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## LINA J. KARAM

Dean, School of Engineering

Professor and Fellow of the IEEE

School of Electrical and Computer Engineering

Lebanese American University

Editor-In-Chief of the IEEE Journal of Selected Topics in Signal Processing

Emerita Professor, Arizona State University, USA

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### Research Topics and Publications Highlights

Signal, Image, and Video Processing, Compression, and Transmission; Computer Vision; Machine Learning; Deep Learning; Perceptual-based Processing; Visual Attention Models; Automated Quality Assessment; Multidimensional Signal Processing; Digital Filter Design.

**Supervised to completion 45 graduate students (22 PhD and 23 MS Thesis students)**

### Industry Collaborations and Technology Transfer

Image and video processing and compression development at AT&T Bell Labs (Murray Hill); multi-dimensional data processing and visualization at Schlumberger; R&D collaborations on computer vision, machine learning, image/video processing, compression, and transmission projects with various industries including Intel, Qualcomm, Google, NTT, Motorola, Freescale, General Dynamics, and NASA.

Established the World's First Visual Innovation Award in 2016:

<https://www.youtube.com/watch?v=pEZ2mT5sASw>

<https://fullcircle.asu.edu/faculty/visual-tech-visionaries-honored-innovation-awards/>

Established the World's First Multimedia Star Innovator Award in 2019.

Established in 2018 an ASU-Silicon Valley Fellowship/Internship Program for Graduate Students (Computer Engineering, Electrical Engineering, Computer Science, Industrial Engineering) with TCL Research America as founding partner.

Established and led in 2018 a University-wide Intel-ASU Collaborative Initiative on Automated Mobility/Autonomous Cars with Intel, ADOT, DPS and GPEC as partners, which culminated in the establishment of the Governor's Institute on Automated Mobility (IAM) at the state level.

Established Intel-ASU A-SPACE initiative (2017-2018) and lead PI on grant (funded in 2018):

<https://asu.pure.elsevier.com/en/projects/intel-asu-a-space-initiative-proposed-research-tasks-3>

**Podcast-Driverless Cars** (August 31, 2018): <https://www.hh-wm.com/podcast/driverless-cars/>

**Interview with FOX 10 News - Cities and Driverless Cars** (October 30, 2018):

<http://www.fox10phoenix.com/news/arizona-news/cities-looking-at-how-self-driving-cars-can-change-their-communities>

**Interview with Phoenix Business Journal - Waymo and Self-Driving Truck Testing** (May 29, 2019):

<https://www.bizjournals.com/phoenix/news/2019/05/29/waymo-to-resume-self-driving-truck-testing-in.html>

[http://lina.faculty.asu.edu/Waymo\\_SelfDrivingTruckTesting\\_PBJ.pdf](http://lina.faculty.asu.edu/Waymo_SelfDrivingTruckTesting_PBJ.pdf)

Judge on Vision Tank 2019 Start-Up Competition, Embedded Vision Summit, Santa Clara, CA, USA (May 22, 2019):

<https://www.youtube.com/watch?v=X-bed7c04IY&feature=youtu.be&t=3>

Inventor on 7 issued patents

National Academy of Inventors, ASU Chapter

Consulting in Patent Litigation, Image/Video Compression, Image/Video Processing, Computer Vision

President, PICARIS, LLC

Director, Image, Video & Usability (IVU) Laboratory

Director, Real-time Embedded Signal Processing (RESP) Laboratory

Director of Industry Engagement, ASU Fulton Schools of Engineering

### **Short Bio**

Lina Karam is currently the Dean of the School of Engineering and a Full Professor in the Department at Electrical & Computer Engineering at the Lebanese American University. She is also an Emerita Professor at Arizona State University. Prior to joining LAU in 2020, she was a tenured Full Professor, Computer Engineering Program Chair, Computer Engineering Director for Industry Engagement, and the Director of the R&D Image, Video, and Usability (IVU) Lab at Arizona State University. Dr. Karam is an IEEE Fellow, the highest grade level in IEEE which is conferred each year to no more than one-tenth of 1% of all IEEE voting members, for her contributions in the image and video processing, visual media compression and transmission, and digital filtering areas. Dr. Karam is a recipient of the National Science Foundation CAREER Award, NASA Technical Innovation Award, the Intel Outstanding Researcher Award, the IEEE SPS Best Journal Paper Award, and the IEEE Phoenix Section Outstanding Faculty Award. At ASU, Dr. Karam helped in establishing two transdisciplinary programs, the Computer Engineering Program (across Computer Science and Electrical Engineering) and the Robotics & Autonomous Systems (RAS) Program (across four schools). Dr. Karam served on the IEEE SPS Board of Governors, the IEEE CAS Fellow Evaluation Committee, IEEE PSPB Strategic Planning Committee, and the editorial boards of the IEEE SP Magazine, IEEE JSTSP, IEEE TIP, and IEEE SP Letters. She served as a Lead Guest Editor for the Proceedings of the IEEE, IEEE JSTSP, and as a Guest Editor for the IEEE SP Magazine and EURASIP Journal on Image and Video Processing. She served as the General Chair of the 2016 IEEE ICIP, Technical Program Chair of the 2009 IEEE ICIP, General Chair of the 2011 IEEE DSP/SPE Workshops. She cofounded the International Conference on Quality of Multimedia Experience (QoMEX). She is currently serving on the IEEE SPS Board of Governors and on the IEEE CAS Fellow Evaluation Committee. She is currently serving as the EiC of the IEEE Journal of Selected Topics in Signal Processing and as the Lead Guest Editor, IEEE Signal Processing Magazine, Special Issue on Autonomous Driving. She is also serving on the IEEE Access Journal Senior Editorial Board, IEEE TechRxiv Advisory Board, and the Foundation and Trends in Signal Processing Journal Editorial Board. She is a member of the IEEE SPS IVMSP TC and IEEE CAS DSP TC.

## **Education**

Georgia Institute of Technology

Ph.D., Electrical Engineering, 1995

M.S., Electrical Engineering, 1992

American University of Beirut

B. E., Computer and Communications Engineering, 1989.

## **Employment**

Dean, School of Engineering, Lebanese American University (January 2020-present)

Professor, Electrical & Computer Engineering, Lebanese American University (January 2020-present)

Emerita Professor, Arizona State University, USA (January 2020-present)

Computer Engineering Program Director (January 2018-December 2018)

Computer Engineering Graduate Program Chair (Oct. 2016-December 2017)

Professor (May 2010 – Dec 2019), School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ.

