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Education	**Ph.D. in Electrical Engineering** (1982) Purdue University, West Lafayette, IN 47907. *Research Topic: Theory and Analysis of Median Filters.*
	Master of Science in Electrical Engineering (1980) Purdue University, West Lafayette, IN 47907.
	Bachelor of Science in Electrical Engineering (1979) *Summa Cum Laude* University of Arkansas, Fayetteville, AR 72701.

Professional Experience	**University of Delaware, Newark, DE 19716** **Charles Black Evans Professor** **JPMorgan Chase Senior Faculty Fellow** Department of Electrical and Computer Engineering and Institute of Financial Services Analytics. 2014-Present.
	Fulbright-Nokia Distinguished Chair in Information and Communications Technologies Aalto University, Helsinki, Finland. 2010-2011, and 2017-2018.
	University of Delaware, Newark, DE 19716 **Charles Black Evans Distinguished Professor and Chairman** Department of Electrical and Computer Engineering. 2004-2009.
	University of Delaware, Newark, DE 19716 **Professor and Chairman** Department of Electrical and Computer Engineering. 2000-2004.
	University of Delaware, Newark, DE 19716 **Interim Chairman** Department of Electrical and Computer Engineering. 1999.
	University of Delaware, Newark, DE 19716 **Professor** , 1992-1996 **Associate Professor**, 1987-1992. **Assistant Professor**, 1982-1987. Department of Electrical and Computer Engineering. 1992-1996.
	Unisys Corporate Research center, Reston, VA 19716 **Visiting Member of Technical Staff**. 1985.
	Purdue University, West Lafayette, IN 47907 **Research Assistant** School of Electrical and Computer Engineering. 1980-1982.

Awards and Honors	Fellow of OPTICA (Formerly the Optical Society of America), 2023.
	Fellow of the National Academy of Inventors, 2023.
	JPMorgan Chase Senior Faculty Fellow at the Institute of Financial Services Analytics, 2017-Present.
	Fulbright-Nokia Distinguished Chair in Information Technologies and Communications 2017.
	JPMorgan Chase Scholar at the Institute of Financial Services Analytics, 2014-2016.

Fulbright-Nokia Distinguished Chair in Information Technologies and Communications Helsinki, Finland, 2010-2011.

Elected Member, Arkansas Academy of Engineering, University of Arkansas, 2008.

DuPont Science and Engineering Awards 1998, 2002, 2008.

Fellow of the IEEE for contributions on the theory and applications of nonlinear signal processing, 2000.

Fellow of the International Society for Optics ad Photonics (SPIE) for contributions to computational imaging, 2019.

Fellow, Center for Advanced Studies, University of Delaware, 1998.

ARL ATIRP Federated Laboratory Symposium Best Paper Award 1997.

Best Scientific Paper Award, Whitaker Foundation and Rehabilitation Engineering Society of North America (RESNA), 1995.

ASEE Teaching Fellow, 1992.

Sperry Corporation Research Award, 1985.

National Science Foundation Research Initiation Award, 1983.

Awards to Students Supervised

Allan P. Colburn Prize in Mathematical Sciences and Engineering for the most outstanding dissertation in the engineering and mathematical disciplines, Xu Ma (2010).

Allan P. Colburn Prize in Mathematical Sciences and Engineering for the most outstanding dissertation in the engineering and mathematical disciplines, Yinbo Li (2006).

Allan P. Colburn Prize in Mathematical Sciences and Engineering for the most outstanding dissertation in the engineering and mathematical disciplines, Juan G. Gonzalez (2002).

Allan P. Colburn Prize in Mathematical Sciences and Engineering for the most outstanding dissertation in the engineering and mathematical disciplines, Kenneth Barner (1992).

