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 vibrartion estimation using synthetic-aperture radar (SAR); information-theoretic optimization of reconfigurable imagers; scene-based nonuniformity 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. National Science Foundation, "CDSE: Optimization of Advanced Cyberinfrastructure through Data-driven Computational Modeling," PI: P. Bridges, Co-PIs: **M. M. Hayat** and T. Estrada, **$523,644**; 9/01/18 – 8/31/21.

Completed 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**.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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.

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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.

20. Sandia National Laboratories, "Novel signal processing strategies for remote detection of vibrational signals," **PI: M. M. Hayat**, **$125,000**, May 2007–May 2009.

21. Sandia National Laboratories, "Image processing strategies for long-wavelength synthetic aperture radar," **PI: M. M. Hayat**, **$35,000**; Jul. 2006–Aug. 2007.

22. 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.

23. 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.

24. 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 Tennesee); total award: $362,000; UNM's portion: **$192,246** (including REU supplements); Aug. 2003 – Dec. 2006.

25. 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.

26. 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

27. 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

28. 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.

29. 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.

30. 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.

31. 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.

32. Sandia National Laboratories, "Multispectral rock-type classification," **PI: M. M. Hayat**, **$49,935**; Mar. 2003–Oct. 2003.

33. 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.

34. 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

35. 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.

36. Air Force Office for Scientific Research (AFOSR/RDL), Faculty Summer Research Program, **$8,000**, May–Aug. 1997.

37. 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.

38. Office of Naval Research, "Minefield modeling," PI: John A. Gubner, **Co-PI: M. M. Hayat**, **$322,120**, Jan. 1994–Dec. 1996.

Publications

Summary

Over 107 peer-reviewed journal publications, over 132 (17 invited) reviewed conference proceedings, **H-Index= 36**, over 5,200 citations (see full record for Majeed Hayat on scholar.google.com)

Select highly-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: 246.
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: 240.

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: 204.
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: 203.
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: 159.
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: 148.
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: 138.
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: 138.
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: 119.
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: 100.
11. 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: 93.
12. 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: 92.
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: 89.
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: 88.
15. 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: 88.
16. M. Rahnamay-Naeini, Z. Wang, N. Ghani, A. Mammoli, and M.M. Hayat, "Stochastic analysis of cascading-failure dynamics in power grids," *IEEE Transactions on Power Systems*, vol. 29, no. 4, pp. 1767–1779 ,2014. Citations: 82.

Refereed journal publications (103)

1. P. Das, R. A. Shuvro, J. Povinelli, F. Sorrentino, and M. M. Hayat, "Mitigating Cascading Failures in Smart Grids via Markov Decision based Load-shedding," *IEEE Transactions on Smart Grid*, under review.
2. P. Das, R. A. Shuvro, J. Povinelli, M. Rahnamay-Naeini, N. Ghani, and M. M. Hayat, "Theory for Optimizing Insecure Inter-Network Connections," *IEEE Systems Journal*, under review.
3. V. Shulyak, M. M. Hayat, J. S. Ng, "Sensitivity Calculations of High-Speed Optical Receivers based on Electron-APDs," *IEEE Journal of Lightwave Technology*, in press, October 2019.
4. M. M. Hossain, J. P. David, and M. M. Hayat, "Exact Analytical Formula for the Excess Noise Factor for Mixed Carrier Injection Avalanche Photodiodes," *IEEE Journal of Lightwave Technology*, vol. 37, pp. 3315–3323, May 2019.
5. O. Diogo, N. Ghani, J. Crichigno, M. M. Hayat, and E. Bou-Harb, "SDN Testbed for Evaluation of Large Exo-Atmospheric EMP Attacks," *IEEE Communications Magazine*, vol. 57, no. 1, pp. 88–97, Jan. 2019.
6. 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*, vol. 33, no. 6, pp. 6013–6024, 2018.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.

14. 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.
15. 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.
16. 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.
17. 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.
18. M. M. Hayat, P. Zarkesh-Ha, G. El-Howayek, R. Efroymson, 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.
19. 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.
20. 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.
21. 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.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.

27. 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.
28. 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.
29. 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.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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.
35. 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.
36. 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.
37. 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.
38. 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.
39. 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.

40. 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.
41. 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.
42. 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.
43. 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.
44. 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.
45. 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.
46. 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.
47. 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.
48. 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.
49. 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.
50. 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.
51. 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.
52. W-Y. Jang, M. M. Hayat, J. S. Tyo, R. S. Attaluri, T. E. Vandervelde, Y. D. Sharma, R. Shenoi, 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.
53. 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.

