Abhijit Mahalanobis

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Principles Areas of Expertise: Image/Signal Processing, Optical Information Processing, Computational Imaging, Compressive Sensing, Automatic Target Recognition, Video Analytics, and Algorithms for ISR.

Research Emphasis:

- Novel Imaging/Sensing Systems and Information Processing.
- Machine learning/AI for machine vision applications in defense and security
- Long range detection/recognition of ground-based and airborne threats and targets.

Education:

Ph.D. - Carnegie Mellon University, August 1987
Dissertation: *New Correlation Filters for Symbolic and Rule Based Pattern Recognition*

M.S. - Carnegie Mellon University, September 1985
Thesis: *Application of SDFs for Optical Character Recognition*

B.S. - University of California, Santa Barbara, May 1984
Graduation with Honors and Distinction.

Employment and Professional Experience:

Associate Professor	**CRCV/Dept of CS, UCF**	2020 - Present
Assistant Professor	**CRCV/Dept. of CS, UCF**	2018 – 2020
Corporate Senior Fellow	**Lockheed Martin**	2011 – 2018
Corporate Fellow	**Lockheed Martin**	2000 – 2011
Senior Scientist/Engineer	**Raytheon Missile Systems**	1993 - 2000
Professional Staff/Task Leader	**Lockheed Martin Orlando**	1991 - 1993
Assistant Professor	**University of Maryland**	1990 - 1991
Assistant Professor	**University of Arizona**	1987 – 1990

Honors and Awards:

- Recipient of Best Paper Award, Workshop in Optics, Barcelona 2016
- **Fellow**, Institute of Electrical and Electronics Engineers (2015)
- **Fellow**, Optical Society of America (2004)
- **Fellow**, *Society of Photo-Optical Instrumentation Engineers* (1997)
- **Senior Fellow (**formerly **Fellow)**, Lockheed Martin Corporation (since 2004)
- SCIENTIST of the YEAR, 2006, awarded by *Science Spectrum* (Career Communication Group)
- Lockheed Martin Corp. NOVA Award (company's highest honor) (2005)
- Lockheed Martin *Inventor of the Year* Award, (2005)
- Lockheed Martin *Excellence Award* (2002 and 2005)
- Lockheed Martin Author of the Year award (2002)
- Elected *Distinguished Member of Technical Staff* Lockheed Martin (2001)
- INNOVATOR of the YEAR, 1999, awarded by State of **Arizona Governor's Award** (GSPED)
- Elected to Raytheon Honors Program (1999)
- Hughes Business Unit Patent Award (1998)
- Research Initiation Grant from NSF at the University of Arizona (1988)
- Listed in Marquis Who's Who in Science and Engineering
- Dean's Honor List (UCSB: 1981,1982)
- Graduation with Honors and Distinction (UCSB: 1984)
- Member of *Tau Beta Pi, Eta Kappa Nu*

Editorials, Books, and Chapters

- Book on ***Correlation Pattern Recognition,*** (with B.V.K. Vijaya Kumar and R. Juday), Cambridge University Press, 2005

- Book Chapter, "Information Processing across Distributed and Netted Systems for Security and Surveillance," Optical Imaging, Photonics, Sensors, and Systems for Homeland Security edited by Bahram Javidi, Springer Verlag, 2004.

- Book Chapter, "Correlation Pattern Recognition: An optimum Approach," in Image Recognition and Classification: Algorithms, Systems, and Applications, Marcel Dekker, New York, Editor: Bahram Javidi, pp. 295-321, 2002.

- Book Chapter "Data Compression and Correlation Filtering: A Seamless Approach to Pattern Recognition," in Smart Imaging Systems, Editor: Bahram Javidi, SPIE PRESS Vol. **PM91** * pp. 111-131, August 2001

- Editor, Special Issue of *Applied Optics*, on Task Specific Sensing, Appl. Opt. 45, 2857-2858 (2006)
- Editor, Special Issue of *Applied Optics* on Image Processing and Pattern Recognition for Electro-Optical Sensors, Volume 43, No. 2, January 2004

- Editor of Special Issue of *Pattern Recognition* on Correlation Filters and Neural NetworksVol. 27, No. 4, April 1994

- Editor of Special Issue of *Optical Engineering* on Optical and Digital Correlators and their applications, October 1997.

- Book Chapter, "Integrated Sensing and Processing for Hyperspectral Imagery," in Optical Remote Sensing, Editor: S. Prasad et al., Springer-Verlag, pp. 49 – 64, 2011

- Editor of Focus Issue of *Applied Optics* on Compressive Sensing, with Joseph N. Mait, , Mark A. Neifeld, and Ravindra A. Athale, Applied. Optics. 54, CS1-CS3 (2015)

- Editor of Special Section of *Optical Engineering* on Optical Computational Imaging, with Lei Tian and Amit Ashok, Vol. 56, No. 4, April 2017

Patents

- "Correlation filters for target reacquisition in trackers," USPTO # 5,947,413, Sept. 1999
- "Polynomial filters for higher order correlation and multi-input information fusion," USPTO # 6,295,373, Sept. 2001
- "Target detection system using trained and untrained detection and methods therefore," USPTO # 7,421,090, Sept. 2008
- "System and method for passive automatic target recognition (ATR)", USPTO #8,369,572, Feb. 2013

- "Multispectral imaging via coded aperture", USPTO # 9,983,063, May 2018
- "System and method for providing compressive infrared imaging," USPTO #10,091,440, Oct. 2018

Professional Affiliations and Services:

- Associate Editor for *Applied Optics*: 2017 – 2019

- Serving on External Advisory Board (EAB) for the Department of Electrical and Computer Engineering at Duke University: 2019 – to date

- Visiting scholar at Hubert Curien Laboratories in Saint Etienne, France (part of University of Lyon): July 2019.-

- Appointed to NATO SET Panel on "Computational Imaging and Compressive Sensing for EO/IR Systems," 2013 – 2019

- OSA Board of Meeting (Division Chair for **Information Acquisition, Processing and Display)** 2012 to 2015

- Associate Editor for IEEE Photonics Journal: 2013 to 2016.