Associate Professor (August 2001 – May 2010), School of Electrical, Computer, and Energy Engineering (formerly known as Department of Electrical Engineering), Arizona State University, Tempe, AZ.

Visiting Associate Professor (August 2005 – December 2005), Department of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX.

Assistant Professor (August 1995 – August 2001), Department of Electrical Engineering, Arizona State University, Tempe, AZ.

Intern (1994), AT&T Bell Laboratories, Murray Hill, NJ.

Research Assistant (September 1992 – June 1995), School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA.

Research Assistant (June 1991 – September 1992), Graphics, Visualization, and Usability (GVU) Center, Georgia Institute of Technology, Atlanta, GA.

Intern (1992), Schlumberger, Austin, TX

Research Assistant (February 1990 - June 1991), Scientific Visualization Group, Georgia Institute of Technology, Atlanta, GA.

Intern (1988), Computing Department, Imperial College, London, UK.

## **Awards and Recognition**

- IEEE Fellow
- Editor-In-Chief, IEEE Journal on Selected Topics in Signal Processing (Jan 2019-Dec 2021).
- National Academy of Inventors, ASU Chapter (inducted in 2019).
- IEEE Region 6 "Outstanding IEEE member who promoted Women in Engineering" Award, 2018
- IEEE Phoenix Section Outstanding Contribution to Promoting Women in Engineering (WIE) Award, April 2018
- Certificate of Recognition, IEEE Signal Processing Society, September 2016
- IEEE Signal Processing Society's Best Paper Award (IEEE Transactions Journal Paper)
- IEEE Signal Processing Society's Board of Governors.

- QoMEX 2012 Best Paper Award, July 2012
- Intel Outstanding Researcher Award, March 2012
- Outstanding Faculty Award, IEEE Phoenix Section, February 2012
- American University of Beirut Distinguished Alumnus Award, 2011
- Certificate of Merit, IEEE Signal Processing Society, 2009
- NASA Technical Innovation Award for work on visual compression, 2006
- Outstanding Technical Contributions Award, Digital Signal Processing, IEEE Phoenix Section, Jan. 2005.
- Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), January 2003.
- Professional Leadership & Service Recognition from the IEEE Signal Processing and the IEEE Communications societies
- U.S. National Science Foundation CAREER Award
- Society of Women Engineers Outstanding Graduate Student Award at Georgia Tech

### **Editorship**

- Editor-In-Chief, IEEE Journal on Selected Topics in Signal Processing (Jan 2019-Present).
- Lead Guest Editor, IEEE Signal Processing Magazine, Special Issue on Autonomous Driving (2019 – present)
- Chief Guest Editor for the Proceedings of the IEEE, Special Issue on Perceptual-Based Media Processing (2011-2013)
- Senior Editorial Board of the IEEE Signal Processing Magazine (2014-present).
- Editorial Board of the IEEE Journal on Selected Topics in Signal Processing (2014-2017).
- Editorial Board, Foundation and Trends in Signal Processing (2006-present).
- Guest Editor for EURASIP Journal on Video Quality Metrics (2012-2013).
- Guest Editor for the IEEE Signal Processing Magazine, Special Issue on Multimedia Quality Assessment (2010-2011).
- Guest Editor for the EURASIP Journal on Image and Video Processing, Special Issue on Quality of Multimedia Experience (2009-2011).
- Lead Editor for the IEEE Journal on Selected Topics in Signal Processing, Special Issue on Visual Quality Assessment (2007-2009)
- Editorial Board of the IEEE Transactions on Image Processing (1999-2003 & 2006-2010)
- Editorial Board of the IEEE Signal Processing Letters (2004-2006)

### **Conference Activities**

- General Co-Chair of the IEEE International Conference of Multimedia and Expo (ICME), Shanghai, China, July 2019.
- General Chair of the 23<sup>rd</sup> IEEE International Conference on Image Processing (ICIP), Phoenix, AZ, September 2016.
- Initiator of the World's First Visual Innovation Award presented for the first time at IEEE ICIP 2016, and of the World's First Multimedia Star Innovator Award presented for the first time at IEEE ICME 2019.

- Initiator of the IEEE Xplore Open Paper Preview, which makes papers freely available open access prior to held conference and which results in higher impact for papers.
- Member of the organizing committee of the QoMEX 2016 conference (Lisbon, Portugal).
- Area Chair, 2015 IEEE International Conference on Image Processing (ICIP) and 2015 IEEE International Conference on Circuits and Systems (IEEE CAS).
- General Chair (together with Jorge Caviedes) of the 2012 International Workshop on Video Processing and Quality Metrics for Consumer Electronics (VPQM), January 2012.
- General Chair (together with Ron Schafer) of the 2011 IEEE Digital Signal Processing and IEEE Signal Processing Education Workshops, Sedona, AZ, January 2011.
- Technical Program Chair (together with Thrastos Pappas) of the 2009 IEEE International Conference on Image Processing.
- Co-Founder (together with Touradj Ebrahimi, *EPFL*, Kahled El-Maleh and Gokce Dane, *Qualcomm*), of the International Workshop on Quality of Multimedia Experience (QoMEX). <http://www.qomex.org>
- Co-Founder (together with Jorge Caviedes, *Intel*, and Sanjit Mitra, *UCSB and USC*) of the International Workshop on Video Quality for Consumer Electronics (VPQM). <http://www.vpqm.org>
- Technical Program Chair (together with Gokce Dane) of the First International Workshop on Quality of Multimedia Experience (QoMEX 2009).
- Technical Program Chair of the First International Workshop on Video Quality for Consumer Electronics (VPQM 2005).
- Served on the Organizing Committees and on the Technical Committees of several other international conferences.