54. 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.
55. 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.
56. 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.
57. 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.
58. 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.
59. 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.
60. 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.
61. 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.
62. 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.
63. 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.
64. 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.
65. J. Chiasson, Z. Tang, J. Ghanem, C. T. Abdallah, J. D. Birdwell, M. M. Hayat, and H. Jerez, "The effect of time delays on the stability of load balancing algorithms for parallel computations," *IEEE Trans. Control Syst. Technol.*, vol. 13, pp. 932–942, 2005.
66. S. Krishna, O-H. Kwon and M. M. Hayat, "Theoretical investigation of quantum-dot avalanche photodiodes for mid-infrared applications," *IEEE J. Quantum Electronics*, vol. 41, pp. 1468–1473, Dec. 2005.
67. D. A. Ramirez, M. M. Hayat, G. Karve, J. C. Campbell, S. N. Torres, B. E. A. Saleh, and M. C. Teich, "Detection efficiencies and generalized breakdown probabilities for nanosecond-gated near infrared single-photon avalanche photodiodes," *IEEE J. Quantum Electronics*, vol. 42, pp. 137–145, Feb. 2006.

68. P. Sun, M. M. Hayat, B. E. A. Saleh, and M. C. Teich, "Statistical correlation of gain and buildup time in APDs and its effects on receiver performance," *IEEE J. Lightwave Technology*, vol. 24, pp. 755–768, 2006.
69. C. Groves, C. H. Tan, J. P. R. David, G. J. Rees, and M. M. Hayat, "Exponential time response in analogue and Geiger mode avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 52, pp. 1527-1534, 2005.
70. O-H. Kwon, M. M. Hayat, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Gain-bandwidth-product optimization of heterostructure avalanche photodiodes," *IEEE Journal of Lightwave Technology*, vol. 23, pp. 1896-1906, May 2005.
71. 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.
72. O-H. Kwon, M. M. Hayat, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Optimized breakdown probabilities in AlGaAs-GaAs heterojunction avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 25, pp. 599–601, 2004.
73. O-H. Kwon, M. M. Hayat, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Effect of stochastic dead space on noise in avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 51, pp. 693–700, 2004.
74. Y. Pan, C. S. Ierotheou, and M. M. Hayat, "Parallel gain-bandwidth characteristics calculations for thin avalanche photodiodes on an SGI Origin-2000 supercomputer," published online in *Concurrency and Computation: Practices and Experience,* John Wiley & Sons, July 15 2004. http://www3.interscience.wiley.com/cgi-bin/abstract/109561230/ABSTRACT
75. 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.
76. B. M. Ratliff, M. M. Hayat, and J. S. Tyo, "Radiometrically accurate scene-based nonuniformity correction for array sensors," *The Journal of the Optical Society of America A*, vol. 20, pp. 1890–1899, 2003.
77. O-H. Kwon, M. M. Hayat, S. Wang, J. C. Campbell, A. L. Holmes, Y. Pan, B. E. A. Saleh, and M. C. Teich, "Optimal excess noise reduction in thin heterojunction $Al_{0.6}Ga_{0.4}As$ avalanche photodiodes, *IEEE J. Quantum Electronics*, vol. 39, pp. 1287–1296, 2003.
78. M. M. Hayat, O-H. Kwon, S. Wang, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Boundary effects on multiplication noise in thin heterostructure avalanche photodiodes: Theory and experiment," *IEEE Trans. Electron Devices*, vol. 49, pp. 2114–2123, December 2002.
79. 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, March 2003.
80. M. M. Hayat, U. Sakoglu, O-H. Kwon, S. Wang, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Breakdown probabilities for thin heterostructure avalanche photodiodes," *IEEE J. Quantum Electronics*, vol. 39, pp. 179–185, Jan. 2003.

81. 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.
82. M. M. Hayat, O-H. Kwon, Y. Pan, P. Sotirelis, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Gain-bandwidth characteristics of thin avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 49, pp. 770–781, May 2002.
83. 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.
84. M. M. Hayat, M. S. Abdullah, A. Joobeur, and B. E. A. Saleh, "Maximum-likelihood image estimation using photon-correlated beams," *IEEE Trans. Image Processing*, vol. 11, pp. 838–846, Aug. 2002.
85. 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.
86. 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.
87. M. A. Saleh, M. M. Hayat, O-H. Kwon, A. L. Holmes, J. C. Campbell, B. E. A. Saleh, and M. C. Teich, "Breakdown voltage in thin III–V avalanche photodiodes," *Applied Physics Letters*, vol. 79, no. 24, pp. 4037–4039, 2001.
88. Z. Chen, M. A. Karim, and M. M. Hayat, "Locating target at high speed using image decimation decomposition processing," *Pattern Recognition*, vol. 34, no. 3, pp. 685–694, 2001.
89. Z. Chen, M. A. Karim, and M. M. Hayat, "Displacement co-occurrence statistics for binary digital images," *J. Electronic Imaging*, vol. 11, no. 2, pp. 127–135, April 2002.
90. M. M. Hayat and G. Dong, "A new approach for computing the bandwidth statistics of avalanche photodiodes," *IEEE Trans. Electron Devices*, vol. 47, no. 6, pp. 1273–1279, 2000.
91. J. A. Gubner, W.-B. Chang, and M. M. Hayat, "Performance analysis of hypothesis testing for sparse pairwise interaction point processes," *IEEE Trans. Information Theory*, vol. 46, no. 4, pp. 1357–1365, 2000.
92. 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.
93. 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.
94. M. M. Hayat, J. A. Gubner, and S. Abdullah, "Asymptotic distributions for the performance analysis of hypothesis testing of isolated-point-penalization point processes," *IEEE Trans. Information Theory*, vol. 45, no. 1, pp. 177–187, 1999.

