EVAN BENOIT

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EDUCATION

University of Utah *December 2023*
PhD in Electrical and Computer Engineering

University of Utah *April 2020*
MS in Electrical and Computer Engineering
Focus: Electromagnetics
GPA: 3.714

University of Utah *April 2020*
BS in Electrical Engineering, *cum laude*
Focus: Electromagnetics
GPA: 3.903

Excelsior College *June 2015*
BS in Nuclear Engineering Technology
GPA: 4.0

US Navy Nuclear Propulsion Training Program *August 2007*
Nuclear trained Electrician's Mate

TECHNICAL STRENGTHS AND SKILLS

Troubleshooting & Repair	10+ years as electrical technician and supervisor. Familiarity with electrical test gear, procedures, specifications, documentation
Quality Assurance	Craftsman, planner and work center supervisor
Professional Work Ethic	Detail oriented, self-motivated, inquisitive, effective communicator, team collaborator
Research Related	Spread Spectrum Time Domain Reflectometry (SSTDR), Inversion Theory, Signal Integrity, Transmission Line Theory
Computer Languages	MATLAB, Latex, Python, R, Verilog, SQL, GitHub PowerPoint
Simulation & Computation	Finite-Difference Time-Domain, Finite Element Method, Cadence, ADS
Design & Construction	2-sided PCB, FPGA, VLSI/ASIC, capacitive touch switch

TEACHING EXPERIENCE

University of Utah Asia Campus

Circuits & Systems: Intro (ECE 1240) - Spring 2024
Physics for Scientists and Engineers II (PHYS 2220) - Spring 2024
Fundamentals of Electromagnetics (ECE 3300) - Fall 2023
Fundamentals of Electromagnetics: Lab (ECE 3305) - Fall 2023
Physics for Scientists and Engineers I (PHYS 2210) - Fall 2023

University of Utah

Microwave Engineering 1 (ECE 5320/6322) - Fall 2022

Fundamentals of Electromagnetics (ECE 3300) - Spring 2022

WORK EXPERIENCE

University of Utah Asia Campus August 2023 - Present

Assistant Professor (Lecturer) *Yeonsu-gu, Incheon Korea*

· Established laboratory procedures and MATLAB code to explore concepts in transmission line and antenna theory using the nanoVNA during the Fall semester of 2023.

· Taught topics in Newtonian mechanics to include kinematics, dynamics, momentum, and energy as well as their application towards motion of rigid bodies, oscillations, and waves in Physics for Scientists and Engineers during the Fall semester of 2023.

University of Utah August 2017 - July 2023

Graduate Research Assistant *Salt Lake City, UT*

· Taught transmission line and waveguide theory, filter design, microwave network analysis, and power divider and directional coupler design in Microwave Engineering during the Fall semester of 2022.

· Taught transmission line, wave propagation, and antenna theory in Fundamentals of Electromagnetics during the Spring semester of 2022. Received Dean's Award for top 15% of instructors in the College of Engineering.

· Gained a thorough understanding of reflectometry methods used in fault detection and circuit impedance analysis. Familiar with SSTDR, STDR, TDR and FDR.

· Constructed laboratory test apparatuses for transmission line characterization, connector cross-talk analysis, variability measurements, load manipulation, and representative fault modes of photovoltaic panel systems.

· Regularly used transmission line theory in developing and conducting reflectometry experiments and simulations. Performed reflectometry analisys in both time and frequency domains.

· Worked with a team of approximately 6 electrical engineering students in applying spread spectrum time domain reflectometry (SSTDR) to photo-voltaic panels and systems for fault detection.

· Researched applicability of complex impedance extraction using spread spectrum time domain reflectometry (SSTDR) and established experimental procedures for conducting measurements.

· Mentored freshmen to senior electrical engineering students in preparing oral presentations, constructing scientific posters, and applying course-work concepts to a new area of research.

· Maintained close relationships with scientists at the National Renewable Energy Laboratory (NREL) for tracking solar panel degradation by use of spread spectrum time domain reflectometry (SSTDR) methods.