Post Doctoral Supervision

- Iftekar Mirza (PhD Delaware, jointly with D. Prather): Compressive spectral imaging, 2010 - 2012.
- Jan Bacca (PhD Delaware): Voronoi dithering for multitoning, 2007-2009.
- InKoo Kang (PhD KAIST - Korea): Visual cryptography and authentication, 2007-2009.
- Jose L. Paredes (PhD Delaware): UWB communications with compressive sensing, 2006, 2008 - 2009.
- Daniel L. Lau (PhD University of Delaware): Electronic printing, 2001.
- Sudhakar Kalluri (PhD University of Delaware): Communications theory, 1998.

Ph.D Student Supervision

[1]. Carlos Mundo Levano, "Directed Hypergraph Networks," in progress.
[2]. Kyle Regan, "Computational mass spectroscopy," in progress.
[3]. Nicolas Bello, "Hypergraph Transformer Neural Networks," in progress.
[4]. Fuli Wang, "HyperGraph neural networks," in progress.
[5]. Nestor Porrar, "Multimodal transformers for satellite lidars," in progress.
[6]. Carlos Restrepo, "Generative Projections for Superresolution X-Ray Tomography," in progress.
[7]. Abdullah Alrushud, "Colored Coded Compressive Spectral Imaging," in progress.
[8]. Michael Don, "Antenna Pattern Characterization via Compressive Phase Retrieval ," in progress.
[9]. Andres Ramirez, "Generative Diffusion Models in Compressive LiDAR Imaging for Earth Science," in progress.

[10]. Xiao Ma, "LED-based compressive spectral temporal imaging," 2022. Now with Qualcomm.

[11]. Karelia Pena, "Learning in high-dimensional settings: QR Codes and Hypergraphs," 2023. Now with Intuit.

[12]. Maria Daniela Dapena, "Blue noise sampling of graph signals in large graphs", 2022. Now with Lighting AI.

[13]. Edgar Salazar, "Coded imaging from the Visible to the X-rays", 2022. Now with the University of Pennsylvania.

[14]. Juan Florez, "Graph Signal Processing and its applications to spectral imaging"', (Co-advised with K. Barner), 2022.

[15]. Angela Cuadros, "Compressive Spectral CT imaging," 2021. Now with Mathworks.

[16]. Alejandro Parada, "Blue Noise Sampling on Graphs," 2020. Now with the University of Pennsylvania.

[17]. Laura Galvis, "Coded Aperture Design in Compressive Spectral Imaging," 2018. Now with Universidad Industrial de Santander, Colombia.

[18]. Chen Fu, "Polarimetric spectral imaging," 2019. Now with Sony Research Laboratory.

[19]. Juan Becerra, "Iterative sparse recovery from high-dimensional measurements," 2017. Now with Universidad de Sevilla, Spain.

[20]. Claudia Correa, "Optical coding in compressive spectral imaging systems and the multi-resolution reconstruction problem," 2017. Now with Boston University.

[21]. Hoover Rueda, "Compressive coded-aperture multimodal imaging systems," 2017. Now with Boston University.

[22]. Andre Rauh, "Fast Algorithms for Selection and Multidimensional Sparse Fourier Transform," 2015.

[23]. Gonzalo Garateguy, "Optimal embedding of QR codes into color, gray scale and binary images," 2014. Now with Mathworks.

[24]. Henry Arguello, "Coded aperture optimization in compressive spectral imaging," 2013. Now with Universidad Industrial de Santander, Colombia.

[25]. Ana Ramirez, "Compressive spectral image classification," 2013. Now with Universidad Industrial de Santander, Colombia.

[26]. Jirar Helou (F. Kiamilev co-advisor), "CMOS architectures for threshold data converters," 2011. Now with Intel.

[27]. Ivan Barrera, "Statistical Approaches to Congestion Control in Internet Routers," 2010. Now with Intel.

[28]. Zhongmin Wang, "Ultra Wide Band Compressed Sensing," 2010. Now with Qualcomm.

[29]. Xu Ma, "Optimization of resolution enhancement techniques in optical lithography," Winner of the Allan P. Colburn Best Dissertation Award as the most outstanding doctoral dissertation in engineering, mathematics, and computer sciences, 2009. Currently on the faculty at the Beijing Institute of Technology.