95. M. M. Hayat, A. Joobeur, and B. E. A. Saleh, "Reduction of quantum noise in transmittance estimation using photon-correlated beams," *Journal of the Optical Society of America A*, vol. 16, no. 2, pp. 348–358, 1999.
96. M. M. Hayat, S. N. Torres, and L. M. Pedrotti, "Theory of photon coincidence statistics in photon-correlated beams," *Optics Communications*, vol. 169, pp. 275–287, 1999.
97. 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.
98. M. M. Hayat, Z. Chen, and M. A. Karim, "An analytical approximation for the excess noise factor of avalanche photodiodes with dead space," *IEEE Electron Device Letters*, vol. 20, no. 7, pp. 344–347, 1999.
99. Z. Chen, M. A. Karim, and M. M. Hayat, "Effects of band-pass sampling on joint transform correlation," *Optical Engineering*, vol. 38, no. 5, pp. 886–892, 1999.
100. Z. Chen, M. A. Karim, and M. M. Hayat, "Elimination of higher-order aliasing by multiple interlaced sampling," *Optical Engineering*, vol. 38, no. 5, pp. 879–885, 1999.
101. J. A. Gubner and M. M. Hayat, "A method to recover counting distributions from their characteristic functions," *IEEE Signal Proc. Lett.*, vol. 3, no. 6, pp. 184–186, 1996.
102. M. M. Hayat, B. E. A. Saleh, and J. A. Gubner, "Shot-noise-limited performance of optical neural networks," *IEEE Trans. Neural Networks*, vol. 7, no. 3, pp. 700–708, 1996.
103. M. M. Hayat, B. E. A. Saleh, and J. A. Gubner, "Bit-error rates for optical receivers using avalanche photodiodes with dead space," *IEEE Trans. Communications*, vol. 43, no. 1, pp. 99–106, 1995.
104. 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.
105. 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.
106. 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.
107. 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.

Representative reviewed conference proceedings and abstracts (over 126, 17 invited)

1. R. A. Shuvro, P. Das, and M. M. Hayat, "Balancing Smart Grid's Performance Enhancement and Resilience to Cyber Threat," *Resilience Week 2019*, San Antonio, TX, November 2019.
2. R. A. Shuvro, M. Talukder , P. Das, and M. M. Hayat, "Predicting Cascading Failures in Power Grids using Machine Learning Algorithms," *51st North American Power Symposium (NAPS 2019)*, Wichita State University, Kansas, 2019.

3. R. A. Shuvro, P. Das, J. M. Abreu, and M. M. Hayat. "Correlating Grid-operators' Performance with Cascading Failures in Smart-Grids," *The 2019 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe)*, Bucharest, Romania, 2019.
4. R. A. Shuvro, P. Das, M. Rahnamay-Naeini, F. Sorrentino, and M. M. Hayat. "On the Dynamics of Transmission Capacity and Load Loss during Cascading Failures in Power Grids," *The 2019 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe)*, Bucharest, Romania, 2019.
5. F. Perez, B. Santhanam, and M. M. Hayat. "Fractional spectrogram for characterizing and classifying vibrating objects in SAR images," *2019 Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 3–6, 2019.
6. F. Pérez, B. Santhanam, T. Atwood, R. Dunkel, A. W. Doerry, and M. M. Hayat, "Detection of vibrating objects in SAR images," *Proc. SPIE 11003, Radar Sensor Technology XXIII*, 3 May 2019); https://doi.org/10.1117/12.2517555
7. 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.
8. P. Das, M. Rahnamay-Naeini, N. Ghaniz, and M. M. Hayat, "On the vulnerability of multilevel communication network under catastrophic events," *ICNC 2017 (International Conference on Computing, Networking and Communications)*, January 26–29, 2017, Silicon Valley, USA.
9. 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 (WiMob'17)*, Oct. 9–11, Rome, Italy, 2017.
10. 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.
11. 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
12. 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.
13. M. M. Hayat, "High speed avalanche photodiodes beyond their traditional buildup time," **invited**, *OSA's 2016 Application of Lasers for Sensing & Free Space Communication (LS&C)*, Boston, MA, 2016.
14. Y. Yasaei, M. M. Hayat, and A. A. Mammoli, "Response of distribution feeder microgrids to system-Level reserve requests," *2016 Proceedings of the IEEE Power and Energy Society (PES) General Meeting*, 17–21, July 2016.
15. F, Perez, J. B. Campbell, Monica Jaramillo, R. Dunkel, T. Atwood, A. Doerry, W. H. Gerstle, B. Santhanam, M. M. Hayat, "Exploiting synthetic aperture radar imagery for retrieving

vibration signatures of concealed machinery," *Radar Sensor Technology XX conference, SPIE Defense + Security Symposium*, 17–21 April 2016, Baltimore, MD.

