

▶ Jeanette Hariharan, PhD, PE

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Objectives

I am interested in teaching and research in the areas of electrical and computer engineering or related disciplines. I have much experience in research and teaching with specialties in electrical-optical systems, and signal / imaging processing. I currently teach in a related discipline (Bioengineering) and am doing joint research with the University of Florida in the area of disease diagnostics in plants. This research involves expertise in signal processing, pattern recognition, statistical data analysis, and numerical methods. My special interests include:

- digital systems (imaging, digitized sensory data system, robotics, radio wave, e/o, IR, camera applications)
- Applications which involve physics-based modeling, numerical methods, signal/ image processing, and pattern recognition

Technology Applications/Expertise

- MATLAB – experienced with Signal Processing Toolbox, Optimization Toolbox, Neural Network Toolbox, Image Processing Toolbox, Control System Toolbox, Wavelet Toolbox, Statistics and Machine Learning Toolbox, Curve-fitting Algorithms
- Simulink - State flow, Simulink Coder (& embedded Coder), S-function design
- Programming languages: C, C++, Python, Java, Fortran, assembly, html, Pearl
- Arduino and Mechatronics projects

Education

1978-1982 Pittsburgh, PA

B.S. Electrical & Biomedical Engineering

- Carnegie-Mellon University

1983-1985 Knoxville, TN

M.S. Electrical Engineering

- University of Tennessee, Space Institute

1992-1997 Akron, Ohio

Ph.D. Electrical & Biomedical Engineering

- University of Akron

Experience

8/7/2019-Present

Florida Gulf Coast University (FGCU), 10501 FGCU Blvd., Fort Myers,, FL 33965 - (239) 590-1000

Visiting Assistant Professor

I am currently teaching in the U.A.Whitaker College of Engineering in the Bioengineering Department. I teach/have taught the following courses:

1. Computational Tools
2. Engineering Entrepreneurship
3. Data Acquisition & Controls
4. Signals & Systems for Bioengineers
5. Mechatronics (NEW – Fall 2020)
6. Engineering Mechanics (NEW – Spring 2021)

I am continuing to do research in the areas of numerical and statistical techniques for plant disease detection using hyperspectral data. I also have established goals and objectives for the AY 19-20 for expanding my research to develop techniques for water analysis and spectral identification of algae species in water using multi-spectral camera data. I have two students doing research in the area of statistics and

machine learning. I am also trying to develop my teaching style in a way that is most conducive to student mastery and retention. I have written two papers last fall (2019); one was accepted in the IEEE CCWC conference (27% acceptance rate), which I presented (1/20) at the University of Nevada. The other paper was accepted in ASC 2020. This paper is a neural network design using auto-regressive analysis for estimating construction cost indices as a function of economic indicators. I have written a third paper on disease detection in plants using pattern recognition methods and have submitted for publication in *IEEE Transactions on Geoscience and Remote Sensing* Jan 2021.

Ave Maria University, 5050 Ave Maria Blvd., Ave Maria, FL 34142
· (239) 348-4705

Assistant Professor Physics (1/1/2018-6/30/2019)

I have developed and taught new course work for the following classes:

- University Physics I, Mechanics;
- University Physics II, Wave motion and Thermodynamics;
- University Physics III, Electricity and Magnetism;
- Optics
- Matlab
- Electric Circuits.
- Directed Research Studies

I have also taught labs for all of these classes.

I began doing joint research with the University of Florida Southwest Research Center (SWFREC) in Immokalee, FL during 2018 summer. Since then I have been able to design disease diagnostics and recognition algorithms for several of their data collection sets from diseased plants using hyperspectral-imaging cameras. Several other algorithms are being developed at this writing. This work is in its infancy but I have confidence from this early and recent success in basic pattern recognition and numerical techniques applied to disease detection, this joint research work will continue well into the future, and can be used for diagnostics in humans as well.

Rockwell Automation, 1 Allen Bradley Dr., Cleveland, OH 44124
· (440) 646-5000 Firmware Test Engineer – Consultant

This job involved the design, development, and verification of automated firmware tests for programmable logic controllers and their associated I/O and ethernet modules. All tests are written in a project format in Python and run on a Jenkins regression platform.