### **Scientific and Professional Society Memberships**

- IEEE Fellow (2013-present).
- IEEE Signal Processing Society's Publications and Awards Boards (2019-present)
- IEEE Access Journal Senior Editorial Board (2019-present)
- IEEE TechRxiv Advisory Board (2019-present)
- IEEE Journal of Selected Topics in Signal Processing Senior Editor Board (2019-present)
- IEEE Circuits and Systems Society's Fellow Evaluation Committee (2018 – 2019)
- IEEE Signal Processing Society's Board of Governors (2016 - 2018)
- IEEE Signal Processing Society's TC Review Committee (2016 - 2017)
- IEEE Signal Processing Society's Image, Video, and Multidimensional Signal Processing (IVMSP) Technical Committee (2005-2011 & 2014-present)
- IEEE Circuits and Systems (CAS) Society's DSP Technical Committee (1996-present)
- Member of the IEEE Publication Services and Products Board (PSPB) Strategic Planning Committee (2014-2016).
- Member of the Award Board and Initiator of the World's First Visual Innovation Award presented for the first time at IEEE ICIP 2016.
- Member of the IEEE Signal Processing Society's Multimedia Technical Committee (2011-2014).

- Member of the IEEE Signal Processing Society's Appointments and Nominations Committee (2011-2014).
- Elected Member and Vice Chair of the IEEE Signal Processing Society's Education Technical Committee (2010-2012).
- Member of the IEEE Signal Processing Society's Technical Directions Board (2008-2009), and Chair of its Diversity Committee (2009).
- Member of the IEEE Signal Processing Conference Board (2003-2005 & 2017-2018).
- Member of the IEEE Signal Processing Society, IEEE Circuits and Systems Society, and IEEE Communications Society.
- Member of the Institute of Electrical and Electronics Engineers (IEEE).

### **Journals / Proposals / Patents / Programs Reviewer**

- Reviewer for IEEE, Elsevier, and ACM journals
- Reviewer on NSF (USA) panels
- Reviewer for NSF (USA) grant proposals including SBIR proposals
- Reviewer for NSERC (Canada) grant proposals
- Reviewed grant proposals for national and international universities
- Reviewed DoD (USA) proposals
- Reviewer and consultant on patent validation and litigation
- Leader of Assessment of Engineering and Computer Science University Programs at the international level.

### **Select University Service**

- Computer Engineering Program Chair (2016-2017)
- Computer Engineering Director, Industry Engagement (2018)
- ADAS lead faculty advisor as part of the DoE/GM-sponsored Advanced Vehicular Technologies (EcoCAR3) Competition (2017-2018)
- Initiated and led transdisciplinary initiatives on automated mobility and self-driving cars across four ASU campuses (Tempe, Downtown, Polytechnic, Washington DC) and across various schools and established academia-university-government partnerships (2017-2019)
- Established an ASU-Silicon Valley partnership and fellowship with TCL Research America as founding member (2018)
- Helped in establishing two new transdisciplinary degree-granting graduate programs and served on their Graduate Program Committees (GPC):
  - Computer Engineering (CEN): transdisciplinary program between 2 schools
  - Robotics and Autonomous Systems (RAS): transdisciplinary between 4 schools
- University Promotion & Tenure Committee
- Engineering Dean's Faculty Advisory Council (DFAC)

### **INVITED PRESENTATIONS, SHORT COURSES, SELECT PANELS**

1. *Invited Talk*, "Resilient Deep Learning through Feature Regeneration," Intel Corporation, Phoenix, AZ, April 2019. *Talk hosted by IEEE WIE Phoenix.*

2. *Panelist (the only engineer on panel among 6 panelists) with Waymo's CExO*, "Let's Talk Self-Driving: A Fireside Conversation with Waymo's Tekedra Mawakana," Arizona State University, Tempe, AZ, USA, April 2019.
3. *Invited Talk*, "Understanding Automated Driving Systems Technologies," Connected and Autonomous Vehicles 101 (CAV 101) Seminar and Roadshow; Education for Arizona Small Towns and Satellite Cities; Tempe, AZ, USA, March 2019.
4. *Invited Talk and Panelist*, "Towards Safe, Efficient Automated Driving at Scale," American Bar Association (ABA) Smart Cities Conference, Tempe, AZ, USA, February 2019.
5. *Invited Talk*, "Generative Sensing: Reliable Recognition from Unreliable Sensor Data," Embedded Vision Summit, Santa Clara, CA, May 2018. **Talk highly ranked by attendees.**
6. *Plenary Talk*, "Generative Sensing," International Conference on Computing, Networking, and Communications (ICNC), Maui, Hawaii, March 2018.
7. *Plenary Talk*, "Generative Sensing: Transforming Unreliable Sensor Data for Reliable Recognition," Twenty-Fourth National Conference on Communications (NCC) 2018, IIT Hyderabad, India, February 2018.
8. *Distinguished Speaker*, "A Closer Look at Visual Attention Models," College of Engineering, Penn State University, April 2017.
9. *Invited Tutorial Lecture*, "Introduction to Image and Video Compression," Visual Signal Analysis and Processing (VSAP) Workshop, Khalifa University, Abu Dhabi, United Arab Emirates, November 2015.
10. *Plenary Distinguished Lecture*, "Attentive Visual Processing – Towards User-Centric Visual Technologies," International Conference on Computing, Networking and Communications (ICNC), February 2014.
11. *Intel Webinar*, "Automated Defect Detection and Identification for Semiconductor Units Undergoing Assembly and Test," Intel Corporation, November 2011.
12. *Plenary Talk*, "Efficient Perceptual-Based Image and Video Processing," Tenth FEA Student Conference, American University of Beirut, Beirut, Lebanon, May 2011.
13. *Expert Panel Talk*, "Trends in 3D Video Processing," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), May 2011.
14. *Invited Talk*, "Foundations and Trends of Visual Quality Assessment," American University of Beirut, Beirut, Lebanon, July 2010.
15. *Plenary Talk*, "Foundations and Trends of Visual Quality Assessment," 2<sup>nd</sup> International Workshop on Visual Information Processing (EUVIP), Paris, France, July 2010.
16. *Invited Talk*, "Adaptive Rate-Distortion Based Wyner-Ziv Video Coding," Multimedia, Mathematics and Machine Learning II, BIRS, Banff Centre, Banff, Canada, July 2009.
17. *Invited Talk*, "Wyner-Ziv Based Low-Complexity Distributed Video Encoding," New Mexico State University, Las Cruces, NM, Nov. 2008.
18. *Invited Lecture*, "Real-World Applications for Freshman Engineering Education," NI Week, Austin, TX, Aug. 2008.
19. *Invited Lecture*, "From Conventional to Distributed Video Coding," IEEE Lebanon Section and American University in Beirut, Beirut, Lebanon, July 2008.
20. *Invited Lecture*, "BLAST-DVC: BitPLane Selective Distributed Video Coding," Center for Research in Mathematics (CIMAT), Guanajuato, Mexico, May 2008.