National Renewable Energy Laboratory (NREL) June-September 2020

Graduate Internship *(Remote) Golden, CO*

· Developed database ingestion scripts using Python and SQL to retrieve data from a public domain photovoltaic system repository and ingest the data into a database maintained and used by the National Renewable Energy Laboratory.

· Worked remotely with NREL scientists to adapt a database used to evaluate photovoltaic system efficiency across the industry.

· Quickly learned database construction methods and became very familiar with website API calls. Processed queried data to remove personal/privacy information prior to ingestion into a new database.

US Navy June 2012 - June 2015

Nuclear Electrician's Mate - Performance Monitoring Team *Pearl Harbor, HI*

· Maintained DC and 3-phase medium-voltage submarine switchgear through manufacturer level inspections as well as corrective and preventative maintenance.

· Personally saved the Navy more than 2.5 million dollars through troubleshooting techniques and early identification of imminent component failures.

· Provided local and long distance technical support as an electrical system expert for 21 submarines, and facilitated teleconferences between lead submarine officials and vendor-level repair agencies.

· Generated detailed technical documents for the identification, tracking, and repair of electrical component deficiencies for ship AC and DC generators, motors, and switchgear.

· Received **Secretary of Defense Field-level Maintenance Award** – For outstanding fleet maintenance and best in Department of Defense maintenance tracking and deficiency correction practices.

US Navy July 2007 - June 2012

Nuclear Electrician's Mate - USS Greeneville *Pearl Harbor, HI*

· Supervised 14 electricians during preventative and corrective maintenance operations, as well as mentored junior sailors on proper maintenance practices and the importance of preserving a safe work environment.

· Maintained a coherent computer-aided preventative maintenance program of all electrical components, and scheduled maintenance according to personnel availability and the submarine's operational commitments.

· Certified quality assurance craftsman, planner, and work center supervisor to aid in Nuclear-Safe and Submarine-Safe maintenance procedures and repairs.

· Established a lead role in complex troubleshooting events, including an in-depth repair to vital submarine propulsion equipment while deployed.

· Qualified Engineering Watch Supervisor – Most senior enlisted submarine nuclear plant watch station. Supervised all submarine nuclear plant operations, maintenance, casualty control, and 10 operators of propulsion and electrical power generating related systems.

ELECTROMAGNETICS COURSEWORK

· **Microwave Engineering I:** Transmission line theory, waveguide theory and waveguide modes, S-parameters, and micro-strip filter design and testing.

· **Microwave Engineering II:** Detailed smith chart analysis and designed ADS models of amplifiers, filters, and matching networks to meet specific output goals.

· **Numerical Techniques in Electromagnetics:** Established a MATLAB simulation environment to computationally solve electromagnetics problems using both, Finite-Difference Time-Domain (FDTD) and Finite Element Method (FEM).

· **Antenna Theory and Design:** Theory and design of dipole, multi-element, phased-array, and rectangular and circular aperture antennas. Characteristics of transmitting and receiving antennas, matching networks, and wave propagation in the ionosphere.

· **Signal Integrity:** Theory of ringing, crosstalk, and radiated noise in high speed digital devices. Constructed a test bench using SMA and coaxial connectors to perform crosstalk analysis on PV MC4 connectors.

· **VNA Fundamentals:** Analyzed the operation and calculations performed by a VNA during measurements. Thorough understanding of VNA variability/error and how to minimize the effects, as well as explored causes of Type-A and Type-B uncertainties.