Safran Electrical & Power, 8380 Darrow Rd, Twinsburg, OH 44087
(330) 487-2000 – Consultant

I worked on the design and development of a Test, Verification and Structural Coverage Analysis process. This work involved analyzing the coverage analysis requirements set forth by the DO-178B/ED-12B,C documents for test coverage and literal / masked MC/DC coverage. From this analysis, a process plan was developed and presented to the FAA certification authorities. Other functionalities in this work included implementing Python code for text mining the source code, and embedding source code delimiters for the Python code to classify and associate for test, verification and structural coverage purposes.

Meggitt PLC, 1204 Massillon Rd, Akron, OH 44306

· (330) 796-8823

Engineering Specialist

Primary Projects (2015-2017)

- My work included the design and development of aircraft brake control systems, design optimization, system hardware/software component interface, Hardware-In-the-Loop testing arrangement, and training others in using and developing the system and system interfaces. I was responsible for analysis of these systems, in terms of signal processing, frequency response, power distribution, efficiency, and software design optimization. I developed, analyzed & tested all system models using MATLAB with Simulink (using real-time environment, State flow). I worked with the team to implement the software, which was tested in an HIL controlled test bed. These systems involved detailed signal processing analysis, digital logic design, and control theory implementation, as well as leading the team through algorithm development, testing, optimizing, troubleshooting, and final product delivery.

Timken Bearings Corp, 4500 Mount Pleasant NW, North Canton, OH 44720

Principal Engineer

Primary Projects (2013-2015)

- I was the lead engineer in charge of the gauging systems software applications for high precision bearing measurements in the Manufacturing Advancement Department. I developed overall gauge systems' design, electronics interface, data acquisition methods, user interfaces, data analytics and algorithms/implementations for measurement systems' strategies. Specific systems developed for roundness, concentricity, eccentricity, flatness, statistics, and other similar geometric /sensor employed measurement gauges for bearings in a test

system environment. Languages/tools used included C++, C#, .Net & MFC API, Python and VBNet; interfaces included National Instruments DAQ, USB devices

Diebold Corp, 5995 Mayfair Rd, North Canton · (330) 490-4000

Senior Electronics Systems Engineer – Contract Position (2012-2013)

- Developed system test code for ATM system firmware project; Designed testing strategy and implemented framework for black box, white box and most of the functional testing for the ATM mechanisms being realized. All modeling and firmware development was done using IBM Rational Rhapsody, Visual Studio, and C++; Interface with USB and CAN BUS.
- Taught strategies for black box and automated white box testing

Lockheed Martin Corp, MS2, Akron, OH

Senior Embedded Software Engineer - Primary Projects (2002-2012)

- Primary responsibilities involved the design, development, integration, and testing of the embedded software for an agile-beam, electronically steered RADAR (AN/APG-80 AESA) for the F16/Block 60 simulator project; Was the first one (@LM-Akron) to take the radar system development work to the object oriented programming level on a Linux platform; Also responsible for the design of the AN/APG-81 radar simulation for the JSF Flight Simulator
- Specified, procured, designed the interface and integrated the Joint Strike Fighter (JSF) Digital Radar Landmass Simulator (DRLMS); assisted in the JSF Sensor/IG simulation, design, development, HW/SW interface and integration. All analysis and coding were done using IBM Rational Rhapsody and C++ in a Linux environment
- Accomplished the analysis, modeling and design implementation of the flight dynamics and wind interactions for a High Altitude Airship (HAA).
- Completed end-to-end EO/IR sensor system simulation which included the development of a set of sensor models for four spectral bands and two varying sized apertures, target trajectory and target signature data, calculations for LOS background radiance, path transmittance, and system noise characteristics.
- Designed and Developed Probabilistic models for an Infra-red Countermeasures Systems (IRCM). These models described the probability of pertinent events happening during a period in the timeline of a missile counter-measures incident.