- Conference Chair, for Automatic Target Recognition (with Firooz Sadjadi) for SPIE's Defense and Security Syposium, 2007 – to date

- Pattern Recognition Chair, Science and Engineering Council of the Optical Society of America (OSA): 2002- 2004

- Co-Chair, Optical Society of America (OSA) Topical Meetings on Computation Optical Sensing and Imaging (COSI): 2005, 2007

- Associate Editor for *Applied Optics*: 2004 to 2009

- Associate Editor for *Pattern Recognition*: 1994 – 2003

- Served on Conference Committee and as Session Chair at SPIE Aerosense, Conferences on Optical Pattern Recognition, Automatic Target Recognition, Orlando: annually from 1992 to 2004

- Served on Conference Committee and as Session Chair at SPIE Annual Meeting, Conference on Optical Information Systems: annually from 1996 to 2004

- Organized Lockheed Martin company-wide Conference with DoD participation on Automatic Target Recognition: 2001, 2002, 2003, and 2009

- Offered course on Correlation Pattern Recognition at SPIE's Aerosense Conference, Orlando: 1996-1998

- Served as Session Chairman at International Conference on Computers and Communications, Phoenix: 1989.
- Reviewer of proposals for **NSF**.
- Reviewer of papers for **PE&RS**, *Optical Engineering*, *Applied Optics* , **JOSA-A**, **JPDC, CVGIP,** and *IEEE Transactions on Signal Processing*
- Served on DARPA's panel on Continuous Tracking in 1998

Research Grants and Contracts (at UCF, August 2018 – to date) Total - **$4,191,048**

Sponsor	Project Title and Role	Period	Funding
DARPA (federal)	**Young Investigator Award** Minimum L1 norm specialist networks for learning via sparse active pathways **Role:** PI (100%)	Base: Aug 2019 – Dec 2021	$500,000
		Option: Jan 2022 – Dec 2023 (Pending)	
	Subcontract from Lockheed Martin Modeling Adversarial Activity: Node and Signal Graph detection in support of Multi-Source Activity Graph Latent Uncovering & Merging **Role:** PI (100%)	Phase I: Jun 2018 – Sept. 2018	$50,000
		Phase 2: Oct 2018 – Aug 2019	$353,209
ONR (federal)	**Subcontract from Lockheed Martin** Wide Field of View - Flexible Foveation and Imaging **Role:** Principal Investigator (100%)	Feb 2019 – Dec 2019	$40,000
Leonardo DRS (industry)	Target detection and recognition capability with low false alarm rate and with reduced training labels **Role:** PI (100%)	Feb 2019 – Dec 2019	$99,934
	Development of a target detection and recognition capability with low false alarm rate with reduced training labels, & Image Processing device for Ground Combat Vehicles **Role: PI** (100%)	Apr 2020 — Dec 2020	$235,000

	AI/Temporal processing for EO/IR, RF, and HFD AI/Temporal processing for EO/IR, RF, and HFD **Role: PI** (50%) with three Co-PIs	May 2021 – Dec 2021	$468,000
Elbit Systems USA (industry)	Algorithms for object detection and human activity recognition **Role: PI** (50%) with Co-PI Dr. M. Shah	Aug 2019 – May 2020.	$200,000
	Algorithms for object detection and human activity recognition, Tagging Frames of Video Data **Role: PI** (100%)	May, 2020-Dec 2020	$60,000
	Optimized end-to-end detection and classification using deep learning **Role: PI** (75%)	May 2021-Dec 2021	$117,720
US Army NVESD	Moving Target Indication (MTI) on the move and Stationary Target Indication (STI) in clutter environments – Year 1 **Role: PI** (100%)	Feb 2020 — Dec 2020	$200,000
	Moving Target Indication (MTI) on the move and Stationary Target Indication (STI) in clutter environments – Year 2 **Role: PI** (100%)	Mar 2021 – Dec 2021	$200,000
US Army CCDC	Image Processing for Acquisition and Tracking (IMPACT) **Role: PI** (100%)	Apr, 2020 — Apr 2021	$80,000
	Representation for background invariant classification in infrared imagery, and 2D to 3D prediction networks, **Role: PI** (75%) with Co-PI Dr. Rahnavard	Jan 2021-Dec 2022	$152,500
	Manifold representation for multi-view object classification **Role: PI** (75%) with Co-PI Dr. Rahnavard	Jan 2022 – August 2022	$56,185
NAVAIR STTR	**Subcontract from Mayachitra Inc**. Phase I Algorithms for multi-platform lifelong learning and knowledge sharing: **Role: PI** (100%)	Aug 2020 – Aug 2021	$72,000
	Subcontract from Mayachitra Inc. Phase II Algorithms for multi-platform lifelong learning and knowledge sharing:	Jan 2022 – December 2023	$364,000

