LINA J. KARAM

Fellow of the IEEE
President and Expert Consultant, PICARIS LLC
Emerita Professor, School of ECEE, Arizona State University, USA
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R&D Topics and Publications Highlights

Computer Vision; Machine Learning; Deep Learning; Signal, Image, and Video Processing, Compression, and Transmission; Autonomous Vehicles; Perceptual-based Processing; Visual Attention Models; Automated Quality Assessment; Multidimensional Signal Processing; Biomedical Signal Processing; Digital Filter Design. **Supervised to completion as main advisor 47 graduate students (24 PhD and 23 MS Thesis students)**

Industry Collaborations and Technology Transfer

R&D collaborations on computer vision, machine learning, Quality Assessment/QoE, medical imaging, image/video processing, compression, and transmission projects with various industries including Intel, Qualcomm, Google, NTT, Motorola, Freescale, General Dynamics, NASA, BNI, and TGEN; elected to IEEE Fellow for contributions in perceptual-based visual processing, image and video communications (including video compression and transmission) and digital filtering; image and video processing and compression development at AT&T Bell Labs (Murray Hill); work on digital filtering widely adopted for the development of improved applications and products in various sectors including but not limited to telecommunications, transmission, health, signal processing, and geophysical applications, and part of which has been integrated in the widely used MATLAB Signal Processing Toolbox (as the cfirpm function); multi-dimensional data processing and visualization at Schlumberger; very low bit-rate scalable video codecs development and productization in collaboration with General Dynamics; image and video processing, computer vision, machine learning, and autonomous driving technologies development with Intel; technical advisor as part of AVTC ECOCAR Mobility Challenge; co-founder of biotech startup with product licensed to healthcare industries; inventor on patented visual compression, computer vision, and machine learning technologies.

Highlights

Inventor on 8 issued US patents and on one published US Patent Application.
Expert delegate of the ISO/IEC JTC1/SC29 Committee (Coding of audio, picture, multimedia and hypermedia information) and participating in JPEG/MPEG standardization activities including machine learning based visual compression.
Expert consulting in IP/Patents, Image/Video Coding, Image/Video Processing, Computer Vision, Machine Learning. *Check out open access AI/Machine Learning Hands-On Book at:* https://deeplearningtextbook.org/
Emerita Professor, School of ECEE, Arizona State University (2020-Present)
Director, Image, Video & Usability (IVU) R&D Laboratory at ASU (1995-Present)
Editor-In-Chief, IEEE Journal on Selected Topics in Signal Processing (2019-2021)
National Academy of Inventors, ASU Chapter (2019-Present)
Featured in Stanford Study among the top 2% of World Scientists in AI and Image Processing

Featured in 8th and 9th editions of Research.com (2022 and 2023) among World Top Computer Science Scientists
Dean, School of Engineering, Lebanese American University (2020-2022)
Director, Real-time Embedded Signal Processing (RESP) Laboratory (2000-2019)
Computer Engineering Program Chair, ASU Fulton Schools of Engineering (2016-2017)
Director of Industry Engagement, ASU Fulton Schools of Engineering (2018-2019)
President, PICARIS, LLC, a consulting company (2007-present)

Established the World's First Visual Innovation Award in 2016:
https://fullcircle.asu.edu/faculty/visual-tech-visionaries-honored-innovation-awards/
https://www.youtube.com/watch?v=pEZ2mT5sASw

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 transdisciplinary Intel-ASU Autonomous Vehicle initiative (2017-2018) and lead PI on grant (funded in 2018):
https://transportation.asu.edu/projects/intel-asu-autonomous-vehicle-initiative/

ADAS lead advisor as part of the DoE/GM-sponsored Advanced Vehicular Technologies (AVTC) EcoCAR3 competition (2017-2018):
https://avtcseries.org/about-avtc/past-competitions/ecocar-3/

Interview with KJZZ 91.5 radio (NPR radio station in AZ) - Preliminary Report: Self-Driving Uber Car Didn't Alert Driver Of Collision Possibility (May 24, 2018):
https://kjzz.org/content/642626/preliminary-report-self-driving-uber-car-didnt-alert-driver-collision-possibility

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

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-bed7c04lY&feature=youtu.be&t=3

Interview with Associated Press - Verification stamps weren't pre-printed on Arizona ballot envelopes (September 29, 2021):
https://apnews.com/article/fact-checking-205460259311