[30]. Michael Wilson, "Projectile Navigation and the application to magnetometers," 2007. Now with the Army Research Laboratories.

[31]. Jan Bacca, "Blue Noise Methods for Hexagonal Grids and Multitone Dithering," 2007. Now with the University Nacional de Colombia in Bogota.

[32]. Renwei Ge, "Information Security in Mobile Ad Hoc Networks," 2006. Now with Qualcomm.

[33]. Yinbo Li, "Nonlinear signal processing in the complex domain and high dimensions," Winner of the Allan P. Colburn Best Dissertation Award as the most outstanding doctoral dissertation in engineering, mathematics, and computer sciences, 2005. Now with Qualcomm.

[34]. Liangping Ma (K. Barner co-advisor), "Signal processing analysis and algorithms for internet congestion control," 2005. Now with San Diego Research Center.

[35]. Karen Bloch, "Signal analysis methods for biological data," 2004. Now with DuPont.

[36]. Sebastian Hoyos (B. Sadler co-advisor), "Mixed signal high speed processing solutions for broadband systems and technologies," 2004. Now with the faculty at Texas A & M University.

[37]. Zhi Zhou, "Advances on digital video and visual cryptography," 2004. Now with Google Research.

[38]. Cesar Nino, "New imaging technologies in halftoning: data hiding, color modeling and color matching," 2002. Now with Pontificia Universidad Javeriana, Bogota, Colombia.

[39]. Jose Luis Paredes, "New robust signal processing tools for multimedia and communications," 2001. Now with the faculty at the University of Los Andes, Venezuela.

[40]. Alexander Flaig, "Nearfield spot-beamforming," Aug. 2000. Now with Texas Instruments.

[41]. Liehua Xie, "Authentication codes and watermarking for multimedia communications in lossy networks," May 2000. Now with Eye Cast.

[42]. Daniel L. Lau (N. C. Gallagher co-supervisor), "Modern digital halftoning," May 1999. Now with the faculty at the University of Kentucky.

[43]. Sudhakar Kalluri, "Nonlinear adaptive algorithms for robust signal processing and communication in impulsive environments," Dec. 1998. Now with Intel.

[44]. Juan G. Gonzalez, "Robust technologies for wireless communications in non-gaussian environments," Winner of the Allan P. Colburn Best Dissertation Award as the most outstanding doctoral dissertation in engineering, mathematics, and computer sciences, May 1997.

[45]. David E. Griffith, "Robust time-frequency representations for signals in alpha-stable noise: methods and applications," December 1997. Now with NIST.

[46]. Edwin A. Heredia, "A piecewise polynomial theory for nonlinear signal processing," May 1996. Now with Microsoft Research.

[47]. Yeong T. Kim, "Permutation and combination filter lattices and their applications in nonlinear signal processing," Aug. 1993. Now VP of Samsung America.

[48]. Timothy Hall, "Permutation and combination weighted order stastic filters for image processing," May 1994. Now with NIST.

[49]. Martin Mueller, "Tomographic algorithms and synthetic detector arrays," May 1993. Now with Siemens Corp.

[50]. Kenneth E. Barner, "Permutation filters: a new group theoretic class of non-linear filters," Winner of the Allan P. Colburn Best Dissertation Award as the most outstanding doctoral dissertation in engineering, mathematics, and computer sciences, May 1993. Now with the faculty at the University of Delaware.

[51]. Shoupu Chen, "Micro-structured adoptive filter theory for robust signal processing," May 1992. Now with Kodak Research.

[52]. David C. Brown (C. Ih co-supervisor), "Scene segmentation and definition for autonomous robotic navigation using structured light processing," May 1989. Now with the Army Research Laboratories.

Master of Science Student Supervision

[1]. Nestor Parra, "Compressive Lidar for Earth Sensing," in progress.

[2]. Carlos Restrepo, "Instant coded X- ray computed tomography via nonlinear reconstruction," 2023.

[3]. Alvaro Aguirre, "Multispectral array demosaicing," 2023.