	Role: PI (100%)		
US Army STTR	**Subcontract from LynnTech** Phase II "Deep Generative Modeling of Infrared Datasets for Aided Target Recognition" **Role: PI** (100%)	Jan 2022 – December 2023	$242,500
US Army ARL	Computer Vision Algorithms for non-GPS navigation **Role**: **Co-PI (**15.15%) PI: Dr. Kyle Renshaw, Total award $4,500,000)	August 2021 – August 2023	$700,000

Courses Taught at UCF

Course Number	Title	Semester	Attendance
CAP 6411	Computer Vision Systems	Fall 2018	12
		Fall 2020	20
		Fall 2021	17
CAP 5415	Computer Vision	Fall 2019	62

Other Activities and Service at UCF :

- Faculty search committee for CRCV (chair 2021, 2020, member 2019)
- Undergraduate advisor for CS Seniors after foundation exam (2019,2020, 2021)
- Served on several PhD Thesis defense committee for CS, ECE, and CREOL
- Currently advising 12 PhD students, 2 MS students, and 4 undergraduate seniors.

Industrial Experience:

Lockheed Martin, Missiles and Fire Control August 2000 – to date

Title: Senior Fellow, Distinguished Member of Technical Staff; Applied Research Technology Manager, Signal and Image Processing.

Responsibilities:

- Spearhead innovations in Sensing and Information Processing technologies, develop new business, and build customer relations
- Direct Applied Research personnel working on Image and Signal Processing technologies

- Mature and transition new technologies to products and mission areas

Major Contributions:

- Established a *National Team* of ATR experts with Lockheed as Prime, to win *Future Combat Systems* AiTR Program (**$38M** contract, with over **$500M** in production value)
- Transition of ATR to Lockheed Martin's Fire Control, Strike Weapons and Tactical Missile programs (such as Future Combat Systems (FCS), Small Diameter Bomb (SDB), and Joint Common Missile (JCM))
- Lead efforts for the independent evaluation of LM's ATR algorithms at NVESD
- Won several Applied Research projects (see below) with DARPA, ONR/China Lake, AMCOM, NVESD and various other DoD agencies
- Pursuit of Adjacent/Commercial Markets and Homeland Defense business opportunities
- ATR workshops to coordinate activities between business divisions of Lockheed Martin
- Instituted the *Lockheed Martin Best Paper Awards* ($5000 grant annually) at SPIE's Defense and Security Symposium
- Established cooperative research and development agreements (CRADAs) with government research laboratories including AMRDEC, NVESD, and NRL.

Applied Research Projects:

- ONR project, High Resolution Wide Field Imaging for Target ID: **280K** (Phase 1)
- DARPA project, Modeling Adversarial Activity (MAA) (2017): **500K/**year for 3 years (LM ATL Prime)
- AFRL project on Compressive Sensing for Weapon Systems (2016): $**150K**
- DARPA project, REVEAL (2016): sub to University of Central Florida, $**150K** (phase 1)
- ONR program MONITOR (2013): $**720K**.
- ONR program on forming large images using small focal planes (2012): $**600K**
- DARPA project, VIRAT Phase III (2011), **5.7M**
- ONR project – Data 2 Decision (2011), $**600K** /year, for 4 years.
- DARPA project, SCENICC Phase I, sub to UC San Diego (2011), **2.8M**.
- DARPA Project, KeCoM (2010) $**3.3M**
- DARPA project, VIRAT I,II (2008) **$5.4M,** $**2M**
- DARPA seedling AWARE (2008) $150K.
- DARPA Project LACOSTE (2006, 18 mos): $**4M.**
- ONR project on C2 and CS (2005 for 3 years): $**600K**
- DARPA project on Integrated Sensing and Processing (2003): **$2.5M**
- NVESD Target Acquisition Sensor Suite Technology Maturation Demonstration (TASS-TMD), multi-year ATR contract with PM NVRSTA (2003): $**450K** Phase I, **$270K** Phase II.

- DARPA project on Multi-Scale ATR: January 2002- June 2003. $**1.1 M**
- Multi-Year contract with China Lake/ONR project on System of System study and Multi-Dimensional Pattern Recognition (October 2001 – January 2005): **$700K**
- DARPA seedling for Swarm Defense program concept development (January 2004): **120K**
- Technical direction of annual IRAD efforts from 2000-2012 (**approx 1M per year**)

Other Activities:

- Leadership-21 Training (Leadership styles, Leading Decisions, Communications)
- Six Sigma Awareness training
- Engaged in Fellows/Group Technical Staff (GTS) activities for mentoring and career development of Engineering Staff, and instituting a culture of learning and innovation.
- Systems Engineering Functional Lead/Delegate for Center of Excellence (Multisensor Automatic Target Recognition and Image Exploitation).
- Leading the establishment of an enterprise wide Algorithm Working Group.
- Signal Processing Lead for Corporate Future Technology Threads (FTTs) for steering LM's technology investment thrust
- Participating in Corporate University Research Initiatives (support for Penn State University)

Raytheon Missile Systems Company August 1993 – July 2000

Title: Senior Scientist/Engineer

Responsibilities:

