technologies,” 2018.



- Associate Editor, Optics Express; Area: Photodetectors and Image Processing, Jan. 04 – Jan. 2010.
- Chair: Technical Committee for Photodetectors, Sensors, Systems and Imaging, IEEE Photonics Society, 2010 – 2013.
- 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 Trans. Parallel & Dist. Computing, IEEE J. Quantum Electronics, IEEE Trans. Signal Processing, IEEE Trans. Image Processing, IEEE Trans. Communications, IEEE Trans. Geoscience & Remote Sensing, IEEE Trans. Electron Devices, IEEE Trans. Power Systems, IEEE Photonics Technology Letters, IEEE Electron Device Letters, J. Optical Society of America A & B, Optical Engineering, J. Applied Physics, Applied Physics Letters, Applied Optics, and a number of other journals.

**Service to the University of New Mexico (Recent)**

- Associate Director, Center for High Technology Materials, UNM, 2012 – 2016.
- Member, ECE faculty search committee, 2017/18.
- General Chair, Optical Science and Engineering, UNM, 2011 – 2015.
- Chair, Faculty Search Committee, Center for High Technology Materials, 2014.
- Chair, School of Engineering ad hoc committee on governance, 2011–2013.
- 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 – 2014.
- 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.

**Major entrepreneurial activities**

Co-founder and Chief Technical Officer, Dynamic Photonics Inc. ([www.dynamic-photonics.com](http://www.dynamic-photonics.com)), 2012–present.

**Consulting service to industry and government**

- Voxel, Inc. (Beaverton, OR): modeling avalanche photodiodes and information-theoretic capability of reconfigurable 3D imagers, 2010–2011 & 2017–present.
- New Mexico Department of Transportation: algorithm for statistical detection of distress in pavements based on GPR data, 2017–2018.
- Princeton Lightwave Inc. (Princeton NJ): modeling high performance avalanche photodiodes for photon counting, 2006–2012.
- Vega Technology and Systems, Inc. (Hanover, IL): modeling and optimization of novel IR sensors (active SBIR program), 2006–2010.
- K&A Wireless LLC (Albuquerque, NM): development and commercialization of image processing algorithms for infrared sensors, 2003–2008.
- Esqel Corporation (Wheaton, IL): consultant and member of the advisory board; performed modeling and performance analysis for technologies related to optical, 2000–2003.