21. *Short Course*, Lina J. Karam, "Image Compression: Foundations," Qualcomm, San Diego, CA, May 2008. Invited One-Day Short Course.
22. *Short Course*, Lina J. Karam, "Basics of Image and Video Compression," Qualcomm, San Diego, CA, 2007. Invited Two-Day Short Course.
23. *Guest Speaker*, "Functional MRI," National Instruments, Austin, TX, 2007.
24. *Invited Talk*, "Selective Error Detection for Error-Resilient Image Coding and Transmission using Similarity Check Functions," Ss Cyril and Methodius University, Skopje, Macedonia, 2006.
25. *Guest Speaker*, "Freshman Introduction to Engineering," National Instruments, Austin, TX, 2005.
26. *Invited Speaker*, "Wavelet-Based Adaptive Image Denoising with Edge Preservation," General Dynamics, Scottsdale, AZ, 2004.
27. *Invited Talk*, "Teaching Image Processing to High School Students," IEEE Digital Signal Processing Workshop, Hunt, TX, 2000.
28. *Invited Talk*, "Error-Resilient Video Coding with Channel-Optimized Trellis-Coded Quantization," IEEE Wireless Communications and Networking Conference, Chicago, IL, 2000.
29. *Invited Talk*, "Channel-Optimized Source Coding for the Transmission of Digital Imagery over Noisy Channels," The American University of Beirut, Beirut, Lebanon, July 2000.
30. *Invited Talk*, "Robust Image Coding Using Perceptually-Tuned Channel-Optimized Trellis-Coded Quantization," Midwest Symposium on Circuits and Systems, Las Cruces, NM, 1999.
31. *Guest Speaker*, "Image Coding based on Perceptual Criteria," Motorola, Scottsdale, AZ, 1996.
32. *Distinguished Lecture*, "Color Video Coding at Very Low Bit Rates," IEEE Signal Processing & Communications Chapter, Phoenix, AZ, 1995.

## PATENTS

Note: Student authors are shown in boldface.

1. Tinku Acharya, Lina J. Karam, and **Francescomaria Marino**, "The Compression of Color Images Based on a 2-Dimensional Discrete Wavelet Transform Yielding a Perceptually Lossless Image," US Patent 6,154,493. Filed 1998 by Intel. **Issued 2000.**
2. Tinku Acharya, Lina J. Karam, and **Francescomaria Marino**, "Real-time Algorithms and Architectures for Coding Images Compressed by DWT-Based Techniques," US Patent 6,124,811. Filed 1998 by Intel. **Issued 2000.**
3. Glen P. Abousleman, **Tuyet-Trang Lam**, and Lina J. Karam, "Communication System and Method for Multi-Rate, Channel-Optimized Trellis-Coded Quantization," US Patent 6,717,990. Filed 2000 by Motorola. **Issued 2004.**
4. **Katherine S. Tyldesley**, Glen P. Abousleman, and Lina J. Karam, "System and Method for Transmission of Video Signals using Multiple Channels," US Patent 7551671 B2. Filed 2003 by General Dynamics. **Issued June 2009.**
5. Glen P. Abousleman, **Wei-Jung Chien** and Lina J. Karam, "Method and Apparatus for Network-Adaptive Video Coding," US Patent. Provisional filed 2007 by ASU. Full patent filed 2008 by ASU.
6. Lina J. Karam and **Asaad F. Said**, "Automatic Cell Migration and Proliferation Analysis," United States Patent 9,082,164. **Issued July 14, 2015.**



7. Lina J. Karam and **Samuel Dodge**, "Systems, Methods, and Media for Identifying Object Characteristics Based on Fixation Points," United States Patent 9,501,710 B2. **Issued November 22, 2016.**
8. Lina J. Karam and **Jinjin Li**, "Stereo Vision Measurement System and Method," United States Patent 9,704,232 B2. Full Patent Filed March 18, 2015. **Issued July 11, 2017. Technology Licensed by Intel through Arizona Technology Enterprises (AzTE).**
9. Lina J. Karam and **Tejas Borkar**, "Systems and Methods for Feature Corrections and Regeneration for Robust Sensing, Computer Vision, and Classification," Provisional Patent Application 62/650,905 filed on 30 March 2018.

### Select ArXiv Papers

Note: Student authors are shown in boldface.

1. Lina J. Karam, **Tejas Borkar**, Junseok Chae, and Kevin Yu, "Generative Sensing: Transforming Unreliable Sensor Data for Reliable Recognition," 5 pages, arXiv:1801.02684[cs.CV], Jan. 2018.
2. **Tejas Borkar** and Lina J. Karam, "DeepCorrect: Correcting DNN Models against Image Distortions," arXiv:1705.02406 [cs.CV], 19 pages, May 2017.
3. **Samuel Dodge** and Lina J. Karam, "Quality Resilient Deep Neural Networks," 10 pages, arXiv:1703.07478 [cs.CV], Mar. 2017.

### BOOKS

Note: Student authors are shown in boldface.

1. Lina J. Karam and **Naji Mounsef**, *Introduction to Engineering: A Starter's Guide With Hands-On Digital Multimedia Explorations and Robotics*, Morgan-Claypool, 2008.
2. Lina J. Karam and **Naji Mounsef**, *Introduction to Engineering: A Starter's Guide With Hands-On Analog Multimedia Explorations*, Morgan-Claypool, 2008.
3. Lina J. Karam, *Design of Complex Digital FIR Filters in the Chebyshev Sense*, Ph.D. Thesis, Georgia Institute of Technology, March 1995.