- Technical Manager/Principle Investigator for ATR Development, Supervisor for technical team, sub-contract management, and technical P.O.C/customer relations.
- Building teams and nurturing/training other technologists
- Assisting in the transition of ATR technology during consolidation of Raytheon divisions to Tucson
- Managing IRAD projects and teams

Major Contributions:

- Commercial deployment of OCR in license plate reader for Electronic Tollway in Canada
- ATR sub-systems development for mobile and fixed targets using IR, LADAR, CCD, SAR and MMW sensors
- Realtime implementation and field demonstration of target recognition systems
- ATR and Tracker Integration

- Wide area search and surveillance for SAR sensors for programs such as ASARS and Joint Strike Fighter.
- Concept development for Low Cost DSMAC for cruise missile (Tomahawk) applications
- LADAR ATR development for in conjunction with Air Force and Navy (Wright Laboratories Eglin AFB and China Lake)
- Joint research and development under CRADA with AMCOM (US Army, Huntsville)
- Contract research and development on Target Recognition in Wavelet Compressed Imagery sponsored by China Lake and ONR
- ATR technology support for various missile seekers (e.g. FOTT, AFSS, TERM, DASSL, JSOW, NetFires)

Lockheed Martin, Orlando July 91 – August 93

Algorithm Task Leader for DARPA's MuSTRS program

- IRAD Task Manager for Advanced Programs
- Developed ATR algorithms for SAR, IR and MMW sensors

List of Publications:

PAPERS IN REFEREED JOURNALS:

1. M. Arif, and A. Mahalanobis, "Infra-Red Target Recognition using Realistic Training Images generated by modifying Latent Features of an Encoder-Decoder Network", accepted, IEEE Transactions on Aerospace and Electronic Systems (May 2021)

2. B. McIntosh, S. Venkataramanan and A. Mahalanobis, "Infrared Target Detection in Cluttered Environments by Maximization of a Target to Clutter Ratio (TCR) Metric Using a Convolutional Neural Network," in IEEE Transactions on Aerospace and Electronic Systems, vol. 57, no. 1, pp. 485-496, Feb. 2021, doi: 10.1109/TAES.2020.3024391.

3. X. Li, V. Monga and A. Mahalanobis, "Multiview Automatic Target Recognition for Infrared Imagery Using Collaborative Sparse Priors," in IEEE Transactions on Geoscience and Remote Sensing, vol. 58, no. 10, pp. 6776-6790, Oct. 2020,

4. A. Mahalanobis, R. Shilling, R. Muise, M. Neifeld, "High resolution imaging using a translating coded aperture," Optical Engineering Vol. 56, No. 8, 084106 (22 August 2017).

5. S. Komatsu, A. Markman, A. Mahalanobis, K. Chen, B. Javidi, "Three-dimensional integral imaging and object detection using long-wave infrared imaging," Applied Optics 56(9) D120-D126, 2017

6. A. Mahalanobis, R. Shilling, R. Murphy, R. Muise, "Recent results of medium wave infrared compressive sensing," Applied Optics Vol. 53, Iss. 34, pp. 8060–8070 (2014)

7. A. Mahalanobis, M. Neifeld, "Optimizing Measurements for Feature Specific Compressive Sensing," Applied Optics, Vol. 53 Issue 26, pp.6108-6118 (2014)

8. A. Mahalanobis, R. Muise and S. Roy, "Efficient target detection using an adaptive compressive imager," in IEEE Transactions on Aerospace and Electronic Systems, vol. 50, no. 4, pp. 2528-2540, October 2014.

9. A. Rodriguez, V.N. Boddeti, B. V. K. Vijaya Kumar, and A. Mahalanobis, "Maximum Margin Correlation Filter: A New Approach for Localization and Classification," IEEE Transactions on Image Processing 22(2): 631-643 (2013)

10. Myungjin Cho, Abhijit Mahalanobis, and Bahram Javidi , "3D passive integral imaging using compressive sensing," Optics Express, Vol. 20, Issue 24, pp. 26624-26635 (2012)

11. M. Cho, A. Mahalanobis, and B. Javidi, "3D passive photon counting automatic target recognition using advanced correlation filters," Opt. Lett. 36, 861-863 (2011)

12. K.M Douglass, J.Ellis, C.Toma, A. Mahalanobis, A. Dogariu, "Expanding the field of view by polarization multiplexing," Applied Optics, Vol. 49, Issue 34, pp. H40-H46 (2010)

13. Abhijit Mahalanobis, Mark Neifeld, Vijaya Kumar Bhagavatula, Thomas Haberfelde, and David Brady, "Off-axis sparse aperture imaging using phase optimization techniques for application in wide-area imaging systems" Applied Optics, Vol. 48, Issue 28, pp. 5212-5224, October 2009

14. A. Mahalanobis, and R. Muise "Object Specific Image Reconstruction using a Compressive Sensing Architecture for Application in Surveillance Systems", IEEE Transactions on Aerospace and Electronic Systems (AES), Volume: 45, Issue: 3, 1167-1180, July 2009

15. David J. Brady, Aristide Dogariu, Michael A. Fiddy, and Abhijit Mahalanobis, "Computational optical sensing and imaging: introduction to the feature issue", Applied Optics, Vol. 47, Issue 10, pp. COSI1-COSI2, April 2008

16. Pradeep Ragothaman, Wasfy B. Mikhael, Robert R. Muise, and Abhijit Mahalanobis, "Automatic target recognition employing signal compression," Applied Optics, Vol. 46, Issue 21, pp. 4702-4711, July 2007

17. A. Mahalanobis, and, "An Integrated approach for Automatic Target Recognition using a Network of Collaborative Sensors", Applied Optics, Vol. 45, Issue 28, pp. 7365-7374 (October 2006).