16. M. M. Hayat, "Dynamic biasing of APDs," **invited**, *IEEE Photonics Conference (IPC-2015)*, Reston, VA, 2015.
17. Md. M. Hossain, P. Zarkesh-Ha, and M. M. Hayat, "Linear mode CMOS compatible p-n junction avalanche photodiode with operating voltage below 9V," *IEEE Photonics Conference (IPC-2015)*, Reston, VA, 2015.
18. A. Farrell, P. Senanayake, G. El-Howayek, M. M Hayat, and D. Huffaker, "Dead-space effect in InGaAs nanopillar avalanche photodetectors," *2015 Compound Semiconductor Week (CSW)*, June 28 – July 2, 2015, University of California Santa Barbara, CA.
19. J. B. Campbell, Q. Wang, J. Ade-Bello, H. Caudana, N. B. Trujillo, I. Bhatta, R. Dunkel, T. Atwood, A. Doerry, W. H. Gerstle, B. Santhanam, and M. M. Hayat, "SAR-based vibrometry using the fractional Fourier transform," *Radar Sensor Technology XIX conference, SPIE Defense & Security Symposium*, SPIE Proc. 9461-24, April 2015.
20. G. El-Howayek, B. M. Milner, P. Senanayake, D. L. Huffaker and M. M. Hayat, "Analytical Model for Impact Ionization in 3D Multiplication Regions," *IEEE Photonics Conference (IPC-2014)*, La Jolla, CA, 2014.
21. Md. M. Hossain1, P. Zarkesh-Ha1, J. P. R. David, and M. M. Hayat, "Low Breakdown Voltage CMOS Compatible p-n Junction Avalanche Photodiode," *IEEE Photonics Conference (IPC-2014)*, pp. 170–171, La Jolla, CA, 2014.
22. Z. Wang, M. M. Hayat, N. Ghani, K. B. Shaban, "A probabilistic multi-tenant model for virtual machine allocation in cloud systems," *Third IEEE International Conference on Cloud Networks (IEEE CloudNet2014)*, 8–10 October 2014, pp. 339–343, Luxembourg, 2014.
23. M. Pourvali, H. Bai, F. Gu, M. Naeini, J. Crichigno, M. Hayat, K. Shaban, N. Ghani, "Virtual network mapping for cloud services under probabilistic regional failures," *Third IEEE International Conference on Cloud Networks (IEEE CloudNet2014)*, 8-10 October 2014, pp. 407–412, Luxembourg, 2014.
24. H. Bai, F. Gu, K. Liang, M. Rahnamay-Naeini, S. Khan, M. M. Hayat, and N. Ghani, "Virtual network reconfiguration in optical cloud substrates," *IEEE Optical Fiber Communications Conference and Exhibition (OFC)*, 2014.
25. J. Ghasemi, P. Zarkesh-Ha, S. Krishna, S. E. Godoy, and M. M. Hayat, "A novel read-out circuit for on-sensor multispectral classification," *2014 IEEE 57th International Midwest Symposium on Circuits and Systems (MWSCAS)*, pp. 386–389, 2014.
26. K. Liang, H. Bai, M. Rahnamay-Naeini, F. Xu, M. Batayneh, M. M. Hayat, and N. Ghani, "Optimization design for multi-domain optical network protection," *IEEE Optical Fiber Communications Conference and Exhibition (OFC)*, pp. 1–3, 2014.
27. A. Jelili, B. Santhanam, and M. M. Hayat, "Limitations and Capabilities of the Slanted Spectrogram Analysis Tool for SAR-Based Detection of Multiple Vibrating Targets," *Asilomar 2014*, (paper TA7b-4), Nov. 2014.
28. S. Ray, M. M. Hella, M. M. Hossain, P. Zarkesh-Ha, and M. M. Hayat, "Speed optimized large area avalanche photodetector in standard CMOS technology for visible light communication," *13th IEEE Sensors 2014*, Valencia, Spain, Nov. 3-5, pp. 2147–2150, 2014.