Established in 2020-2022 the award-winning VIP+ program, adapting the Georgia Tech's Vertically Integrated Projects (VIP) model by intergrating an explicit entrepreneurial component into VIP, and served as VIP+ program director and lead LAU PI on grant funded by the US Department of State (US MEPI TLP grant); the established VIP+ program was granted three awards in 2022 by the International VIP Consortium consisting of 44 institutions in 13 countries (out of which 25 institutions are in the US):
https://news.lau.edu.lb/2022/laus-vertically-integrated-project-wins-major-international-consortium-awards.php
https://www.vip-consortium.org/node/1422
https://news.lau.edu.lb/2021/new-mepi-grant-to-boost-employability.php
https://mepitl.lau.edu.lb/news/the_lau_school_of_engineering_or.php
Video with students' testimonials: https://youtu.be/W0y1WNnd9ko

Established in 2021 a partnership between the United Nations Development Program (UNDP)'s Energy Innovation Hub and LAU School of Engineering and secured UNDP grant funding:
https://eihub-lb.com/

Led an initiative with a consortium of industry partners to help advance the Renewable Energy/Solar Industry Sector in Lebanon and served as lead PI on USD multi-million proposal to USAID Trade and Investment Fund (USAID-TIF) to establish a photovoltaic (PV) pilot scale module manufacturing facility, a certified PV testing facility and a training facility to assist the local solar energy companies to build customizable high-quality PV panels. The submitted proposal was highly scored and has been selected to move to the co-creation stage with industry partners.
https://www.linkedin.com/feed/update/urn:li:activity:6894991934830501889/
https://news.lau.edu.lb/2022/toward-solar-panels-made-in-lebanon.php
https://news.lau.edu.lb/2022/harnessing-solar-energy-in-lebanon-with-the-support-of-usaid.php

Established in 2021 the First ENPMED (Engineering PreMed) program incorporating a Premed track in all engineering majors at the Lebanese American Univesity (LAU):
https://news.lau.edu.lb/2021/medicine-by-way-of-engineering-new-premed-track-at-lau.php

Established in 2021 iLEAP (industry-focused Lebanese Education & Academia Partnership) between LAU and LebNET (https://lebnet.us/), a non-profit US organization focused on education and mentoring, and comprising a network of technology experts, Fortune 500 managers and executives, venture capitalists and investors, startup founders and entrepreneurs, academics, consultants and small business owner in North America:
https://lebnet.us/LAU-iLEAP
https://news.lau.edu.lb/2021/lebnet-lau-initiative-adds-leverage-for-engineering-students.php

Developed and submitted to LAU's Board of Trustees in 2021 a proposal and business plan to establish the *LAU Industrial Hub*. The proposal was approved by LAU's Board of Trustees.

Interview with Al Nahar Newspaper – Engineering Premed (ENPMED), Medicine and Medical Technologies through Engineering (December 14, 2021):
https://www.annahar.com/arabic/section/77-%D9%85%D8%AC%D8%AA%D9%85%D8%B9/13122021062414414

SHORT BIO

Lina Karam is currently President and Expert Consultant at PICARIS LLC and an Emerita Professor at Arizona State University. Prior to becoming Emerita Professor, she was a tenured Full Professor, Computer Engineering Program Chair, Computer Engineering Director for Industry Engagement at Arizona State University. From 2020 to 2022, Dr. Karam served as Dean of the School of Engineering at the Lebanese American 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 coding and transmission, and digital filtering areas. Dr. Karam has been featured in Research.com among World Top Computer Science Scientists and in Stanford Study among the top 2% of World Scientists in AI and Image Processing. 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. She served as Editor-in-Chief of the high-impact IEEE Journal on Selected Topics in Signal Processing (IEEE JSTSP) from 2019 to 2021. 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 Signal Processing Society (SPS) Board of Governors, IEEE SPS Conference Board, IEEE SPS Publications Board, IEEE SPS Awards Board, IEEE Circuits and Systems (CAS) Fellow Evaluation Committee, IEEE PSPB Strategic Planning Committee, IEEE TechRxiv Advisory Board (as Chair), IEEE SPS IVMSP and MMSP Technical Committees, IEEE CAS DSP Technical Committee, and various journal editorial boards. She served as the General Chair of IEEE ICIP 2016, General Co-Chair of IEEE ICME 2019, Technical Program Chair of IEEE ICIP 2009, General Chair of IEEE DSP/SPE 2011 Workshops. She cofounded the International Conference on Quality of Multimedia Experience (QoMEX). In addition to serving as the EiC of IEEE JSTSP, Dr. Karam served 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 Editorial Board, Foundation and Trends in Signal Processing Journal Editorial Board, IEEE EAB Faculty Resources Committee and IEEE TAB/PSPB Products and Services Committee. She is an inventor with 8 issued US patents in the fields of image/video processing, coding, and transmission, computer vision, and AI/Machine Learning. She is an expert delegate of the ISO/IEC JTC1/SC29 Committee (Coding of audio, picture, multimedia and hypermedia information) and participating in JPEG/MPEG standardization activities.