[4]. Kyle Regan, "MALSI tof Mass Spectroscopy denoising," in progress.

[5]. Ken Liu, "StaticCode CT: coded aperture strategies," 2022.

[6]. Xiao Ma, "LED-based compressive spectral temporal imaging," 2017.

[7]. Yuksel Karahan, "Improved depth map upsampling Using Iterative Joint Trilateral Filter," 2017.

[8]. Angela Cuadros, "Coded aperture design by uniform sensing in compressive X-ray tomosynthesis systems," 2016.

[9]. Hoover Rueda, "Higher order discretization model for coded aperture spectral imaging systems," 2015.

[10]. Kai Wang, "Coded aperture compressive tomosynthesis," 2014.

[11]. Sergio Matiz, "Analog joint source channel coding for wireless optical communications and image transmission," 2013.

[12]. Claudia Correa, "Lapped-windowed reconstructions in compressive spectral imaging," 2013.

[13]. Diego Pienovi, "Threshold data converters," 2009.

[14]. Xu Ma, "Generalized Inverse Lithography Methods for Phase-shifting Mask Design," 2008.

[15]. Rafael Nunez, "Fast Sample Myriad Computation," 2008.

[16]. Andres Medina, "Statistical Approach to Neighborhood Congestion Control," AdHoc Nework Congestion control, 2007.

[17]. Liangping, Ma, "New packet delay network protocols based on robust signal processing," 2007.

[18]. Alvaro Gonzalez, "Alpha Stable Human Visual System Models for Digital Halftoning," 2007.

[19]. J. Bacca, "Spectral design of weighted median filters: a general iterative approach," 2003.

[20]. F. Faheem, "Digital multitoning using gray level separation," Dec. 2002.

[21]. A. M. Khan, "Stochastic Moire," Jan. 2002.

[22]. N. Grabowski, "Sigma Delta Modulation Using Weighted Median Filters," Jan. 2002.

[23]. S. Hoyos, "Mixed-signal architectures for printed circuit board channels," Aug. 2001.

[24]. C. Nino, "Data embedding in digital halftones with screen mask codes," May. 2000.

[25]. S. Hasan, "Elimination of interference terms of discrete wigner distribution using nonlinear filtering," 1999.

[26]. Y. Berananda, "Adaptive myriad filters for image processing in alpha-stable impulsive noise," 1999.

[27]. J. Paredes, "Stack filters, stack smoothers, and mirrored threshold decomposition," 1998.

[28]. L. Xie, "Watermarking digital image signatures for authentication," 1998. Now with Eye Cast.

[29]. A. Flaig (K. Barner co-supervisor), "Affine-order-statistic filters: medianization of linear FIR filters," 1998.

[30]. F. Strobel, "Wavelet encoded zero tree compressed still image transmission using a partial reliability/partial order transport protocol," (Technical University Uhlm FHTE), May 1997.

[31]. H. Cui (N. C. Gallagher co-supervisor), "The development of a simulator for neuromorphic circuits," Fall 1996.

[32]. Y. Kim (A. Khayrallah co-supervisor), "Nonlinear filters in robust data compression of speech signals," 1996.

[33]. A. Flaig, "Fuzzy order-statistics," (Technical University Aalen FHTE), 1996.

[34]. P. Zurbach, "Weighted myriad filters for image processing," June, 1996.

[35]. L. Li, "Detection of evoked potentials as a method for brain computer interfacing," Fall 1996.

[36]. J. Gonzalez (K. Barner co-supervisor), "A new approach to suppressing abnormal tremor through signal equalization," 1995.

[37]. D. Griffith, "Partially decoupled volterra filters: formulation and adaptive algorithms," 1994.

[38]. M. Tian, "Transform domain adaptive order stastic based filters," Aug 1994.

[39]. W. Reynolds, "Micro-statistics in adaptive antenna arrays," Aug. 1992.

[40]. R. Hardie, "Ranking multivariate data and its use in color image estimation," May 1990.

[41]. K. Barner, "Optimal detection schemes for the restoration of images with signal dependent noise," Dec. 1989.