29. M. Rahnamay-Naeini, N. Ghani, and M. M. Hayat, "On the Interplay Between Resource-Management Overhead and Performance in Sensor Networks: An Information Theoretic Approach," *Communications QoS, Reliability and Modeling Symposium, IEEE GLOBECOM 2013*, pp. 1564–1569.
30. M. Rahnamay-Naeini and M. M. Hayat, "On the Role of Power-Grid and Communication-System Interdependencies on Cascading Failures," *Proc. IEEE Global Conference on Signal and Information Processing*, pp. 527–530, 2013.
31. G. El-Howayek and M. M. Hayat, "Method for Performance Analysis and Optimization of APD Optical Receivers Operating Under Dynamic Reverse Bias," *IEEE Photonics Conference*, Bellevue, Washington, 2013.
32. M. M. Hossain, J. Ghasemi, P. Zarkesh-Ha, and M. M. Hayat "Design, Modeling and Fabrication of a CMOS Compatible p-n Junction Avalanche Photodiode," *IEEE Photonics Conference*, Bellevue, Washington, 2013.
33. M. P. Pepin and M. M. Hayat, "Point source localization from de-ramped phase history bound on interferometric synthetic aperture radar (IFSAR) accuracy," *SPIE Proceedings vol. 8746, Algorithms for Synthetic Aperture Radar Imagery XX*, 2013.
34. M. M. Hayat, "Information-theoretic metrics for 3D photon-counting integral imaging," **invited**, *SPIE Defense and Security Conference*, 8738-29, Baltimore, MD, 2013.
35. M. Rahnamay-Naeini, Z. Wang , A. Mammoli, and M. M. Hayat, "A Probabilistic Model for the Dynamics of Cascading Failures and Blackouts in Power Grids," *IEEE Power & Energy Society General Meeting (PES)*, San Diego, CA, 2012.
36. M. Rahnamay-Naeini, Z. Wang , A. Mammoli, and M. M. Hayat, "Impacts of Control and Communication System Vulnerabilities on Power Systems Under Contingencies," *IEEE Power & Energy Society General Meeting (PES)*, San Diego, CA, 2012.
37. S. E. Godoy, M. M. Hayat, W-Y. Jang, and S. Krishna, "Classifier-enhanced algorithm for compressive spatio-spectral edge detection," *IEEE Photonics Conference (IPC)*, Burlingame, CA, 2012.
38. D. A. Ramirez, M. M. Hayat, A. S. Huntington, and G. Williams, "Theory for spatial distribution of impact-ionization events in avalanche photodiodes," *IEEE Photonics Conference (IPC)*, Burlingame, CA, 2012.
39. Q. Wang, B. Santhanam, M. Pepin, and M. M. Hayat, "Performance Analysis on Synthetic Aperture Radar-based Vibration Estimation in Clutter," *Proceedings of 46th Asilomar Conference on Signals, Systems, and Computers*, Asilomar, CA, Nov. 4-7, 2012.
40. Q. Wang, M. Pepin, R. Dunkel, T. Atwood, A.W. Doerry, B. Santhanam, W. Gerstle, and M. M. Hayat, "Reduction of Vibration-Induced Artifacts in Synthetic Aperture Radar Imagery using the Fractional Fourier Transform," *IEEE International Conference on Image Processing*, Orlando, FL, 2012.
41. Q. Wang, B. Santhanam, M. Pepin, T. Atwood, and M. M. Hayat, "Refocusing vibrating targets in SAR images," *Proc. SPIE Defense, Security and Sensing Symposium*, Baltimore, MD, April, 2012.

42. M. Pepin and M. M. Hayat, "Separation of vibrating and static SAR object signatures via an Orthogonal Subspace Transformation," *Proc. SPIE Defense, Security and Sensing Symposium*, Baltimore, MD, April, 2012.
43. Z. Wang, M. M. Hayat, M. Rahnamay-Naeini, Y. Mostofi, and J. E. Pezoa, "Consensus-based Estimation Protocol for Decentralized Dynamic Load Balancing over Partially Connected Networks," *Proc. the 50th IEEE Conference on Decision and Control and European Control Conference,* Orlando, FL, USA, December 12-15, 2011.
44. M. Rahnamay-Naeini, J. E. Pezoa, G. Azary, N. Ghani, and M. M. Hayat, "Modeling Stochastic Correlated Failures and their Effects on Network Reliability," *Proceedings of the The International Conference on Computer Communications and Networks (ICCCN 2011)*, Maui, HI, July 31 - August 4, 2011.
45. Q. Wang, M. Pepin, R. Beach, R. Dunkel, T. Atwood, A. Doerry, B. Santhanam, W. Gerstle, and M. M. Hayat, "Demonstration of Target Vibration Estimation in Synthetic Aperture Radar Imagery," *The 2011 IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2011)*, August 1–5, Vancouver, CA.
46. Q. Wang, B. Santhanam, M. Pepin, T. Atwood, and M. M. Hayat, "SAR vibrometry using a pseudo-subspace approach based on the discrete fractional Fourier transform," *SPIE Defense, Security and Sensing*, Orlando, FL, April 2011.
47. M. Pepin and M. M. Hayat, "Fast synthetic aperture radar imaging with a streamlined 2D fractional Fourier transform," *SPIE Proceedings vol. 8051 Algorithms for Synthetic Aperture Radar Imagery XVIII*, 2011.