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/POSITIONS

President and Expert Consultant, PICARIS LLC, a technology consulting company (2007-present)

Emerita Professor, School of Electrical, Computer & Energy Engineering, Arizona State University, USA (2020-present)

Professor and Dean, School of Engineering, Lebanese American University (2020-2022)

Computer Engineering Graduate Program Chair and Director of Industry Engagement (2016-2018), Arizona State University, Tempe, AZ

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 Usabilty (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.

INVITED PRESENTATIONS, SHORT COURSES, AND SELECT PANELS

1. *Invited Lecturer*, "Deep Learning for Quality Robust Visual Recognition," DeepLearn 2022, Guimaraes, Portugal, https://irdta.eu/deeplearn2022sp/
2. *Featured guest,* "Artificial Intelligence in Lebanon: Reality and Need," 1st Webinar and Panel Discussion on Artificial Intelligence being organized by the Order of Engineers and Architects in Lebanon (in-person and live streamed over social media), 11 February 2022. https://soe.lau.edu.lb/school/news/2022/webinar-and-panel-discussion-on-.php https://www.facebook.com/oeabeirut/videos/470212477889219/
3. *Panelist,* "Diversity Faculty Sharing Experiences," IEEE PROGRESS Workshop, USA, June 2021, October 2021, and June 2020.
4. *Keynote Speaker,* "Resilient Machine Learning for Automated Mobility," Communications of the ACM (ACM) Arabia Workshop, August 2020.
5. *Plenary/Keynote Speaker,* "Towards Resilient Deep Learning," IEEE International Conference on Image Processing, October 2020.
6. *Session Moderator,* Embedded Vision Summit, Silicon Valley, USA, May 2020.
7. *Judge/Panelist,* Vision Tank 2019 Start-Up Competition, Embedded Vision Summit, Santa Clara, CA, USA, May 2019.

8. *Invited Talk,* "Resilient Deep Learning through Feature Regeneration," Intel Corporation, Phoenix, AZ, April 2019. *Talk hosted by IEEE WIE Phoenix.*
9. *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.
10. *Invited Talk,* "Understanding Automated Driving Systems Technologies," Connected and Autonomous Vehicles 101 (CAV 101) Seminar and Roadshow; Education for Arizona Small Towns ans Satellite Cities; Tempe, AZ, USA, March 2019.
11. *Invited Talk and Panelist,* "Towards Safe, Efficient Automated Driving at Scale," American Bar Association (ABA) Smart Cities Conference, Tempe, AZ, USA, February 2019.
12. *Invited Talk,* "Generative Sensing: Reliable Recognition from Unreliable Sensor Data," Embedded Vision Summit, Santa Clara, CA, May 2018. ***Talk highly ranked by attendees.***
13. *Plenary Talk*, "Generative Sensing," International Conference on Computing, Networking, and Communications (ICNC), Maui, Hawaii, March 2018.
14. *Plenary Talk*, "Generative Sensing: Transforming Unreliable Sensor Data for Reliable Recognition," Twenty-Fourth National Conference on Communications (NCC) 2018, IIT Hyderabad, India, February 2018.
15. *Distinguished Speaker*, "A Closer Look at Visual Attention Models," College of Engineering, Penn State University, April 2017.
16. *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.
17. *Plenary Distingushed Lecture*, "Attentive Visual Processing – Towards User-Centric Visual Technologies," International Conference on Computing, Networking and Communications (ICNC), February 2014.
18. *Intel Webinar*, "Automated Defect Detection and Identification for Semiconductor Units Undergoing Assembly and Test," Intel Corporation, November 2011.
19. *Plenary Talk*, "Efficient Perceptual-Based Image and Video Processing," Tenth FEA Student Conference, American University of Beirut, Beirut, Lebanon, May 2011.
20. *Expert Panel Talk*, "Trends in 3D Video Processing," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), May 2011.
21. *Invited Talk*, "Foundations and Trends of Visual Quality Assessment," American University of Beirut, Beirut, Lebanon, July 2010.
22. *Plenary Talk,* "Foundations and Trends of Visual Quality Assessment," 2nd International Workshop on Visual Information Processing (EUVIP), Paris, France, July 2010.
23. *Invited Talk*, "Adaptive Rate-Distortion Based Wyner-Ziv Video Coding," Multimedia, Mathematics and Machine Learning II, BIRS, Banff Centre, Banff, Canada, July 2009.
24. *Invited Talk*, "Wyner-Ziv Based Low-Complexity Distributed Video Encoding," New Mexico State University, Las Cruces, NM, Nov. 2008.
25. *Invited Lecture*, "Real-World Applications for Freshman Engineering Education," NI Week*,* Austin, TX, Aug. 2008.
26. *Invited Lecture,* "From Conventional to Distributed Video Coding," IEEE Lebanon Section and American University in Beirut, Beirut, Lebanon, July 2008.