18. P. Ragothaman, T. Yang, W. B. Mikhael, R. R. Muise and A. Mahalanobis, "Efficient adaptive subspace tracking algorithm for automatic target recognition," in IET Electronics Letters, vol. 42, no. 20, pp. 1183-1184, 28 September 2006.

19. P. Ragothaman, T. Yang, W. Mikhael, R. Muise, A. Mahalanobis, "Automatic Target Recognition Using a Novel Adaptive Technique for Rayleigh Quotient Quadratic Correlation Filters", WSEAS Trans. On Signal Processing, Issue 7, Vol. 2, pp. 949-955, July 2006.

20. F. Sadjadi, A. Mahalanobis, "Target-adaptive polarimetric synthetic aperture radar target discrimination using maximum average correlation height filters," Applied Optics, Vol. 45, Issue 13, pp. 3063-3070 (May 2006)

21. M. Neifeld, A. Mahalanobis, D. Brady, "Introduction to Task Specific Sensing," Applied Optics, Vol. 45, Issue 13, pp. 2857-2858 (May 2006)

22. S. R. F. Sim and A. Mahalanobis, "Performance evaluation of quadratic correlation filters for target detection and discrimination in infrared imagery," Optical Engineering, Vol. 43, No. 08, p. 1705-1711, August 2004

23. A. Mahalanobis, R. R. Muise, S. R. Stanfill, "Quadratic correlation filter design methodology for target detection and surveillance applications," Applied Optics, Volume 43, Issue 27, 5198-5205 September 2004

24. R. Muise, A. Mahalanobis, R. Mohapatra, J. Li, M. Wasfy, "Constrained Quadratic Correlation Filters," Applied Optics, Volume 43, No.2, pp. 304-314, January 2004

25. B.V.K. Vijaya Kumar, Marios Savvides, Chunyan Xie, Krithika Venkataramani, Jason Thornton and Abhijit Mahalanobis, "Biometric Verification using Correlation Filters," Applied Optics, Volume 43, No.2, pp. 391-402, January 2004

26. A. Mahalanobis and F. Goudail, "Methods for Automatic Target Recognition by Use of Electro-Optic Sensors: Introduction to the Feature Issue," Editorial, Applied Optics, Volume 43, No. 2, pp. 207-209, January 2004

27. C. Daniell, A. Mahalanobis, R. Goodman, "Object Recognition in Subband Transform Compressed Images by use of Correlation Filters," Applied Optics, Volume 42, Issue 32, 6474-6487, November 2003

28. A. Mahalanobis, R.Muise, R. Stanfill, "Design and application of quadratic correlation filters for target detection," IEEE Transactions on AES, Vol. 40, Issue 3, pp. 837-850, July 2004

29. A. Van Nevel, A. Mahalanobis, "Comparative study of maximum average correlation height filter variants using ladar imagery". Optical Engineering. Vol. 42. pp. 541-550. (2003).

30. A. Mahalanobis, S.R.F. Sims, A. Van Nevel, "A Signal to Clutter Measure for measuring ATR performance using Complimentary Eigen-Value Distribution Analysis," Optical Engineering, Vol. 42, No. 4, pp. 1144-1151, 2002

31. A.Van Nevel, A. Mahalanobis, "Comparative study of MACH filter variants using LADAR imagery," Optical Engineering, Vol. 42, No. 3, pp.541-550, 2002.

32. M. Alkanhal, B.V.K. Vijaya Kumar, and A. Mahalanobis, "Improving the false alarm capabilities of the maximum average correlation height (MACH) correlation filter," Optical Engineering, Vol. 39, No. 5, pp. 1133-1141, May 2000.

33. A. Mahalanobis, B.V.K. Vijaya Kumar, and R.T. Frankot, "Optimization of Intra-Class and Between Class Registration for Correlation Filter Synthesis," Applied Optics, Vol. 39, No. 17, pp. 2918-2924, June 2000.

34. B.V.K. Vijaya Kumar, A. Mahalanobis, "Recent advances in Composite Correlation filter designs," Asian Journal of Physics, Vol. 8, No. 4, pp. 407-420, 1999

35. B. V. K. Vijaya Kumar, A. Mahalanobis and A. Takessian, "Optimal tradeoff circular harmonic function (OTCHF) correlation filters providing controlled in-plane rotation response", IEEE Transactions on Image processing, Vol. 9, No. 6, pp. 1025-1034, June 2000.