[42]. T. Hu, "Applications of subband decomposition to data compression," Dec. 1989.

[43]. R. Feehs, "Optimal detection approaches to image restoration: signal independent noise," Dec. 1989.

[44]. R. Foster, "Algorithms architectures and the VLSI implementation of ranked-order filters for multidimensional signal processing," May 1988.

[45]. T. Rao, "Fourier based analysis of ordered dither halftoning," Dec 1988.

[46]. S. Fontana, "Temporal ranked filters for stationary and motion compensated imagery," Dec. 1986.

[47]. M. Mc Loughlin, "Deterministic properties of two-dimensional medial type filters," Dec. 1985.

[48]. R. Crinon, "Theoretical analysis of the median filtering of impulse type noise," May 1984.

[49]. J. Dalton, "Visual model based image halftoning using markov random field error diffusion," Dec. 1984.

Contracts and Grants

Summary: *As principal investigator or co-principal investigator, I have been responsible for close to $30 million in research funding from various DoD organizations, NSF, and Industry.*

- G. R. Arce and D. L. Lau, "t-HGSP: Hypergraph Signal Processing and Networks with t-Products," NSF CCF Grant 2230161, $600,000 , 7/1/2023 – 6/30/2026.

- D. L. Lau and G. R. Arce, "Learning Hypergraphs in Complex Systems," DEPSCoR AFOSR, $600,000 , 8/1/2022 – 7/30/2025.

- G. R. Arce and R. Vargas, "Computational Lidar Sensing for Earth Science," UNIDEL21O-UD AI CTR-ARCE PILOTR, $15,000 , 2/1/2023 – 1/30/2024.

- G. R. Arce, "Sampling and Deep Learning Reconstruction of LiDAR Waveforms," NASA Grant Number 80NSSC22K1099, 40, 000, 6/01/22- 5/31/23.

- G. R. Arce, Amo Tong, "Planetary LiDAR Compressive Point-Cloud Sampling and Machine Learning High- Resolution Reconstruction", NASA EPSCoR RID, $28,000 , 8/1/2021 – 6/30/2022

- Institute for Financial Services Analytics and JPMorgan Chase, "JPMC Senior Faculty Fellow," $450,000, 2021-2025.

- G. R. Arce, "Mass spectroscopy signal processing ", Zeteo Tech, $6,000 , 7/1/2021 – 7/30/2022

- A. Brockmeier, G. R. Arce, "Advancing machine learning for neuroimaging through topology-aware signal processing", UDRF-SI, $45,000, 09/2019-09/2020

- R. Vargas, G. R. Arce, "LINKS-GSP: Large Information and Knowledge of Soil respiration using Graph Signal Processing", NASA EPSCoR RID, $19,909 , 8/1/2019 – 6/30/2020

- Institute for Financial Services Analytics and JPMorgan Chase, "JPMC Faculty Fellow," $300,000, 2018-2021.

- D. Freeman, G. R. Arce, "Spectral CT," National Science Foundation, $50,000, 08/2019-02/2021.

- K. Barner, G. R. Arce, M. Baidey, "Graph signal processing and underwater acoustic modeling techniques," Knobles Scientific/ONR," $359,253, 12/2018-12/2021.

- G. R. Arce, "Smart QR Codes," B&W Tek Foundation, $25,000, 2018.

- G. R. Arce, "Compressive Spectral Tomography," National Science Foundation, $450,000, 09/2018-08/2022.

- G. Poirer, G. R. Arce and K. Barner, "Advanced Dual Energy X-ray Imaging ," UNIDEL Foundation and GoreTek Inc $1,200,000, 9/2018 - 8/2019.

- D. Lau, G. R. Arce, and S. Cioba, "Blue Noise Sampling on Graphs," NSF 16-578 Computing and Communications Foundations (CCF) Core programs, $500,000, July 2018 - June 2021.

- D. Guilliot and G. R. Arce, "Efficient Design of Uniqueness Sets for Bandlimited Signals on Networks," UDRF Strategic Initiative Award, $49,949, February 2018 - July 2019.