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

AWARDS AND RECOGNITION

- IEEE Fellow
- Editor-In-Chief, IEEE Journal on Selected Topics in Signal Processing (Jan 2019-Dec 2021)
- Invited Lecturer at DeepLearn 2022
- Invited Plenary/Keynote Speaker at the 2020 IEEE International Conference on Image Processing (IEEE ICIP)
- 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
- Founding Member, US Representative, QUALINET, European Network on Quality of Experience in Multimedia Systems and Services (Founded in 2009), http://www.qualinet.eu/
- NASA Technical Innovation Award for work on visual coding, 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 for work on perceptual-based image/video coding
- 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-Dec 2021).
- Lead Guest Editor, IEEE Signal Processing Magazine, Special Issues on Autonomous Driving (2019-2021)
- Senior Editorial Board, IEEE IoT Magazine (2021-present)
- Editorial Board, IEEE Access (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 (2014-2019).
- 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

- Publicity Co-Chair, International Conference on Quality of Multimedia Experience (QoMEX), 2022.
- Awards Co-Chair, IEEE International Conference on Multimedia Information Processing and Retrieval (IEEE MIPR), 2022.
- Awards Co-Chair, IEEE International Conference on Image Processing, 2021.

- General Co-Chair of the IEEE International Conference of Multimedia and Expo (ICME), Shanghai, China, July 2019.
- General Chair of the 23rd 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 Thrasos 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/Conference 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 Technical Activities Board (TAB)/Publication Services and Products Board (PSPB) Products and Services Committee (2023-present)
- IEEE Educational Activities Board (EAB) Faculty Resources Committee (2023-present)
- IEEE Access Journal Senior Editorial Board (2019-present)
- IEEE TechRxiv Editorial Advisory Board (2022-present)
- IEEE TechRxiv Advisory Board (2019-2021) and Ad-Hoc Committee Chair (2021)
- IEEE Signal Processing Society's Conference Board (2003-2005 & 2017-2018 & 2021)
- IEEE Signal Processing Society's Publications Board (2019-2021)

- IEEE Signal Processing Society's Awards Board (2019-2020)
- IEEE Journal of Selected Topics in Signal Processing Senior Editor Board (2019-2021)
- 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 & 2014-2020)
- 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 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

- Dean of Engineering, LAU (2020-2022)
- Computer Engineering Director, Industry Engagement, ASU (2018-2019)
- 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, ASU (2017-2019)
- ADAS lead faculty advisor as part of the DoE/GM-sponsored Advanced Vehicular Technologies (AVTC) ECOCAR (EcoCAR3) Mobility Challenge, ASU (2017-2018)

- Established an ASU-Silicon Valley partnership and fellowship with TCL Research America as founding member (2018)
- Computer Engineering Program Chair, ASU (2016-2017)
- Helped in establishing two new transdisciplinary degree-granting graduate programs and served on their Graduate Program Committees (GPC) at ASU:
    - Computer Engineering (CEN): transdisciplinary program between 2 schools
    - Robotics and Autonomous Systems (RAS): transdisciplinary program between 4 schools
- University Promotion & Tenure Committee, ASU
- Engineering Dean's Faculty Advisory Council (DFAC), ASU

PATENTS

Note: Students co-inventors 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 Application Publication No. 2008/0259796 A1. **Published October 2008**.
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," United States Patent US11,0304,85. **Issued June 2021**.