36. B.V.K . Vijaya Kumar, D. Carlson, and A. Mahalanobis, "Efficient determination of optimal gain and angle in the design of optical correlation filter", Optical Engineering, Vol. 37, No. 1, pp. 132-137, January 1998

37. A. Mahalanobis, B.V.K. Vijaya Kumar, "On the optimality of the MACH filter for detection of targets in noise" Optical Engineering, Special Issue on Correlation Pattern Recognition, Vol. 36 (10), pp. 2642-2648, October 1997

38. A. Mahalanobis, "Correlation Pattern Recognition", Guest Editorial, Optical Engineering, Special Issue on Correlation Pattern Recognition, Vol. 36 (10), pp. 2631-2632, October 1997

39. A. Mahalanobis, B.V.K. Vijaya Kumar, and S.R.F. Sims, "Distance classifier correlation filters for multi-class automatic target recognition", Applied Optics , Vol. 35, No. 17, pp. 3127-3133, June 1996

40. B.V.K. Vijaya Kumar, D.W. Carlson, and A. Mahalanobis, "Optimal trade-off synthetic discriminant function (OTSDF) filters for arbitrary devices", Optics Letters, Vol. 19, No. 19, pp. 1556-1558, October 1994

41. P. Mahalanobis and A. Mahalanobis, "Statistical inference for automatic target recognition", Applied Optics, Vol. 33, No. 29, pp. 6823-6825, October 1994.

42. A. Mahalanobis, A. Forman, N. Day, M. Bower, R Cherry, “Multi-class SAR ATR using shift-invariant correlation filters”, Pattern Recognition, Special Issue on Correlation Filters and Neural Networks, Vol. 27, No. 4, pp. 619-626, 1994.

43. A. Mahalanobis, Editorial for Special Issue of Pattern Recognition on Correlation Filters and Neural Networks, Vol. 27, No. 4, pp. 459, April 1994.

44. A. Chandola and A. Mahalanobis, “Ordered rules for full sentence translation: a neural network realization and case study for Hindi and English”, Pattern Recognition, Special Issue on Correlation Filters and Neural Networks, Vol. 27, No. 4, pp. 515-521, 1994.

45. A. Mahalanobis, B.V.K. Vijaya Kumar, S. Song, S.R.F. Sims, J. Epperson, "Unconstrained Correlation Filters", Applied Optics, Vol. 33, No. 17, pp 3751-3759, 1994

46. A. Mahalanobis and H. Singh, "Application of Correlation filters for texture recognition", Applied Optics, Vol. 33, No. 11, pp. 2173-2177, April 1993.

47. S.K. Mitra, A. Mahalanobis, and T. Saramaki, "A generalized structural subband decomposition of FIR filters and its applications in efficient FIR filter design and implementation", IEEE Transactions on Circuits and Systems, Vol. 40, pp. 375-381, June 1993.

48. A. Mahalanobis, S. Song, M. Petragalia and S.K. Mitra, "Adaptive FIR filters based on structural subband decomposition for system identification problems” IEEE Transactions on Circuits and Systems, Vol. 40., pp. 354-362, June 1993.

49. A. Mahalanobis and S. Song, "Theoretical framework for the design of purely real SDF-type correlation filters", Applied Optics, Vol. 31, No. 35, pp. 7450-7456, Dec. 1992

50. B.V.K. Vijaya Kumar, A. Mahalanobis, S. Song, S.R.F. Sims and J. Epperson,"Minimum Squared Error Synthetic Discriminant Functions", Optical Engineering, Vol. 31, No. 5, pp. 915-922, May 1992

51. M.A. Awal, A. Mahalanobis and T. Kundu "Low frequency acoustic microscopy and pattern recognition for studying damaged and anisotropic composites and material defects", Journal of Nondestructive Evaluation, Vol.11, No.1, pp. 19-28, Jan. 1993.

52. A. Mahalanobis, "Signal dependent degradation in noise performance of optimum detectors for multiple signal detection", IEEE Transactions on Signal Processing, Vol. 29, No. 2, pp. 431-436, February 1991

53. A. Mahalanobis, D. Casasent, "Performance evaluation of Minimum Average Correlation Energy Filters", Applied Optics, Vol. 30, No. 5, pp. 561-572, December 1990.

54. S.I. Sudarshanan, A. Mahalanobis, and M.K. Sundareshan, "Unified framework for the synthesis of synthetic discriminant function with reduced noise variance and sharp correlation structure".,

Optical Engineering, special issue on Optical Pattern Recognition, Vol. 29, No. 9, pp. 1021-1028, September 1990. (Invited paper)

55. S.I. Sudharshanan, A. Mahalanobis, and M.K. Sundareshan, "Selection of optimum output correlation values in synthetic discriminant function design", Journal of the Optical Society of America, A , Vol. 7, No. 4, pp. 611-616, April (1990).

56. B.V.K. Vijaya Kumar, D. Casasent, and A. Mahalanobis, "Correlation filters for target detection in Markov model background clutter", Applied Optics , Vol. 28, No. 15, pp. 3112-3119, August 1989.

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125. D. Casasent and A. Mahalanobis, "Rule-based, probabilistic, symbolic target classification by object segmentation", Optical Society of America Topical Meeting on Optical Computing, Technical Digest Series 1987, Vol. 11 (Optical Society of America, Washington D.C.) pp. 155-158, March 1987.

126. D. Casasent, S.A. Liebowitz, and A. Mahalanobis, "Parameter selection for iconic filter synthesis", Proceedings of SPIE , Vol. 726, pp. 284-303, October 1986.

127. A. Mahalanobis and D. Casasent, "Large class iconic pattern recognition: an OCR case study", Proceedings of SPIE , Vol. 726, pp. 2-27, October 1986.

128. D. Casasent and A. Mahalanobis, "Correlation filters for distortion invariance and discrimination", Optical Society of America, Topical Meeting on Machine Vision , pp. FB5-1,FB5-3, March 1985.

129. S.K. Mitra and A. Mahalanobis, "Fast computation of jacobian and inverse jacobian of robot manipulators", Proceedings of SPIE , Vol. 521, pp. 235-242, October 1984.