- Designed & implemented hybrid detection and tracking method for an air to ground sensor suite that included handovers from passive to active sensors, in various fields-of-view.
- Redesigned an acquisition and tracking system which designated a desired LOS, with the capability to search, acquire and track targets using video from an IR and TV camera suite of sensors.
- Optimization of RF Communications System for the purposes of establishing maximum coverage capability, identifying and reducing gap areas, and the development of battle management strategies.
- Developed course materials and taught ELDP engineers several courses, including Radar Systems, Design & Analysis; Digital Optical Communications and Experimental Data Analysis.
- Produced package for reliability/failure rate analysis in VBA/Excel for system components of a large production, in theatre program.
- Designed automated controls for servo amp control of motorized valves used in specified flow rate system. Used some RSX Logix 5000; mostly Arduino boards, which used embedded C.

2000-2002 **University of Akron** - Micro scale Physiochemical Engineering Center (MPEC) (Part-time)

Research Associate

- My primary responsibilities involved analyzing and modeling electro-rheological flow systems with enhanced effects due to surface phenomena, specific geometries, particulates, and porous materials found in Nano scale flow systems.

1999 - 2001 **Stark State College** North Canton, OH

Part-time Instructor

- Taught linear and nonlinear electronics systems, digital logic, C++, and networking

1990-1997 **University of Akron**, Akron, OH

Research Assistant

- Conducted research that included the development of a cochlear implant model, neural networks for use in cochlear implants, pattern recognition systems for saccadic eye

movements, and encoding methods for cochlear implant signal encoding and transmission; research was funded by a NIH grant and led to PhD Dissertation

1985 - 1989 **Goodyear Aerospace/Loral Corp.** Akron, OH

Research Engineer

- Designed, fabricated, and tested hardware/firmware systems for the development of the F-15E Flight Simulator; major design work for the target recognition and tracking system.

1984 - 1985 **University of Tennessee, Space Institute** Tullahoma, TN

Research Assistant- work led towards MS in Electrical Engineering;

- Took graduate level courses in Numerical Analysis, Transform Methods, Filter Design and Signal Processing, while developing fast filter algorithms for the TMS320 series of microprocessors.

1982 - 1984 NASA (**ICASE division**) Hampton, VA

Research Assistant

- System Analyst for the Institute for Computer Applications in Science and Engineering (ICASE); Co-Maintained, and managed a VAX-1127 Mainframe (UNIX operating system), for scientific programming; responsibilities included managing shutdowns, backups, adding new users, etc.

1980 - 1982 Carnegie-Mellon Univ. (**Biomedical Eng. Dept.**) Pittsburgh, PA

Research Assistant

- Designed an assembler that was responsible for decoding a select set of assembly instruction codes for a PDP-11 microprocessor for implementation in a fetal heart monitor, then in TRL 6 level development stages.
- Worked on optimization of precision programming for insulin pumps that were being developed through a research grant with Pitt Medical School. Also responsible for flow rate monitoring and calibration.

Publications

1. J. Hariharan, “*A Comparison of Low Noise Structures for Realizing Digital Filters on the TMS32010 Digital Signal Processor*”, Master’s Thesis, University of Tennessee, 1985
2. J. Hariharan, “*A Comparison of Low Noise Structures for Realizing Digital Filters on the TMS32010 Digital Signal Processor*”, *Proceedings of the IEEE Midwest Symposium on Circuits and Systems, 1985*