    Fast synthetic aperture radar imaging with a streamlined 2D fractional Fourier transform
48. B. Santhanam and M. M. Hayat, "On a pseudo-subspace framework for discrete fractional Fourier transform based chirp parameter estimation," *14th IEEE Signal Processing Society DSP Workshop*, Sedona, AZ, Jan 2011.
49. W-Y. Jang, M. M. Hayat, B. S. Paskaleva and S. Krishna, "Enhanced efficiency and functionality of algorithmic multispectral sensing using tunable DWELL-based MidIR detectors," 2011 Annual Meeting of the the Photonics Society, Denver, CO, Nov. 2010.
50. M. M. Hayat and D. A. Ramirez, "Impact Ionization under Dynamic Fields," *2010 Annual Meeting of the the IEEE Photonics Society*, Denver, CO, Nov. 2010.
51. F. Xu, M. Peng, M. Esmaeili, M. Rahnamay-Naeini, S. Khan, N. Ghani, M. Hayat, "Post-Fault Restoration in Multi-Domain Networks with Multiple Failures," *IEEE MILCOM 2010*, San Jose, CA, November 2010. Optimizing cloud-service performance for cloud clients: efficient resource provisioning via optimal workload allocation
52. M. M. Hayat, D. A. Ramirez, M. A. Itzler and G. J. Rees, "Model for passive quenching of single-photon avalanche diodes," in *Proc. SPIE Photonics West*, San Francisco, CA, Jan. 2010, **invited**.
53. B. Paskaleva, M. M. Hayat, W-Y. Jang, Y. Sharma, S. C. Bender, and S. Krishna, "Joint Spatio-spectral Based Edge Detection for Mulitispectral Infrared Imagery," *Proceedings of the 2010 IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2010)*, July 26–30, 2010, Honolulu, HA, pp. 2198–2201, 2010.

54. M. M. Hayat, D. A. Ramirez, G. J. Rees, and M. A. Itzler, "Modeling negative feedback in single-photon avalanche diodes," SPIE Defense, Sensing, and Security Symposium, Orlando, FL, April 2010, **invited**, SPIE Proc. 7681, 2010.
55. Q. Wang, M. Pepin, B. Santhanam, T. Atwood and M. M. Hayat, "SAR-Based Vibration Retrieval Using the Fractional Fourier Transform in Slow time," *SPIE Defense, Sensing, and Security Symposium: : Radar Sensor Technology XIV*, Kenneth I. Ranney; Armin W. Doerry, Editors, Orlando, FL, April 2010, SPIE Proc. vol. 7669.
56. M. Pepin and M. M. Hayat, "Estimation of the Vibration Spectra and Vibrating Direction with Synthetic Aperture Radar," *SPIE Defense, Sensing, and Security Symposium: Algorithms for Synthetic Aperture Radar Imagery XVII*, Edmund G. Zelnio; Frederick D. Garber, Editors., Orlando, FL, April 2010, SPIE Proc. vol. 7699.
57. B. Javidi, M. M. Hayat and S. Narravula, "Three-dimensional passive sensing and imaging with photon counting," SPIE Defense, Sensing, and Security Symposium, Orlando, FL, April 2010, **invited**.
58. P. Vines, C-H Tan, J. P. R. David, W. Jang, Y. Sharma, S. Krishna, and M. M. Hayat "Quantum dot infrared photodetectors with highly tunable spectral response for an algorithm-based spectrometer," SPIE Defense, Sensing, and Security Symposium, Orlando, FL, April 2010.
59. M. M. Hayat, S. Narravula, and B. Javidi, "Information Theoretic View of Photon-Counting Integral Imaging," in *Proc. Information Optics Workshop 2009,* Paris, France, July 2009, **invited**.
60. M. M. Hayat, D. A. Ramirez, M. A. Itzler and G. J. Rees, "Modeling Passive-Quenching in Infrared Single Photon Avalanche Diodes," in *Proc. The XV International Workshop on the Physics of Semiconductor Devices (IWPSD 2009),* Delhi, India, December 15–19, 2009, **invited**.
61. J. E. Pezoa, S. Dhakal, and M. M. Hayat, "Decentralized load balancing for improving reliability in heterogeneous distributed systems," in *Proc. The International Workshop on Design, Optimization and Management of Heterogeneous Networked Systems (DOM-HetNetS-2009)*, Vienna, Austria, 2009.
62. D. A. Ramirez, J. Shao, M. M. Hayat, and S. Krishna, "Recent Progress on the Quantum-dot Avalanche Photodiode (QDAP)," *IEEE Photonics Society (formerly LEOS) 2009 Annual Meeting: Photodetectors and Imaging*, Antalya, Turkey, Oct. 5–9, 2009.
63. W-Y Jang, B. S. Paskaleva, M. M. Hayat, S. C. Bender, and S. Krishna, "Multispectral Classification with Bias-tunable Quantum Dots in a Well Focal Plane Array," *IEEE Photonics Society (formerly LEOS) 2009 Annual Meeting: Photodetectors and Imaging*, Antalya, Turkey, Oct. 5–9, 2009.
64. Q. Wang, M. M. Hayat, B. Santhanam, and T. Atwood, "SAR Vibrometry using fractional-Fourier-transform processing," *SPIE Defense, Security & Sensing Symposium: Radar Sensor Technology XIII (Conference DS304)*, Orlando, FL, April, 2009, SPIE Proceedings vol. 7308, 2009.