OTHER COURSEWORK

- · **FPGA - Digital system design**
- · **ASIC - Digital VLSI design**
- · **Optics for energy**
- · **Lasers and applications**
- · **Intro to feedback systems**
- · **Technical editing**
- · **Physics of nano-electrical devices**
- · **Ultrasound**
- · **Linear systems**
- · **Writing and communications for Grad students**

PUBLICATIONS

(For online access to this list of publications, go to: https://bit.ly/PVSSTDR)

Journal Publications

1. **Evan Benoit**, Sam J. Hansen, Sam R. Kingston, Joel B. Harley, and Cynthia Furse, "Capability of impedance measurement using spread spectrum time domain reflectometry," IEEE Transactions on Instrumentation Measurement, vol. 72, Art. no. 1503709, Jul. 2023. DOI: 10.1109/TIM.2023.3318677

2. **Evan Benoit**, Joel B. Harley, and Cynthia M. Furse, "Evaluation of impedance measurement using spread spectrum time domain reflectometry," IEEE Transactions on Instrumentation Measurement, vol. 72, Art. no. 2006008, Jul. 2023. DOI: 10.1109/TIM.2023.3295463

3. Samuel Kingston, Cody LaFlamme, Mashad U. Saleh, Hunter Ellis, **Evan Benoit**, Ayobami Edun, Michael A. Scarpulla, Cynthia M. Furse, Joel B. Harley, "Spread Spectrum Time Domain Reflectometry (SSTDR) Digital Twin Simulation of Photovoltaic Systems for Fault Detection and Location," Progress in Electromagnetics Research (PIERS-B), Vol. 94, pp. 105-126, Jan. 2021

4. Cody LaFlamme, **Evan Benoit**, Ayobami Edun, Cynthia M. Furse, Michael A. Scarpulla, Joel B. Harley, "Quantifying the Environmental Sensitivity of SSTDR Signals for Monitoring PV Strings," IEEE Journal of Photovoltaics,2021

5. Ayobami S. Edun, Samuel Kingston, Cody LaFlamme, **Evan Benoit**, Michael R. Scarpulla, Cynthia M. Furse, Joel B. Harley, "Detection and Localization of Disconnections in a Large-Scale String of Photovoltaics using SSTDR," IEEE Journal of Photovoltaics, 2021

6. Mashad Uddin Saleh, Chris Deline, **Evan Benoit**, Samuel Kingston, Joel B. Harley, Cynthia M. Furse, Michael Scarpulla, "Detection and Localization of Damaged Photovoltaic Cells and Modules Using Spread Spectrum Time Domain Reflectometry," IEEE Journal of Photovoltaics, 11(1), pp. 195-201, Jan. 2021, Print ISSN: 2156-3381, Online ISSN: 2156-3403, DOI: 1109/JPHOTOV.2020.3030185

7. **Evan Benoit**, Jack Mismash, Samuel Kingston, Ayobami Edun, Hunter Ellis, Cody LaFlamme, Michael Scarpulla, Joel B. Harley, Cynthia Furse, "Quantifying the Window of Uncertainty for SSTDR Measurements of a Photovoltaic System," DOI 10.1109/JSEN.2021.3059412

8. Samuel R. Kingston, Hunter Ellis, Mashad U. Saleh, **Evan Benoit**, Ayobami Edun, Cynthia M. Furse, Michael A. Scarpulla, Joel B. Harley, "Spread Spectrum Time Domain Reflectometry and Steepest Descent Inversion to Measure Complex Impedance," accepted to ACES Journal, 2021

9. Ayobami S. Edun, Cody LaFlamme, Samuel Kingston, Harsha Tatali, **Evan Benoit**, Cynthia Furse, Michael Scarpulla, Joel Harley, "Finding Faults in PV Systems: Supervised Unsupervised Dictionary Learning Approaches with SSTDR," accepted to IEEE Sensors Journal, 2020

10. Hunter Ellis, Mashad Uddin Saleh, Samuel Kingston, Joel B. Harley, Michael A. Scarpulla, **Evan Benoit**, Cynthia M. Furse, "A Model for SSTDR Signal Propagation through Photovoltaic String," accepted to IEEE Journal of Photovoltaics, 2020

11. Samuel Kingston, Naveen Kumar Tumkur Jayakumar, Mashad U. Saleh, **Evan Benoit**, Ayobami S. Edun, Rujun Sun, Cynthia Furse, Michael Scarpulla, Joel B. Harley, "Measurement of Capacitance in PV Cells using Spread Spectrum Time Domain Reflectometry (SSTDR) and Dictionary Matching," accepted to IEEE Sensors Journal, 2020

12. Mashad Uddin Saleh, Joel Harley, Naveen Kumar Tumkur Jayakumar, Samuel Kingston, **Evan Benoit**, Michael Scarpulla, Cynthia Furse, "Reflectometry on Asymmetric Transmission Line Systems," Progress in Electromagnetics Research (PIER-M), 89 (2020): 121-130.