### BOOK CHAPTERS

1. **Vicente Moleri**, Lina J. Karam, and Zoe Lacroix, "CLAST: Clustering Biological Sequences," in *Emerging Trends in Computational Biology, Bioinformatics, and Systems Biology* (Q. Nam and H. Arabnia Eds.), Chapter 10, pp. 203-220, Aug. 2015, Elsevier. ISBN: 978-0-12-802508-6. <http://www.sciencedirect.com/science/book/9780128025086>
2. **Nabil G. Sadaka** and Lina J. Karam, "Perceptually Driven Super-Resolution Techniques," in *Perceptual Digital Imaging: Methods and Applications*, Rastislav Lukac Editor, CRC Press/Taylor & Francis, 2012.
3. Lina J. Karam, "Lossless Image Compression," in *The Essential Guide to Image Processing*, Al Bovik Editor, Chapter 16, pages 385-417, Elsevier Academic Press, 2009.
4. Lina J. Karam, "Lossless Coding", in *the Handbook of Image and Video Processing*, 2<sup>nd</sup> Edition, Al Bovik Editor, Chapter 5.1, pages 643-660, Elsevier Academic Press, 2005.
5. Umesh Rajashekar, Alan C. Bovik, Daniel Sage, Michael Unser, Lina J. Karam, and Reginald Legendijk, "Image Processing Education," in *the Handbook of Image and Video Processing*, 2<sup>nd</sup> Edition, Al Bovik Editor, Chapter 2.4, pages 73-95, Elsevier Academic Press, 2005.

6. Lina J. Karam, "Lossless Image Coding," in *the Handbook of Image & Video Processing* Al Bovik, Editor, Chapter 5.1, pages 461-474, Academic Press, 2000.
7. Lina J. Karam, James H. McClellan, Ivan Selesnick, and C. Sidney Burrus, "Digital Filtering," in *the Digital Signal Processing Handbook* (V. K. Madisetti and D. B. Williams, Editors), Chapter 11, pages 11-1 to 11-86, CRC Press, 1998.

### REFEREED JOURNAL PAPERS (PUBLISHED OR ACCEPTED):

Note: Student authors are shown in boldface.

1. **Tejas S. Borkar** and Lina J. Karam, "DeepCorrect: Correcting DNN Models against Image Distortions," *IEEE Transactions on Image Processing*, vol. 28, issue 12, pp. 6022-6034, Dec. 2019.
2. **Samuel F. Dodge** and Lina J. Karam, "Human and DNN Classification Performance on Images With Quality Distortions: A Comparative Study," *ACM Transactions on Applied Perception*, vol. 16, issue 2, 18 pages, March 2019; doi 10.1145/3306241.
3. **Jinane S. Monsef** and Lina J. Karam, "Augmented Sparse Representation Classifier (ASRC) for Face Recognition under Quality Distortions," *IET Biometrics Journal*, vol. 8, issue 6, pp. 431-442, Nov. 2019.
4. **Charan D. Prakash**, Farshad Akhbari, and Lina J. Karam, "Robust Obstacle Detection for Advanced Driver Assistance Systems using Distortions of Inverse Perspective Mapping of a Monocular Camera," *Robotics and Autonomous Systems Journal*, vol. 114, pp. 172-186, 2019.
5. **Samuel F. Dodge** and Lina J. Karam, "Quality Robust Mixtures of Deep Neural Networks," *IEEE Transactions on Image Processing*, vol. 27, no. 11, pp. 5553-5562, Nov. 2018.
6. **Samuel F. Dodge** and Lina J. Karam, "Visual Saliency Prediction Using a Mixture of Deep Neural Networks," *IEEE Transactions on Image Processing*, vol. 27, no. 8, pp. 4080-4090, August 2018.
7. **Aditee Shrotre** and Lina J. Karam, "Full Reference Objective Quality Assessment for Reconstructed Background Images," *Journal of Imaging*, vol. 4, no. 6, 82; 24 pages, June 2018. <https://doi.org/10.3390/jimaging4060082>
8. **Samuel Dodge, Jinane Mounsef**, and Lina J. Karam, "Unconstrained Ear Recognition using Deep Neural Networks," *IET Biometrics*, 8 pages. Accepted January 2018. doi: 10.1049/iet-bmt.2017.0208

9. **Milind S. Gide** and Lina J. Karam, "Computational Visual Attention Models," *Foundations and Trends® in Signal Processing*, vol. 10, no. 4, pp 347-427, 2017. <http://dx.doi.org/10.1561/20000000055> (invited)
10. **S. Alirezah Golestaneh** and Lina J. Karam, "Reduced-Reference Quality Assessment Based on the Entropy of DWT Coefficients of Locally Weighted Gradient Magnitudes," *IEEE Transactions on Image Processing*, vol. 25, no. 11, pp. 5293-5303 (11 pages), Nov. 2016.
11. **Bashar M. Haddad, Sen Yang**, Lina J. Karam, Jieping Ye, Nital Patel, and Martin Braun, "Multi-Feature, Sparse-Based Approach for Defects Detection and Classification in Semiconductor Units," *IEEE Transactions on Automation Science and Engineering*, 15 pages, Aug. 2016, doi 10.1109/TASE.2016.2594288.
12. **Milind Gide** and Lina J. Karam, "A Locally Weighted Fixation Density-Based Metric for Assessing the Quality of Visual Saliency Predictions," *IEEE Transactions on Image Processing*, vol. 25, no. 8, pp. 3852-3861, Aug. 2016.
13. **Mahesh Subedar** and Lina J. Karam, "3D Blur Discrimination," *ACM Transactions on Applied Perception*, vol. 13, issue 3, article no. 12, 13 pages, May 2016, doi 10.1145/2896453.
14. **Jinjin Li**, Bonnie L. Bennett, Lina J. Karam, and Jeffrey S. Pettinato, "Stereo Vision Based Automated Solder Ball Height and Substrate Coplanarity Inspection," *IEEE Transactions on Automation Science and Engineering*, vol. 13, no. 2, pp. 757-771, April 2016.
15. **Srenivas Varadarajan** and Lina J. Karam, "A No-Reference Texture Regularity Metric Based On Visual Saliency," *IEEE Transactions on Image Processing*, vol. 24, no. 9, pp. 2784-2796, Sep. 2015.
16. **Qian Xu, Srenivas Varadarajan**, Chaitali Chakrabarti, and Lina J. Karam, "A Distributed Canny Edge Detector: Algorithm and FPGA Implementation," *IEEE Transactions on Image Processing*, pp. 2944-2960, vol. 23, no. 7, Jul. 2014.
17. **Tong Zhu** and Lina J. Karam, "A No-Reference Objective Image Quality Metric based on Perceptually Weighted Local Noise," *EURASIP Journal on Image and Video Processing*, 2014 (8 pages). Available online: <http://jivp.eurasipjournals.com/content/2014/1/5>.
18. **Berkay Kanberoglu**, Nina Z. Moore, David Frakes, Lina J. Karam, Josef P. Debbins, Mark C. Preul, "Neuronavigation using Three-Dimensional Proton Magnetic Resonance Spectroscopy Data," *Stereotactic and Functional Neurosurgery*, pp. 306-314, 92(5), 2014.
19. **Sin Lin Wu**, Jorge Caviedes, Lina Karam, and Ingrid Heynderickx, "The Effect of Applying 2D Enhancement Algorithms on 3D Video Content," *Hindawi Journal of Electrical and Computer Engineering*, 11 pages, 2014. Online at: <http://dx.doi.org/10.1155/2014/601392>.