- Institute for Financial Services Analytics and JPMorgan Chase, "JPMC Faculty Fellow," $300,000, 2015-2017.

- National Science Foundation and Intel, "Collaborative Research: Joint Compressive Spectral Imaging and 3D Ranging Sensing using a commodity Time-Of-Flight Range Sensor," $900,000 from NSF; $25,000 from Intel, Co-PI Daniel Lau, 09/01/2015-08/31/2018.

- Johns Hopkins University Applied Physics Laboratory, "Compressive Colored Raman Imaging (CCRI) of Optical Standoff Explosive Detection," $100,000, 06/21/2016 -05/10/2017.

- Army Research Laboratories, "A compressive sensing infrared camera for spinning munitions," $329,500, 09/26/2014-09/25/2017.

- Fulbright, Colfuturo, "Colombian PhD fellowships," $900,000, 2013-2019.

- Army Research Office, "A system for compressive spectral and polarimetric imaging," $90,000, 2014-2015.

- Institute for Financial Services Analytics and JPMorgan Chase, "JPMC Faculty Scholar" $279,000, 02/01/2014-01/31/2017.

- Army Research Office, "Compressive Spectral Image Classification," $150,000, 8/12-5/15.

- Unidel Foundation, "Global Partnerships" $ 27,000, 8/11 -9/12.

- Michelin Corporation, with J. Garcia-Frias and X.-G. Xia, "Anomaly pattern analysis and prediction using low-rank and sparse models," $ 360,000, 5/11 - 6/14.

- Army Research Office, "Compressed Sensing Imaging," $50,000, 8/11-5/12.

- Office of Naval Research, with D. Prather and J. Garcia-Frias, "Spectrally adaptive compressed imaging system," $1,450,000, 7/10-7/13.

- ARL through DSCI subcontract, with D. Sincoskie, and other ECE faculty, "Cybersecurity in tactical environments," $ 706,999 , 10/10-8/12.

- National Science Foundation, with J. Garcia-Frias, "Analog compressive sensing," $500,000, 7/09-7/13.

- National Science Foundation, with J. Garcia-Frias, "Compressed sensing using a-priori information," $310,000, 9/07-8/13.

- Army Research Office, "Network Intrusion Detection," $50,000, 8/10-5/11.

- Intel Corporation, "Inverse Lithography with partially coherent illumination," $200,000, 1/08-08/10.

- Army Research Laboratories, "Signals and Controls Laboratory," $60,000, 12/08-12/09.

- State of Delaware, with C.Ih, "Smart universal power inverter for reactive power generation and recuperation," $100,000, 3/07-3/08.

- Telcordia Technology/Army Research Laboratory, with S. Bohacek, "Collaborative Technology Alliance Consortium Phase II," $400,000 5/06-9/09.

- Office of Naval Research, with D.Prather, "Compressed Sensing Imaging with Wide FOV and Dynamic Magnification," $2,213,586, 12/06-6/10.

- Army Research Laboratories, with D. Weile, "Nonlinear signal processing and EM modeling of attitude RF polarimetric sensors, $300,000, 12/06-12/08.