13. Mashad Uddin Saleh, Christopher Deline, Samuel Kingston, Naveen Kumar Tumkur Jayakumar, **Evan Benoit**, Joel B. Harley, Cynthia Furse, Mike Scarpulla, "Detection and Localization of Disconnections in PV Strings Using Spread Spectrum Time Domain Reflectometry," IEEE Journal of Photovoltaics. 10(1), 2019, pp. 236-242. DOI 10.1109/JPHOTOV.2019.2953392

14. Naveen Kumar Tumkur Jayakumar, **Evan Benoit**, Samuel Kingston, Mashad Uddin Saleh, Michael Scarpulla, Joel Harley, Cynthia Furse, "Post-Processing for Improved Accuracy and Resolution of Spread Spectrum Time Domain Reflectometry (SSTDR)," IEEE Sensors Letters, 2019

Conference & Presentations

1. Samuel Hansen, Robbie Barker, **Evan Benoit**, Joey Brignone, Derek Dyreng, Ayobami Edun, Farhad Elyasi Chamazkoti, Nikodem Gazda, Julio Gutierrez, Samuel Kingston, Cody LaFlamme, Ivan Nikishov, Bryan Paulsen, Hailee Sumpter, Zachary Wilkerson, Michael A. Scarpulla, Joel B. Harley, Paul K. Kuhn, Cynthia M. Furse, "Fault Detection and Location on Photovoltaic Systems using Spread Spectrum Time Domain Reflectometry," PV Performance Modeling Collaborative (PVPMC) workshop, Salt Lake City, Utah, August 23-24, 2022

2. Samuel Jerel Hansen, **Evan Benoit**, Joseph Brignone, Joel B. Harley, Cynthia M. Furse, "Measuring Impedance with Spread Spectrum Time Domain Reflectometry," accepted to IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Denver, July 10-15, 2022

3. **Evan Benoit**, Cynthia Furse, "A Broadband S/SSTDR-VNA for Energized Circuits", IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Singapore (and virtual), Dec. 4-10, 2021

4. Cynthia Furse, **Evan Benoit**, Samuel Hansen, "Towards a Spread Spectrum VNA," IEEE Conference on Antenna Measurements and Applications (2021 IEEE CAMA), online, Nov. 15-17, 2021

5. Cody LaFlamme, Ayobami Edun, **Evan Benoit**, Michael Scarpulla, Joel Harley, Cynthia Furse, "Baseline Signal Learning for SSTDR Fault Detection in Photovoltaic Strings," Review of Progress in Quantitative Nondestructive Evaluation (QNDE), online, July 28-30, 2021

6. Farhad Elyasichamazkoti, **Evan Benoit**, Dawn Sweeney, Cynthia Furse, "Machine Learning for Spread Spectrum Time-Domain Reflectometry Impedance Measurement," Review of Progress in Quantitative Nondestructive Evaluation (QNDE), online, July 28-30, 2021

7. Joel B. Harley, Ayobami Edun, Cody LaFlamme, Samuel Kingston, **Evan Benoit**, Michael Scarpulla, Cynthia Furse, "Spread Spectrum Time Domain Reflectometry for Health Monitoring of Solar Arrays," 47th Annual Review of Progress in Quantitative Nondestructive Evaluation, Minneapolis, MN, July 25-26, 2020

8. **Evan Benoit**, Cynthia Furse, "Inversion Theory and SSTDR Analysis," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Montreal (moved online), July 5-10, 2020 (video presentation available at https://youtu.be/QdRBr-DVZWo)