    D. A. Ramirez, J. Shao, M. M. Hayat, S. Krishna, "Demonstration of the quantum dot avalanche photodiode (QDAP)," *SPIE Defense, Security & Sensing Symposium: Advanced*

Photon Counting Techniques (Conference DS112), Orlando, FL, April, 2009, SPIE Proceedings vol. 7320.

65. O. Lankoande, M. M. Hayat, and B. Santhanam, "A Markov-random-field based filter for speckle reduction in ultrasound imagery," *SPIE Symposium on Medical Imaging*, Lake Buena Vista, FL, Feb. 7–12, , proceedings vol. 7265, 2009.
66. B. Santhanam, S. L. Reddy, and M. M. Hayat, "Co-channel FM Demodulation Via the Multi Angle-Centered Discrete Fractional Fourier Transform" *2009 IEEE Digital Signal Processing Workshop*, Marcos Islands, FL, Jan. 2009.
67. M. M. Hayat, G. J. Rees, D. A. Ramirez, and M. A. Itzler, "Statistics of Self-quenching Time in Single Photon Avalanche Diodes," *IEEE-LEOS 2008 Annual Meeting: Photodetectors and Imaging*, Newport Beach, CA, Nov. 9–13, 2008, pp. 230–231.
68. B. Paskaleva, M. M. Hayat, and S. Krishna, "A new approach for spatio-spectral feature selection for sensors with spectrally overlapping bands," *2008 IEEE International Geoscience & Remote Sensing Symposium (IGARSS 2008)*, July 6–11, 2008, Boston, MA, vol. 5, pp. V385–V388.
69. T. M. Giles, M. M. Hayat, and S. Krishna, "Shift estimation algorithm for dynamic sensors with frame-to-frame variation in their spectral response," *2008 International Symposium on Spectral Sensing Research (2008 ISSSR)*, Hoboken, NJ, June 23–27, 2008.
70. B. Paskaleva, M. M. Hayat, W-Y. Jang, S. Bender, and S. Krishna, "Application of the canonical-correlation feature-selection algorithm to tunable quantum-dot detectors: Material discrimination and gas detection," *2008 International Symposium on Spectral Sensing Research (2008 ISSSR)*, Hoboken, NJ, June 23–27, 2008.
71. W-Y. Jang, M. M. Hayat, S. Bender, and S. Krishna, "Performance enhancement of an algorithmic spectrometer with quantum-dots-in-a-well infrared detectors," *2008 International Symposium on Spectral Sensing Research (2008 ISSSR)*, Hoboken, NJ, June 23–27, 2008.
72. D. S. G. Ong, J. S. Ng, J. P. R. David, P. Sun, and M. M. Hayat "Optimization of InP APDs for high-speed lightwave systems," *20th Indium Phosphide & Related Materials Conference (IPRM 2008),* Versailles, France, May 2008, pp. 1–4.
73. D. A. Ramirez, M. M. Hayat, and M. A. Itzler, "Dependence of the Performance of Single Photon Avalanche Diodes on the Multiplication Region Width: Temperature and Field Effects," *IEEE-LEOS 2007 Annual Meeting: Photodetectors and Imaging*, Orlando, FL, pp. 511–512, Oct. 2007.
74. W-Y. Jang, R. S. Attaluri, S. Annamalai, M. M. Hayat, J. S. Tyo, and S. Krishna, "Development of an algorithmic spectrometer for target recognition using quantum-dot infrared sensors," *The Nanoelectronic Devices for Defense & Security (NANO-DDS) Conference*, Arlington, VA, June 2007.
75. S. Dhakal, J. E. Pezoa, and M. M. Hayat, "A Regeneration-based Approach for Resource Allocation in Cooperative Distributed Systems," *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2007)*, vol. 3, pp. III-1261–III-1264, April 2007.
76. S. L. Reddy, B. Santhanam, and M. M. Hayat, "Multicomponent chirp demodulation using discrete fractional fourier analysis," *Proc. of IEEE DSP Workshop*, pp. 418–422, Jackson Hole, WY, Sept. 2006.