- DuPont, "Authentication with visual cryptography," $10,000, 12/07 - 12/08.
- Unidel Foundation, "Sub-terahertz and Millimeter wave imaging and spectroscopy laboratory," $320,000, 9/05-9/06.
- Army Research Laboratories, "Digital Signal Processing Laboratory," $50,000, 12/05-12/07.
- Unidel Foundation, "Spintronics laboratory in ECE," $300,000, 9/04-9/05.
- National Science Foundation, with D. Mills, "ITR: Optimal Diffusion Mechanisms for Fast and Robust TCP Congestion Control," $349,978, 9/03-8/07.
- Intel Corporation, "Wavelet Inverse Imaging for Sub Wavelength Lithography," $200,000, 1/04-06/06.
- Agere, "HVS Model-based halftoning," $177,000, 2004-2005.
- Unidel Foundation, "Nanofabrication Equipment for ECE Laboratories," $350,000, 9/02-9/03,
- Army Research Laboratory, "Collaborative Technical Alliance in Networks and Communications," with 8 faculty in ECE and CIS, $6,000,000 , 2001 - 2006.
- Unidel Foundation, "Undergraduate laboratories in ECE," $300,000, 9/01-9/02.
- Battelle, with F. Kiamilev, "Power-saving communication protocols for VCSEL arrays," $24,000, 9/01-9/02.
- Raytheon Systems Co., with F. Kiamilev, "Raytheon A.C.N. Project," $44,000, 5/00-9/01.
- DE Research Partnership, "Delaware Research Partnership Program," $54,000.00, 1/01-6/02.
- PMC-Sierra, Inc., "Signal processing for internet technology," $35,000, 3/00-2/02.
- Lexmark International, Inc., "Advances in Color and green noise halftoning for electronic imaging," $30,000, 6/00-5/02.
- Direct Radiology Corporation (with K. Barner), "New methods for improved noise reduction, contrast enhancement, and volume rendering of directray images," $46,000, 2000 - 2001.
- Du Pont iTechnologies, "Digital Halftoning for Prepress Technologies," $80,000, 6/01 - 6/03.
- Lexmark International, "Advances in Color and Green Noise Halftoning for Electronic Imaging," $30,000, 6/00-5/02.
- Battelle, "Power-saving Communication Protocols for VCSEL Arrays," $24,000, 9/01-9/02.
- Direct Radiology Corporation (with K. Barner), "Digital processing of X-ray imagery" $5,000, 1999.
- AANETCOM, "Signal processing for gigabit Ethernet," $90,000, 1999-2000.
- Lexmark International, "Green noise halftoning masks," $27,000, 1999.
- Du Pont, "Digital image watermarking," $25,000, 1998-1999.
- National Science Foundation, "Parallel and distributed computing," with 8 faculty in ECE and CIS, $900,000, 1997 - 2001.
- National Science Foundation (with N. Gallagher), "Weighted myriad filters and their application to communications," $310,000, 1996 - 2000.
- Army Research Laboratories, "Robust Viterbi decoders," $30,000, 1998-1999.
- National Science Foundation, "Research Experiences for Undergraduates," $10,000, 1997 -1998.
- Army Research Laboratory, "Advanced Telecommunications/Information Distribution Research Federated Laboratory," with 6 faculty in ECE and CIS, $ 4 million, 1996 - 2001.
- Silicon Graphics (with N. C. Gallagher, K. Barner, C. Boncelet), "Multimedia equipment for Instruction and research," $420,000, 1995 - 1996.
- National Science Foundation, "Video signal processing research," with C. Boncelet, et al, $ 100,000, 1994 - 1995.

- National Science Foundation, "Microstatistc signal decomposition and the optimal filtering problem," $130,000, 1991 - 1993.

- ALCOA, "Three dimensional computerized tomography with truncated projections," $95,000, 1990 - 1992.

- Sperry Corporation, "Multidimensional signal processing and computer vision," $30,000, 1986 - 1987.

- Du Pont, "Data compression methods in process control," $28,000, 1987 - 1988.

- Du Pont and The Delaware Research Partnership, "Visual communications of computer networks," $57,000, 1989 - 1990.

- Unidel Foundation, "A Computer Vision and Image Processing Laboratory," $170,000, with P. Warter and C. Boncelet, 1986 -1987.

- University of Delaware Research Foundation, "Analysis of Two Dimensional Median Filters," $15,000, 1983 - 1984.

- National Science Foundation, Research Initiation Grant, "Theoretical analysis of recursive median filters," $55,000, 1983 - 1985.

Patents

[1]. M. Don and G. R. Arce, " Antenna radiation pattern compressive sensing," US Patent Application 17/592,603, 2023.

[2]. G. R. Arce and C. Fu and M. Don. "Compressive spectral imaging via polar coded aperture." U.S. Patent No. 11,137,287. 05 Oct. 2021.