9. Ayobami Edun, Cody LaFlamme, Mashad U. Saleh, Samuel Kingston, **Evan Benoit**, Hunter Ellis, Jack Mismash, Michael A. Scarpulla, Cynthia M. Furse, Joel B. Harley, "Spread Spectrum Time Domain Reflectivity to Detect and Locate Disconnects in Large-Scale PV Arrays", PV Reliability Workshop, Denver, CO, February 25-29, 2020

10. Kingston, Samuel, **Evan Benoit**, Naveen KT Jayakumar, Mashad U. Saleh, Josiah LaCombe, Cynthia M. Furse, Michael A. Scarpulla, and Joel B. Harley. "Spread spectrum time-domain reflectometry for detecting and locating capacitive impedances," In AIP Conference Proceedings, vol. 2102, no. 1, p. 090009. AIP Publishing, 2019.

11. **Evan Benoit**, Naveen Kumar Tumkur Jayakumar, Samuel Kingston, Mashad Uddin Saleh, Michael Scarpulla, Joel Harley, Cynthia Furse, "Applicability of SSTDR Analysis of Complex Loads," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Atlanta, GA, July 7-12, 2019

12. Samuel Kingston, Ayobami Edun, **Evan Benoit**, Naveen K. T. Jayakumar, Mashad U. Saleh, Cynthia M. Furse, Michael A. Scarpulla, Joel B. Harley, "Simulating the Spread Spectrum Time Domain Reflectometry Responses of Photovoltaic Cells to Detect and Locate Faults," PV Reliability Workshop, Denver, CO, February 26-31, 2019

13. **Evan Benoit**, Naveen Kumar Tumkur Jayakumar, Samuel Kingston, Mashad U. Saleh, Michael Scarpulla, Joel B. Harley, Cynthia Furse, "Spread Spectrum Time Domain Reflectometry for Complex Impedance Fault Detection," PV Reliability Workshop, Denver, CO, February 26-31, 2019

14. Samuel Kingston, **Evan Benoit**, Naveen Kumar Tumkur Jayakumar, Josiah LaCombe, Mashad Saleh, Michael A. Scarpulla, Cynthia M. Furse, Joel B. Harley, "Spread Spectrum Time Domain Reflectometry used for Detecting and Locating Electrical Faults in Solar Panels and Connecting Cables with Arbitrary Impedances," Qualitative Non-Destructive Evaluation (QNDE) Conference, July 16-19, 2018, Burlington, VT

15. (Invited Paper) Cynthia Furse, Naveen Kumar Tumkur Jayakumar, **Evan Benoit**, Mashad Saleh, Josiah LaCombe, Michael Scarpulla, Joel Harley, Samuel Kingston, Brent Waddoups, Chris Levine, "Spread Spectrum Time Domain Reflectometry for Complex Impedances: Application to PV Arrays," IEEE AutoTestCon 2018, Sept 17-20, National Harbor, MD

16. Naveen Kumar Tumkur Jayakumar, Mashad Uddin Saleh, **Evan Benoit**, Josiah Lacombe, Michael Scarpulla, Cynthia Furse, "Fault Detection In PV Strings Using SSTDR," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Boston, MA, 2018.

17. Mashad Uddin Saleh, Naveen Kumar Tumkur Jayakumar, Josiah Lacombe, **Evan Benoit**, Cynthia Furse, Mike Scarpulla, 'Modeling SSTDR Localization of Faults in PV Strings: Constructing a Frequency-Dependent Model of Signal Propagation', 2018 NREL Photovoltaic Reliability Workshop (PVRW). 3rd place student paper prize.

18. **Evan Benoit**, Naveen Kumar, Mashad Uddin Saleh, Josiah Lacombe, Samuel Kingston, Cynthia Furse, Mike Scarpulla, Joel Harley, "SSTDR for Fault Detection in PV Arrays," Senior Project Research Presentations, April 2018