BOOKS

Note: Student authors are shown in boldface.

1. **Samuel Dodge** and Lina Karam, *Introduction to Machine Learning and Deep Learning: A Hands-On Starter's Guide*, 2017 1st version; revised 2020. Available online at: https://deeplearningtextbook.org/
2. Lina J. Karam and **Naji Mounsef**, *Introduction to Engineering: A Starter's Guide With Hands-On Digital Multimedia Explorations and Robotics,* Morgan-Claypool, 2008.
3. Lina J. Karam and **Naji Mounsef**, *Introduction to Engineering: A Starter's Guide With Hands-On Analog Multimedia Explorations,* Morgan-Claypool, 2008.
4. Lina J. Karam, *Design of Complex Digital FIR Filters in the Chebyshev Sense*, Ph.D. Thesis, Georgia Institute of Technology, March 1995.

BOOK CHAPTERS

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161. **Tuyet-Trang Lam**, Glen P. Abousleman, and Lina J. Karam, "Wavelet-Based Image Coder with Channel-Optimized Trellis-Coded Quantization," *IEEE International Conference on Acoustics, Speech, and Signal Processing*, vol. 6, pages 3201-3204, 1999.

162. **Francescomaria Marino**, Tinku Acharya, and Lina J. Karam, "A DWT-Based Perceptually Lossless Color Image Compression Architecture," *Thirty-Second Asilomar Conference on Signals, Systems, and Computers*, vol. 1, pages 149-153, Nov. 1998.

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165. **José G. Gonzalez**, Mark J.T. Smith, **Ingo Hontsch**, Lina Karam, Kamesh Namuduri, and Harold Szu, ``Perceptual Image Compression for Data Transmission on the Battlefield," *SPIE Symposium on Aerospace/Defense Sensing, Simulation, and Controls -- AeroSense'98*, vol. 3387, pages 56-67, Apr. 1998.

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167. **Ingo S. Hontsch** and Lina J. Karam, ``Locally Adaptive Perceptual Quantization without Side Information for DCT Coefficients," *Thirty-First Asilomar Conference on Signals, Systems, and Computers*, vol. 2, pages 995-999, Nov. 1997.

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169. **Ingo S. Hontsch** and Lina J. Karam, "Locally Adaptive Perceptual Quantization without Side Information for Compression of Visual Data," *IEEE Globecom*, vol. 2, pages 1042-1046, 1997.

170. **Ingo S. Hontsch** and Lina J. Karam, ``APIC: Adaptive Perceptual Image Coding Based on Subband Decomposition with Locally Adaptive Perceptual Weighting," *1997 IEEE International Conference on Image Processing*, vol. 1, pages 37-40, Oct. 1997.

171. **Ingo S. Hontsch**, Lina J. Karam, and Robert J. Safranek, "A Perceptually Tuned Embedded Zerotree Image Coder Based on Set Partitioning," *1997 IEEE International Conference on Image Processing*, vol. 1, pages 41-44, Oct. 1997.

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174. Lina J. Karam and James H. McClellan, ``Efficient Design of Families of FIR Filters by Transformation," *IEEE International Conference on Acoustics, Speech, and Signal Processing*, vol. 3, pages 359-1362, May 1996.

175. Lina J. Karam and James H. McClellan, ``Design of Optimal Digital FIR Filters with Arbitrary Magnitude and Phase Responses," *IEEE International Symposium on Circuits and Systems*, vol. 2, pages 385-388, May 1996.

176. Anush Yardim, Lina J. Karam, James H. McClellan, and Gerry D. Cain, ``Performance of Complex Chebyshev Approximation in Delay-Root-Nyquist Filter Design," *IEEE International Symposium on Circuits and Systems*, vol. 2, pages 169-172, May 1996.

177. Lina J. Karam and Christine Podilchuk, ``Chroma Coding for Video at Very Low Bit Rates," *IEEE International Conference on Image Processing*, vol. 1, pages 562-565, October 1995.

178. Lina J. Karam and James H. McClellan, ``A Multiple Exchange Remez Algorithm for Complex FIR Filter Design in the Chebyshev Sense," *IEEE International Symposium on Circuits and Systems*, vol. 2, pages 517-520, May--June 1994.