Invited Talks and Seminars:

1. "Compressing Deep CNNs using Spectral Fine-tuning," Seminar, CMU-Africa, Rwanda, March 2020

2. "An overview of Coded Aperture techniques for image super-resolution, and relevant performance metrics", Workshop on Machine-Learning-Assisted Image Formation, Nice (France), July 2019

3. "Comparison of Wide Area Imaging Strategies for Target Detection," Presented at Workshop in Information Optics, held at KTH, Stockholm (Sweden), July 2019 (Keynote Talk)

4. "An overview of some techniques for the detection and recognition of objects in 3D data", presented at Imaging and Applied Optics Congress, Optical Society of America (OSA), Munich (Germany) June 2019 (Invited Talk)

5. "Task Specific Compressive Sensing for Target Detection", NATO SET-265, Specialist Meeting on "Compressive Sensing applications for Radar / ESM and EO / IR imaging", Salamanca (Spain), May 2019.

6. “A comparison of target detection algorithms using DSIAC ATR algorithm development data set”, conference on Automatic Target Recognition, SPIE Defense and Commercial Sensing Symposium, Baltimore, April 2019

7. “High Resolution Imaging with a moving coded aperture,” Invited talk at Frontiers in Optics, Washington DC, 2017

8. “Recent results of high resolution imaging using a moving coded aperture,” invited talk at Workshop in Optics, Interlaken, Switzerland, 2017.

9. “Pixel Resolution Improvement using a Sliding Mask,” invited talk at Workshop in Optics, Barcelona, Spain 2016.

10. “Integral imaging for anti-access/area denial environments,” invited talk at Topical Meeting on 3D Image Acquisition and Display: Technology, Perception and Applications, OSA Imaging Congress, 2016

11. "Recent Results of Infra-Red Compressive Sensing," invited talk at Computational Optical Sensing and Imaging (COSI) Topical Meeting, 2014

12. “Adaptive Compressive Sensing for efficient target detection,” invited talk at Workshop in Optics, Tenerife, Spain, July 2013.

13. “Adaptive transform domain compressive sensing,” invited talk at Workshop in Optics, Benecassim, Spain, June 2011

14. “Sensor Adaption Techniques”, Workshop on Machine Learning, Institute for Pure and Applied Mathematics (IPAM), UCLA, October 2010.

15. “Imaging issues using interleaved sparse apertures,” Euro-American Workshop in Optics, July 20-24, Paris, France, 2009 (Invited)

16. “An Overview of Integrates Sensing and Processing using Coded Aperture Imaging Systems,” Fifth International Work Shop on Information Optics, June 5-7, 2006, Toledo, Spain (Invited)

17. “Automatic target detection and recognition approaches for unattended electo-optical sensors”, SPIE Defense and Security Symposium, London, U.K. October, 2004 (Invited)

18. “Wireless Video Image processing for Security Surveillance and Situational Awareness,” KEYNOTE Address, SPIE Conference on Defense and Security, Orlando, April 2004 (Invited)

19. “Image Processing for Surveillance and Security” International Conference on Advanced Technologies for Homeland Security (ICATHS), University of Connecticut, Sept. 25-26, 2003 (Invited)

20. “Design and Application of Correlation Filters,” Mathematics Colloquium, University of Central Florida, October, 2002

21. “Seamless Approach to Pattern Recognition and Image Compression,” Invited talk at Euro-American workshop on Optical Information Processing, Valencia, Spain, May 2001

22. “Target tracking and aimpoint selection using correlation filters,” OSA annual meeting, Santa Clara, California, October 1999 (invited).

23. “Implementation of correlation based algorithms for ATR”, OSA annual meeting, Long Beach, California, October 1997 (invited).

24. “Polynomial Correlation Filters”, Invited talk Euro-American workshop on optical information processing, Sitges, Spain, June 1997

25. “Review of correlation filters and their applications for scene matching”, Critical Review on Optical Pattern Recognition, Chair: B. Javidi, SPIE, Denver, 1996

26. "Application of Correlation Filters", Presentation to DARPA Image Understanding Group, Martin Marietta, March 1992.

27. "Signal Processing using 2-D FIR filters for Pattern Recognition", Seminar, Department of Electrical Engineering, Tampere University of Technology, Tampere, Finland, June 1991.

28. "Overview of Correlation Techniques for Machine Vision", Seminar, Center for Automation Research, University of Maryland, College Park, April, 1991

29. "Recent Advances in Optical Pattern Recognition", Presentation to RADC at Hanscom Air Force Base, March 1991

30. "Pattern recognition schemes based on correlation filtering", Seminar, Department of Electrical Engineering, Indian Institute of Technology, New Delhi, India, June 1990

31. "Pattern recognition using 2-D Spatial Filters", Seminar, Department of Systems and Industrial Engineering, University of Arizona, October 1989

32. "Optical Signal Processing", Presentation to USWEST, University of Arizona, March, 1988.

33. "Target Detection using Generalized Spatial Filters", Seminar at Department of Electrical Engineering, University of California, Santa Barbara, November 1988.