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8. **Samuel F. Dodge** and Lina J. Karam. "Is Bottom-Up Attention Useful for Scene Recognition?" arXiv:1307.5702, July 2013. Available Online at: <https://arxiv.org/abs/1307.5702>
9. **Akshay Pulipaka**, Patrick Seeling, Martin Reisslein, and Lina J. Karam, "Traffic and Statistical Multiplexing Characterization of 3D Video Representation Formats (Extended Version)," arXiv:1311.5834, Nov. 2013. Available Online at: <https://arxiv.org/abs/1311.5834>

## **STUDENTS' THESES AND DISSERTATIONS SUPERVISED TO COMPLETION**

### **Ph.D. Graduates (22)**

#### **Dr. Bashar Haddad**

Date: May 2019

Thesis Title: BagStack Classification for Data Imbalance Problems with Application to Defect Detection and Labeling in Semiconductor Units

Affiliation: Intel, Chandler, AZ, USA

#### **Dr. Samuel Dodge**

Date: December 2018

Thesis Title: Tree-Based Deep Mixture of Experts with Applications to Visual Saliency Prediction and Quality Robust Visual Recognition

Affiliation: Clarifai, Silicon Valley, USA

#### **Dr. Jinane Mounsef**

Date: December 2018

Thesis Title: Distortion Robust Biometric Recognition

Affiliation: Assistant Professor, Rochester Institute of Technology, Dubai, UAE

#### **Dr. S. Alireza Golestaneh**

Date: May 2018

Thesis Title: Visual Quality Assessment and Blur Detection Based on the Transform of Gradient Magnitudes

Affiliation: Carnegie Mellon University, Robotics Institute, Pittsburgh, PA

#### **Dr. Jinjin Li**

Date: May 2017

Thesis Title: Locally Adaptive Stereo Vision Based 3D Visual Reconstruction

Affiliation: Amazon Research Labs, San Jose, CA

#### **Dr. Milind Gide**

Date: December 2016

Thesis Title: Subjective and Objective Evaluation of Visual Attention Models  
Affiliation: Edge 3 Technologies

**Dr. Tong Zhu**

Date: May 2016

Thesis Title: Perceptual-Based Locally Adaptive Noise and Blur Detection

Affiliation: Apple, San Jose, CA

**Dr. Mahesh Subedar**

Date: December 2015

Thesis Title: Visual Quality with a Focus on 3D Blur Discrimination and Texture Granularity

Affiliation: Intel, Chandler, AZ

**Dr. Qian Xu**

Date: December 2014

Thesis Title: Spatial and Multi-Temporal Visual Change Detection with Application to SAR Image Analysis

**Dr. Srenivas Varadarajan**

Date: May 2014

Thesis Title: Texture Structure Analysis

Affiliation: Intel Labs, Bangalore, India

**Dr. Akshay Pulipaka**

Date: December 2012

Thesis Title: Traffic Characterization and Modeling of H.264 Scalable & Multi-View Encoded Video

Affiliation: San Jose Startup Video Company

**Dr. Nabil Sadaka**

Date: December 2011

Thesis Title: Efficient Perceptual Super Resolution

Affiliation: Intel, Chandler, AZ

**Dr. Asaad F. Said**

Date: December 2010

Thesis Title: Noise Resilient Image Segmentation and Classification Methods with Applications in Biomedical and Semiconductor Images

Affiliation: Intel, Chandler, AZ

Awards: Joe Palais Outstanding Doctoral Dissertation Award

Intel Division Award

**Dr. Ajit Devaraj**

Date: October 2010

Thesis Title: Advanced Methods in Post Cartesian Imaging

(Co-advised with Dr. James Pipe, Barrow Neurological Institute)  
Affiliation: Philips Medical Systems, Cleveland, OH

**Dr. Ryan Robison**

Date: May 2010

Thesis Title: Mitigation of Artifacts in T1-Weighted Spiral Projection Imaging

(Co-advised with Dr. James Pipe, Barrow Neurological Institute)

Affiliation: Philips Healthcare

**Dr. Wei-Jung Chien**

Date: February 2009

Thesis Title: Rate-Distortion Based Adaptive Distributed Video Coding

Affiliation: Qualcomm, San Diego, CA

**Dr. Rony Ferzli**

Date: November 2007

Thesis Title: Perceptual Based Image Quality Assessment and Enhancement

Affiliation: Microsoft, Seattle, WA; Intel, Chandler, AZ

**Dr. Tuyet-Trang (Snow) Lam**

Date: May 2006

Thesis Title: Selective Error Detection and Error Concealment for Error-Resilient Wavelet-Based Image Coding

Affiliation: Motorola, Tempe, AZ; Intel, Chandler, AZ

**Dr. Zoran Ivanovski**

Date: June 2006 (Univ. of Ss. Cyril and Methodius, Skopje, Macedonia)

Thesis Title: Super-resolution for the Restoration of Compressed Video

Affiliation: **Assistant Professor**, Faculty of Engineering, University of Ss. Cyril and Methodius, Skopje, Macedonia, <http://dsp.feit.ukim.edu.mk/ZoranIvanovski.htm>

**Dr. Zhen Liu**

Date: December 2003

Thesis Title: Context-based and Perceptual-based Image Coding with Applications to JPEG2000