[3]. A. Cuadros and G. R. Arce. "Pixelated K-edge coded aperture system for compressive spectral X-ray imaging." U.S. Patent No. 10987071. 27 April 2021.

[4]. A. Cuadros and G. R. Arce, "Pixelated K-edge coded aperture system for compressive spectral X-ray imaging." US Patent 10,874,361. Dec 12, 2020.

[5]. G. R. Arce, G. J. Garateguy, S. X. Wang, and D. L. Lau, "Method to store a secret QR code into a colored secure QR code," US Patent 10,832,110, November 10, 2020.

[6]. G. R. Arce, G. J. Garateguy, S. X. Wang, and D. L. Lau, "System and method for embedding of a two dimensional code with an image." US Patent 510,817,971 October 27, 2020.

[7]. G. R. Arce, G. J. Garateguy, S. X. Wang, and D. L. Lau, "System and method for embedding a two dimensional code in video images." US Patent 10,614,540 April 7, 2020.

[8]. G. R. Arce, G. J. Garateguy, S. X. Wang, and D. L. Lau, "Method to store a secret QR code into a colored secure QR code," US Patent 710,152,663 Dec. 18, 2018.

[9]. G. R. Arce, G. Garateguy, S. X. Wang, "System and method of embedding a two dimensional code with concealed secure message," US Patent 10,089,508. Oct. 2, 2018.

[10]. D. L. Lau, G. R. Arce, "Spectral imaging sensors and methods with time of flight sensing," US Patent App. 810,151,629 , Dec. 18, 2018.

[11]. G. R. Arce, and H. Arguello, "Spectral Imaging Sensors and Methods", US Patent 9,343,491. May, 2016.

[12]. D. Lau and G. R. Arce, "Image Quantization for Digital Printing", US Patent 8,867,100B2, Oct. 2014.

[13]. Z. Zhou, Y. T. Kim, and G. R. Arce, "Method of motion compensated temporal noise reduction", US Patent 7,535,517, June 19, 2009.

[14]. S. Hoyos, B. Sadler, G. R. Arce, "Analog to Digital Conversion with Signal Expansion," US Patent 7,253,761, August 7, 2007.

[15]. L. Russo, J. Paredes, G. R. Arce, "Bijection Mapping for Compression/Denoising of Multi-Frame Images," US Patent 7,224,845, May 29, 2007.

[16]. C. Nino, and G. R. Arce, "Method for Modeling Color Halftones," US Patent 7,173,733, February 7, 2007.

[17]. D. Lau, G. R. Arce, and N. Gallagher, "Digital color halftoning with generalized error diffusion vector green-noise masks" US Patent 6,798,537, September 28, 2004.

[18]. K. Bloch and G. R. Arce, "Method of Non-Linear Analysis of Biological Sequence Data," US Patent 6,728,642, April 27, 2004.

[19]. L. Xie, A. Lewis, E. Basch, G. R. Arce, "Message Authentication Code with Improved Error Tolerance," US Patent 6,665,420, December 16, 2003.

[20]. L. Xie, A. Lewis, A. Michelson, E. Basch, G. R. Arce, "Message Authentication Code Using Image Histograms," US Patent 6,606,393, August 12, 2003.

[21]. X. Xia, C. Boncelet, and G. R. Arce, "Watermarking Methods for Digital Images and Videos," US Patent 6,556,689, April 12, 2003.

[22]. L. Xie, A. Lewis, E. Basch, G. R. Arce, "Systems and Methods for Etching Digital Watermarks," US Patent 6,512,836 B1, January 28, 2003.

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[2]. "Compressive Lidar Sensing and Reconstruciton for Earth Science, "Keynote Talk at the 2022 Workshop on Adaptive, Compressive, and Computational Imaging, Bucaramanga, 2022.

[3]. "Fast Lithographic Source Optimization based on Compressive Sensing," International Workshop on Advanced Patterning Solutions (IWAPS). DoubleTree by Hilton Hotel Xiamen-Haicang, Xiamen, China, Oct, 2018.

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