3. J. Hariharan, T. Hartley, “*Three-Dimensional Root Locus Realizations for Distributed Parameter Systems*”, *Proceedings of IEEE Conference on Modeling and Simulation, 1989*
4. J. Hariharan, K. Mudry, “*A Comparative Analysis of Neural Networks for Synthesizing Patterns Representing Sounds*”, *Proceedings of IEEE Conference on Modeling and Simulation, 1990*
5. J. Hariharan, “*A Phoneme Recognition and Encoding Method for Cochlear Implants*”, Ph.D. Dissertation, December 1997
6. J. Hariharan, K. Mudry, “*Speech Processing Techniques for Cochlear Implant Encoding with emphasis on Fast Filters and Neural Network Realizations*”, Proposal for DARPA, March 2002
7. J. Hariharan, E. Quinn, “*Dual Power Distribution and Imaging System for a High Altitude Airship*”, Patent Application, January 2007 - status - PATENT awarded June 29, 2010
8. J. Hariharan, J. Carlotta, “*Methods for Implementing Tone Mapping Filters For Contrast Enhancement of Real-time Sensor Imagery*”, Lockheed Martin Innovator Competition, Feb 2008
9. J. Hariharan, “*Transform Methods for Distortion Invariant Object Detection in High Clutter Environments*”, *Lockheed Martin Joint Technology Focus Group Conference, April, 2010*
10. J. Hariharan, “*Detection and Tracking Algorithm for Ground Targets in Low Contrast Regions of Interest*,” *Lockheed Martin Joint Technology Focus Group Conference, April, 2011*
11. J. Hariharan, J. Fuller, Y. Ampatzidis, J. Abdulridha, A. Lerwill, “*A Method for Plant Disease Detection using Finite Difference Analysis and Bivariate Correlation of Hyperspectral Data. Case Study: Detection of Laurel Wilt Disease and Nutritional Deficiency in Avocado*”, *Remote Sensing, July 24 2019*
12. J. Hariharan, Y. Ampatzidis, J. Abdulridha, “*The Basis for Development of a Foundational Biomarker Reflectance Signature Database System for Plant Cell Identification, Disease Detection, and Classification Purposes*”, *IEEE Proceedings of Computing and Communications Workshop and Conference, January 2020*
13. C. Capano, J. Hariharan, I. Moud, “*Construction Cost Predication Model Using Macro Economic Indicators*”, *Associated Schools of Construction Management Conference, Liverpool, UK, April 2020*

14. I. Moud, I. Flood, H. Hakim, C. Kibert, J. Hariharan, “*Sustainability Assessment of Data Centers Beyond LEED*”, *IEEE 2020 Green Technologies Conference, Oklahoma City, OK, April 2020*
15. J. Hariharan, Y. Ampatzidis, J. Abdulridha, O. Batuman, “*A Method for Biomarker Reflectance Signature Specification for Disease Detection and Classification*”, *IEEE Transactions on Geoscience and Remote Sensing, Submitted Jan 7, 2021*
16. I. Moud, , I. Flood, H. Hakim, C. Kibert, J. Hariharan, “*Sustainability Assessment of Data Centers Beyond LEED*”, *IEEE Transactions on Big Data, In Process*

Book Publication

Hariharan, J. (2020). *A Primer on Mechatronics with Practical Applications*, 1st Edition, Top Hat Academic Publications, ISBN: **978-1-77412-383-6**

Professional Memberships

IEEE

Ohio State Board of Professional Engineers and Surveyors

National Society of Professional Engineers

References

- *Dr. Chris Geiger, Florida Gulf Coast University, 10501 FGCU Blvd.S., Fort Myers, FL 33965, cgeiger@fgcu.edu (239)590-7355*
- *Dr. Hashem Izadi Moud, Florida Gulf Coast University, 10501 FGCU Blvd.S., Fort Myers, FL 33965, hizadimoud@fgcu.edu (239)745-4564*
- *Dr. Ioannis Ampatzidis, University of Florida Southwest Research Center, 2685 State Road 29N, Immokalee, FL 34142, I.ampatzidis@ufl.edu (239)658-3451*
- *Dr. Jaafar Abdulridha, University of Florida Southwest Research Center, 2685 State Road 29N, Immokalee, FL 34142, ftash@ufl.edu (863)280-3605*
- *Dr. Roger Nutt, Vice-President of Academic Affairs, Ave Maria University, 5050 Ave Maria Blvd., Ave Maria, FL 34142, 239-280-1603, roger.nutt@avemaria.edu*

- *Randy Wallace, Lockheed Martin Corp.*, 1210 Massillon Rd., Akron, OH 44315; 330-796-8067; randy.w.wallace@lmco.com
- *Ed Quinn, Lockheed Martin Corp.*, 1818 Sawgrass Drive, Uniontown, OH 44685; 330-752-6185; mcsprof@gmail.com

Accreditations and Awards

- Certified Professional Engineer (OH license: PE.54966);
- Certified Six Sigma Greenbelt;
- Peer-to-Peer Recognition Award, 12/2010;
- Boeing Outstanding Team Performance Award, June 2016
- Innovation Award; Meggitt, 2/2017
- Previously held Top Secret Clearance with Lockheed Corp

Patent Award

- Power and Imaging System for an Airship, Patent #US 7,744,032 B2, Patent awarded June 29, 2010