Affiliation: Qualcomm, San Diego, CA

**Dr. Yassin Hasan**

Date: December 2000

Thesis Title: Nonlinear Shape-Based Image Analysis and Coding

Affiliation: **Assistant Professor**, Assiut University, Assiut, Egypt

<http://www.icict.gov.eg/ICICT2004/YassinHasan.jsp>

**Dr. Ingo Höntsch**

Date: August 1999

Thesis Title: Adaptive Perceptual Coding of Visual Information

Affiliation: Institut Fur Rundfunktechnik (IRT), Munich, Germany

## **Post-Doctoral Students**

### **Dr. Francescomaria Marino**

Date: October 1997 – November 1998

Research Topic: Algorithms and Architectures for Wavelet-Based Image Compression

Affiliation: **Associate Professor**, Department of Electrical and Electronic Engineering, Politecnico di Bari, Bari, Italy, <http://dee.poliba.it/dee-web/marinoweb/home.html>

## **M.S. Graduates (23)**

### **Sai Prajwal Kotamraju**

Date: December 2018

Thesis Title: Performance Evaluation of Object Proposal Generators for Salient Object Detection

Affiliation: Automotus, Los Angeles, CA

### **Vinay KashyapTakmulPurushothamaRaju**

Date: December 2014

Thesis Title: Fisheye Camera Calibration and Applications

Affiliation: Intel, Chandler, AZ

### **Tejas Borkar**

Date: December 2013

Thesis Title: Automated Animal Coloration Quantification in Digital Images using Colors and Skin Classification

Affiliation: Pursuing PhD studies at ASU

### **Charan Prakash**

Date: Spring 2012

Thesis Title: Camera Calibration using Adaptive Segmentation and Ellipse Fitting for Localizing Control Points

Affiliation: Pursuing PhD studies at ASU

### **Nicholas Werth**

Date: February 2011

Thesis Title: Synthetic Aperture Radar Image Formation via Sparse Decomposition

Affiliation: Lockheed Martin

### **Vijay Sundaram**

Date: September 2010

Thesis Title: Fast Algorithms and Architectures for High Throughput Encoding in H.264/AVC

(Co-advised with Dr. Chaitali Chakrabarti)



Affiliation: Intel, Portland, OR

**Adithya Murthy**

Date: May 2010

Thesis Title: Matlab Based Framework for Image and Video Quality Evaluation

Affiliation: Intel, Chandler, AZ

**Vicente Molieri**

Date: April 2010

Thesis Title: Genomic Sequence Clustering

**Steven Chris Burns**

Date: July 2009

Thesis Title: Real-Time Fixed-Point Wavelet-Based Image Compression

Affiliation: General Dynamics Decision Systems, Scottsdale, AZ

**Manal Jalloul**

Date: June 2009 (American University of Beirut)

Thesis Title: Improving Side Information Generation in a Distributed Video Coding System

Co-advised with Prof. M. Adnan Al-Alaoui at the American University of Beirut

**Berkay Kanberoglu**

Date: December 2008

Thesis Title: Novel Tools and Techniques in Neurosurgical Planning

Affiliation: Intel, Chandler, AZ

**Brian Lenoski**

Date: May 2007

Thesis Title: Estimating the Autocorrelation of Functional Magnetic Resonance Imaging: Presurgical Mapping of Finger Movement and Reading Comprehension

Affiliation: Medical Numerics, Germantown, MD

**Houssam Abbas**

Date: May 2006

Thesis Title: Analysis and Suppression of Mosquito Noise in Compressed Video using Optimized Epsilon-Filters

Affiliation: Intel, Chandler, AZ; Postdoc at University of Pennsylvania

**Juan Andrade Rodas**

Date: July 2005

Thesis Title: Semi-Autonomous 3D Tracking

Affiliation: **Professor and Director**, School of Electronics and Telecommunications Engineering, University of Cuenca, Cuenca, Ecuador

<http://ingenieria.ucuenca.edu.ec/escuelas/telecomunicaciones/default.aspx>

<http://ingenieria.ucuenca.edu.ec/Paginas/Profesores1.aspx>

Currently pursuing PhD studies

**Mahesh Subedar**

Date: May 2004

Thesis Title: Scalable Embedded Region-Of-Interest based Image Coding

Affiliation: Intel, Chandler, AZ

**Muhammad Yasin**

Date: December 2003

Thesis Title: Web-Based Two-Dimensional Signal Processing

**Katherine Tyldesley**

Date: May 2003

Thesis Title: Wireless Video Coding and Transmission over the Iridium Network

Affiliation: IBM, Tucson, AZ

**Charles Q. Zhan**

Date: May 2003

Thesis Title: Adaptive Wavelet-Based Image Denoising with Edge Preservation

Affiliation: Honeywell, Phoenix, AZ

**Lei Gao**

Date: May 2002

Thesis Title: Error-Resilient Image Coding and Transmission over Wireless Channels

Affiliation: Honeywell, Phoenix, AZ

**David Giguët**

Date: December 2001

Thesis Title: Error-Resilient and Very Low Bit Rate Image Coding

Affiliation: Purple Labs, Chambéry, France

**Sumohana Channappayya**

Date: December 2000

Thesis Title: Error-Resilient Image Coding and Transmission

Affiliation: worked with Packet Video, San Diego, CA, received Ph.D. at UT Austin (under the supervision of Prof. Al Bovik); Qualcomm, San Diego, CA; Associate Professor at IIT Hyderabad.

**Mohamad Owais Osmani**

Date: December 1999

Thesis Title: Object-based Processing

Affiliation: Intel, Chandler, AZ

**Tuyet-Trang (Snow) Lam**

Date: August 1999

Thesis Title: Image Compression for Noisy Environments

Affiliation: received Ph.D. at ASU (under my supervision), now with Intel, Chandler, AZ

## **INSTRUCTION**

### **New Courses Developed**

#### **1. EEE 598 Deep Learning for Media Processing and Understanding (developed in Spring 2018 and offered yearly)**

This is a four-credit graduate-level course that covers the fundamentals of deep learning with applications to media classification, processing, restoration, compression, and generation. Examples of media include image, video, text, speech, and audio. This course also includes hands-on assignments and projects in Python.