77. B. Paskaleva, U. Sakoglu, Z. Wang, M. M. Hayat, J. S. Tyo, and S. Krishna, "Algorithmic tunability of quantum-dot infrared detectors," *IEEE LEOS Newsletter*, vol. 20, No. 5, pp. 33–36, October 2006.
78. P. Sun and M. M. Hayat, "Decision-feedback and transversal equalization for high-speed APD-based receivers," *SPIE Symposium on Optics East, Optoelectronic Devices: Physics, Fabrication, and Application III*, Boston , MA, SPIE Proc. No. 6368, Oct. 2006.
79. M. M. Hayat, U. Sakoglu, Z. Wang, B. Paskaleva, J. S. Tyo, and S. Krishna, "Algorithmic tunabilty of quantum-dot infrared detectors," **(invited)**, *IEEE/LEOS Summer Topical Meetings*, Quebec City, QC, Canada, 17–19 July, 2006, pp. 34–35.
80. J. Shao, R. S. Attaluri, A. Stintz, J.S. Brown, M. M. Hayat and S. Krishna, "Demonstration of a novel mid infrared device: The quantum-dot avalanche photodiode (QDAP)," *IEEE/LEOS Annual Meeting*, Montreal, Canada, pp. 114–115, 2006.
81. D. A. Ramirez, M. M. Hayat, G. Karve, J. C. Campbell, S. N. Torres, B. E. A. Saleh and M. C. Teich, "Detection efficiencies for InP, InAlAs, and InAlAs-InP single-photon avalanche photodiodes," *IEEE-LEOS 2005 Annual Meeting: Photodetectors and Imaging*, Sydney, Australia, pp. 371–372, Oct. 2005, pp. 387–388.
82. S. Dhakal, M. M. Hayat, J. E. Pezoa, C. T. Abdallah, J. D. Birdwell, and J. Chiasson, "Load balancing in the presence of random node failure and recovery," *20th IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, pp. 10, April 2006, Rhodes Island, Greece.
83. 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.
84. 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.
85. 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.
86. 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.
87. 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.
88. 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.

89. 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.

90. S. Dhakal, M. M. Hayat, J. Ghanem, and C. T. Abdallah, "Load balancing in distributed computing over wireless LAN: Effects of network delay," *Proceedings of the IEEE Wireless Communication & Networking Conference (WCNC-2005)*, New Orleans, LA, vol. 3, pp. 1755–1760, March 13–17, 2005.

91. 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 – April1, 2005.

92. 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.

93. 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.

94. 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.

95. O-H. Kwon, A. Grine, A. Haji, M. M. Hayat, J. C. Campbell, B. E. A. Saleh and M. C. Teich, "Breakdown characteristics of In0.52Al0.48As-InP heterojunction APDs," *IEEE-LEOS 2004 Annual Meeting: Photodetectors and Imaging*, vol. 1, pp. 76–77, Puerto Rico, Nov. 7–11, 2004.

96. 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.

97. 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.

98. 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.

99. 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.

100. 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.
101. 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.
102. 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.
103. 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.
104. 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.
105. 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.
106. 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.
107. 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.
108. 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.
109. 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.
110. 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.
111. 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.

112. 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.

113. 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.

114. 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.

115. 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.

116. 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.

117. 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.

118. 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 AereoSense'2000 (Orlando, FL), Infrared Imaging Systems: Design, Analysis, Modeling, and Testing*, vol. 4030, pp. 196–203, April 2000.

119. 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.

120. 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.

121. 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.

122. 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.

123. 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.
124. 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.
125. 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.
126. 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.
127. 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.
128. 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.
129. 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.
130. 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.
131. 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.
132. 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.

Book chapters

1. R. C. Hardie and M. M. Hayat, *Digital Image Processing.* In the Dekkers Encyclopedia of Optical Engineering, (Ronald Drigger, Editor). Dekker publishing (ISBN: 0-8247-4258-3), 2003.
2. J. D. Birdwell, J. Chiasson, Z. Tang, C. T. Abdallah, M. M. Hayat, and T. Wang, *Dynamic time delay models for load balancing, Part I: Deterministic models.* In Advances in Time Delay Systems, Springer Series on Lecture Notes in Computational Science and Engineering, (Keqin Gu and Silviu-Iulian Niculescu, Editors), vol. 38, pp. 355–370, Springer: Berlin, 2004 (ISBN 3-540-20890-9).
3. M. M. Hayat, S. Dhakal, C. T. Abdallah, J. Chiasson, and J. D. Birdwell, *Dynamic time delay models for load balancing. Part II: Stochastic analysis of the effect of delay uncertainty.* In Advances in Time Delay Systems, Springer Series on Lecture Notes in Computational Science and Engineering, (Keqin Gu and Silviu-Iulian Niculescu, Editors), vol. 38, pp. 371–385, Springer: Berlin, 2004 (ISBN 3-540-20890-9).

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 an 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 a 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 Valpaiso 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. Biliana 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 20011–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. Carg 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 Univesidad 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 Nanoelectronic 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), 2012–present.

Consulting service to industry and government

- Voxtel, 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.