179. Lina J. Karam and James H. McClellan, ``A Combined Ascent-descent Algorithm for Complex Chebyshev FIR Filter Design," *28th Annual Princeton Conference on Information Science and Systems*, March 1994.

180. Lina J. Karam, ``An Analysis/Synthesis Model for the Human Visual System Based on Subspace Decomposition and Multirate Filter Bank Theory," *IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, pages 559-562, October 1992.

OPEN ACCESS ARXIV PAPERS

Note: Student authors are shown in boldface.

1. **Yingpeng Deng** and Lina J. Karam, "Learning-based Compression for Material and Texture Recognition," arXiv:2104.10065, April 2021. Available Online at: https://arxiv.org/abs/2104.10065

2. **Yingpeng Deng** and Lina J. Karam, "Towards Imperceptible Universal Attacks on Texture Recognition," arXiv:2011.11957, Nov. 2020. Available Online at: https://arxiv.org/abs/2011.11957

3. **Yingpeng Deng** and Lina J. Karam, "A Study for Universal Adversarial Attacks on Texture Recognition," arXiv:2010.01506, Oct. 2020. Available Online at: https://arxiv.org/abs/2010.01506

4. **Tejas Borkar**, Felix Heide, and Lina Karam, "Defending Against Universal Attacks Through Selective Feature Regeneration," arXiv:1906.03444, June 2019. Available Online at: https://arxiv.org/abs/1906.03444

5. **Yingpeng Deng** and Lina J. Karam, "Frequency-Tuned Universal Adversarial Attacks" arXiv:2003.05549, March 2020. Available Online at: https://arxiv.org/abs/2003.05549

6. **Charan D. Prakash** and Lina J. Karam, "It GAN DO Better: GAN-based Detection of Objects on Images with Varying Quality," arXiv:1912.01707, Dec. 2019. Available Online at: https://arxiv.org/abs/1912.01707

7. **S. Alireza Golestaneh** and Lina Karam, "Synthesized Texture Quality Assessment via Multi-scale Spatial and Statistical Texture Attributes of Image and Gradient Magnitude Coefficients," arXiv:1804.08020, Apr. 2018. Available Online at: https://arxiv.org/abs/1804.08020

8. **Aditee Shrotre** and Lina Karam, "Full Reference Objective Quality Assessment for Reconstructed Background Images," arXiv:1803.04103, March 2018. Available Online at: https://arxiv.org/abs/1803.04103

9. Lina Karam, **Tejas Borkar**, Yu Cao, and Junseok Chae, "Generative Sensing: Transforming Unreliable Sensor Data for Reliable Recognition," arXiv:1801.02684, Jan 2018. Available Online at: https://arxiv.org/abs/1801.02684

10. **Milind S. Gide** and Lina J. Karam, "A Locally Weighted Fixation Density-Based Metric for Assessing the Quality of Visual Saliency Predictions," arXiv:1708.00169, Aug. 2017. Available Online at: https://arxiv.org/abs/1708.00169

11. **S. Alireza Golestaneh** and Lina J. Karam, "Spatially-Varying Blur Detection Based on Multiscale Fused and Sorted Transform Coefficients of Gradient Magnitudes," arXiv:1703.07478, March 2017. Available Online at: https://arxiv.org/abs/1703.07478

12. **Samuel Dodge** and Lina J. Karam, "Can the early human visual system compete with Deep Neural Networks?," arXiv:1710.04744, Oct. 2017. Available Online at: https://arxiv.org/abs/1710.04744

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15. **Samuel Dodge** and Lina J. Karam, "Quality Resilient Deep Neural Networks," arXiv:1703.08119, Mar. 2017. Available Online at: https://arxiv.org/abs/1703.08119

16. **Samuel Dodge** and Lina J. Karam, "Visual Saliency Prediction Using a Mixture of Deep Neural Networks," arXiv:1702.00372, Feb. 2017. Available Online at: https://arxiv.org/abs/1702.00372

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18. **Samuel Dodge** and Lina Karam, "Understanding How Image Quality Affects Deep Neural Networks," arXiv:1604.04004, April 2016. Available Online at: https://arxiv.org/abs/1604.04004

19. **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

20. **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

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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 assignemnts 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

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

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 Spectogram
- 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)

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