Some of the topics covered include:

- Basic Concepts in Machine Learning
- Probability Basics
- Motivation for Deep Learning
- Deep Feedforward Networks
- Regularization for Deep Learning
- Optimization for Training Deep Models
- Recurrent and Recursive Nets
- Autoencoders, Generative Models, Generative Adversarial Networks
- Applications: Computer Vision, Image Generation, Image Compression, Video Processing, Natural Language Processing

#### **2. EEE 508 Digital Image and Video Processing and Compression**

This is a four-credit graduate-level course that covers the fundamentals of digital image perception, representation, processing, and compression and include hands-on assignments and projects in OpenCV/C/C++, Matlab, and Android Studio. Some of the topics covered include:

- Two-Dimensional Digital Signal Processing Basics
- Vision and Perception
- Light and Color Models
- Image Segmentation
- Image Enhancement
- Image Restoration
- Basic Concepts in Information Theory
- Scalar and Vector Quantization

- Rate Distortion Theory
- Image Transforms
- Predictive, Transform, and Subband Coding
- Motion Estimation
- Entropy Coding: Huffman and Arithmetic Coding
- Run-Length Coding
- JPEG and JPEG2000 Image Compression Standards
- Motion Estimation and Compensation
- ISO MPEG and ITU-T VCEG Video Compression Standards

More information can be found at <http://lina.faculty.asu.edu/eee508/>

### **3. EEE 507 Multidimensional Signal Processing**

This is a three-credit graduate-level course that is concerned with understanding signals of more than one variable and with systems for processing them. The specific topics covered are:

- Multi-D Discrete-Time(Space) Signals and Systems
- Multi-D Sampling
- Multi-D Discrete Fourier Transform (DFT)
- Multi-D Finite Impulse Response (FIR) Digital Filters
- Multi-D Z-Transform
- Multi-D Infinite Impulse Response (IIR) Digital Filters
- Processing of Propagating Space-Time Signals
- Multi-D Signal Restoration and Reconstruction
- Medical Imaging

More information can be found at <http://lina.faculty.asu.edu/eee507/>

### **4. EEE 404/EEE 591 Real-Time Digital Signal Processing**

This is a four-credit senior-level course that provides the students with knowledge and hands-on experience in translating DSP concepts into real-time software for embedded systems using fixed-point DSP boards (Freescale DSP56858 and TI TMS320C5510). In addition to two 75-minute lecture sessions per week, on-campus students meet weekly for a three-hour laboratory session under the guidance of a TA. On-line students can access and control the lab equipment, boards, and software remotely, and can develop and run real-time applications from their remote location using the lab equipment, hardware, and software through a user-friendly “virtual bench” interface. I secured funding for the development of this course from the Consortium for Embedded and Inter-Networking Technologies (CEINT), Motorola, Freescale, Texas Instruments, and Tektronix.

The lecture topics covered include:

- Real-Time Systems: Introduction and Basics
- Basic Concepts in Signals and Systems: signals, Analog-to-Digital/Digital-to-Analog conversion, sampling and aliasing, quantization, discrete-time representation, filtering
- Digital Signal Processor Architectures: Harvard architecture, special addressing modes, parallel instructions, pipelining, real-time programming, modern digital signal processor architectures, hardware interfacing
- Computer Arithmetic: fixed-point and floating-point numbers, integer arithmetic

- Finite-wordlength effects: quantization, overflow, saturation, scaling, rounding and truncation
- Fixed-point Digital Signal Processors
- Fast Fourier Transforms and Applications: DTFT, DFT, FFT, implementation complexity, linear convolution, circular convolution, fast convolution, Short-Time Fourier Transform and Spectrogram
- Real-Time Multimedia and Communication Applications: speech processing, and/or audio processing, and/or image processing, and/or adaptive filtering, and/or modulation/demodulation, and/or matched filtering, and/or equalization.

The labs include:

- Lab 1: Overview of Hardware and Software Tools.
- Lab 2: Introduction to CodeWarrior.
- Lab 3: Introduction to the DSP56800E Assembly.
- Lab 4: Introduction to On-Chip Peripherals.
- Lab 5: Introduction to Processor Expert.
- Lab 6: Applications Using the DSP56858EVM CODEC.
- Lab 7: Real-Time Image Processing.
- Lab 8: Introduction to Code Composer Studio and TMS320C55x Assembly.
- Lab 9: Musical Notes Synthesis
- Lab 10: Introduction to On-Chip Peripherals and Music Equalizer
- Lab 11: Fast Fourier Transform
- Lab 12: Applications of Fast Fourier Transform (Spectrum Analysis and Speech Processing)
- Lab 13: Modem (optional)

More information can be found at <http://lina.faculty.asu.edu/realdsp>

## 5. EEE/CSE/FSE 101 Introduction to Engineering Design

This is a Freshman level course which was developed to include two 50-minute lectures per week and a 2-hour hands-on lab session per week under the supervision of a TA. In addition, the students work in teams on two 4-week projects (one of which is a Robotics project) that build on the lab experiments. I secured funding for the development of this course from National Instruments (cash and equipment in the amount of \$120,000). The lecture component of this course was adapted from the previously taught ECE100 (Intro to Engineering Design) course. The lab component was fully developed from scratch as it was non-existent in the previous ECE100 course. The laboratory component of this course was designed to include hands-on lab experiments that expose entering freshman students to a wide range of areas in electrical and computer engineering including circuits, electronics, communications, analog and digital signal processing, digital image processing, computing hardware and software, embedded systems, robotics and control.

The developed labs include:

- Lab 1: Introduction to Circuits: NI ELVIS, Breadboard, Circuit elements
- Lab 2: Analog Audio Level Meter (using comparators)
- Lab 3: Noise Removal Using Analog Filters
- Lab 3: Analog Music Equalizer (using op-amps)
- Lab 4: Analog Music Composer (using 555 timers)

- Lab 5: Introduction to LabVIEW and SPEEDY-33
- Lab 6: Digital Audio Level Meter
- Lab 7: Noise Removal using Digital Filters
- Lab 8: Digital Music Equalizer
- Lab 9: Digital Music Composer
- Lab 10: Digital Sound Effects
- Lab 11: Introduction to Robotics
- Lab 12: Digital Image Processing Basics
- Lab 13: Webcam Applications
- Lab 14: Telephone
- Lab 15: Amplitude Modulation
- Lab 16: Modem