Previous Experience at the University of Arizona (1987-1990)

Grants Received:

Sponsor	Project Title	Amount($)	Dates
NSF	Research Initiation: Machine Vision Systems	50,000.00	Aug 88 -July 90
NSF	Pattern Recognition Non-Destructive Evaluation using Acoustic Microscopy	71,000.00	Sep 88 - Aug 90
IBM	Signal Processing for Magnetic Data Recording	110,000.00	Jan 89 - Dec 90
AT&T	DSP Laboratory	15,000.00	Jan 89 - Dec 89
NSF	Research Experience for Undergraduates (REU)	16,000.00	Mar89 - Aug 90
AFOSR	Automatic Target Recognition	25,000.00	Aug 90 -July 91

Capital Equipment Received from Industry

Motorola	- Four DSP56000 based processors for PC compatibles with software and simulator (Valued at $7000).
Texas Instruments	- TMS320C30 based processor, simulator and software. Jointly received with Dr. M. Marcellin. (Valued at $28,000)
Fluke	- Measurement Devices (multimeters, frequency counters) (Valued at $2500).

University Activities and Services:

- Faculty adviser to India Club, campus organization, (1988 - 1989).
- Member of Department curriculum committee, (1988 - 1989).
- Member of Department optics committee, (1989 - 1990).
- Member of group seminar committee, (1988- 1990).

Summary of Teaching and Advising

Course Number	Title	Semester	Attendance
ECE 428	Digital Signal Processing	Fall 1987	45
		Summer 1989	65
ECE 528	Advanced Signal Processing	Spring 1988	22
ECE 537	Pattern Recognition	Spring 1989	8
(New Course)		Spring 1990	9
ECE 529	Applied Signal Processing	Fall 1989	7
(New Course)			
ENEE 728z	Digital Image Processing	Fall 1990	9
(U MD)			
ENEE 728y	Machine Vision Principles	Spring 1991	12
(U MD, New Course)			
ECE 340	Linear Systems	Fall 1998	71

- Established a Signal and Image Processing Laboratory for teaching seniors and graduate students.
- Supported 4 outstanding undergraduates as a part of the *Research Experience for Undergraduates* (REU) program sponsored by NSF.
- Introduced two new graduate courses on pattern recognition (ECE 537) and signal processing (ECE 529).

Advised Students:

Name	Degree/Project
1. Edward Orcutt:	Masters (completed, Fall 1989)
2. Nadar Marriapan:	Masters (completed, Spring 1990)
3. Cheol Yoo	Masters (completed, Fall 1990)
4. S. Song	Masters (completed, Fall 1990)
5. Han-Lung Wang:	Research Assistant (1987-88)
6. S.I. Sudarshanan:	Research assistant (1988-90)
7. Charles Hung:	Senior project completed (1987-88)
8. Carolyn Pearl:	Senior project completed (1987-88)

9. John McArthur:	Senior project completed (1987-88)
10. Hidayat Tresna:	Senior project completed (1988-89)
11. Hong-Fu Yow:	Senior project completed (1988-89)
12. M. Eljabaoui	Senior project completed (1988-89)
13. Rich Schuman	Senior project completed (1988-89)
14. Howard Hom	Senior project completed (1989-90)
15. Robert Mcmoran	Senior project completed (1989-90)
16. Ahmed Zia	Senior project completed (1989-90)
17. Mayuran Subramanium	Senior project completed (1989-90)

Examination Committees:

- Served on the Department M.S. Non-Thesis examination committee (1989)

- Served as examiner on M.S. and Ph.D. defense, qualifiers, and preliminary examinations for 26 students (1987-1990)

Other University Experience (since 1990)

- Introduced new course on machine vision (ENEE 728y) at the University of Maryland (1991)

- Adjunct Professor/Instructor for course on Machine Learning and Pattern Recognition (EEL 5825), University of Central Florida, (Fall 2006).

- Served as PhD. co-advisor of Robert. R. Muise, "Quadratic filters for automatic pattern recognition," University of Central Florida, 2003

- Served as external committee member on doctoral committees of the following students at Carnegie Mellon University:
    1. Daniel Carlson, "Optimal tradeoff composite filters," August 1996.

    2. Mohamed Alkanhal, "Eigen and nonlinear correlation filters for automatic target recognition," September 2000.

    3. Marios Savvides, "Reduced-Complexity Face Recognition using Advanced Correlation Filters and Fourier subspace Methods for Biometric Applications," April 2004

    4. Ryan Kerekes, "Combining correlation outputs for enhanced distortion-tolerant target recognition," May 2007.

    5. Andres Rodriguez, "Maximum margin generalized correlation filters," August 2012.

    6. Vishnu Naresh Boddeti, "Advances in Correlation Filters: Vector Features, Structured Prediction and Shape Alignment," December 2012.

7. Joseph Fernandez, "Accounting for aliasing in correlation filters: Zero-Aliasing and Partial-Aliasing correlation filters," April 2014.

8. Stephen Siena, "Improving the design and use of correlation filters in visual tracking," Septemeber 2017.

- Served as external Committee member for the following PhD Students at University of Central Florida:

1. Brian Millikan, "Compressed Automatic Target Recognition Using a Compressive Infrared Imager," March 2018 (Thesis Advisor: Hassan Foroosh).

2. William McDowell, "Vehicle Tracking and Classification via 3D Geometries for Intelligent Transportation Systems," December 2015, (Thesis Advisor: Wasfy Michael)

3. Pradeep Ragothaman, "Efficient Algorithms for Correlation Pattern Recognition," December 2007 (Thesis Advisor: Wasfy Michael).