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Education

Ph.D. in Engineering, *Memorial University of Newfoundland*, St. John's, NL, **May 2017 – Apr. 2021**
GPA: 4.00/4.00.

Thesis: Generalized Functions Approach to the Derivation of the High-Frequency Radar Cross-Section of Ocean Surfaces with Electromagnetically-Large Waves

Supervisory Committee: Prof. Eric W. Gill, Prof. Weimin Huang, Prof. Sarah Power

Coursework: Ocean Measurements and Data Analysis (PHYS 6316), Random Signals (ENGI 9825)

Master of Engineering, *Memorial University of Newfoundland*, St. John's, NL, **Sept. 2015 – Jun. 2017**
GPA: 4.00/4.00.

Thesis: A Nonlinear Approach to Ocean Wave Spectrum Extraction From Bistatic HF-Radar Data

Supervisors: Prof. Eric W. Gill and Prof. Reza Shahidi

Coursework: Applied Remote Sensing (ENGI 9560), Physical Oceanography (PHYS 6310), Antenna Theory (ENGI 9816), Digital Signal Processing (ENGI 9821), Engineering Graduate Seminar (ENGI 9100)

Industrial Electrical Engineering, *Instituto Federal da Bahia*, Salvador, Brazil, **Aug. 2008 – Sept. 2014**
Final Average Grade: 8.09/10.

Specialization: Control and Automation

Final Project: Electromagnetic Position and Orientation Tracking System with Six Degrees-of-Freedom (in Portuguese)

Supervisor: Prof. Eduardo Santos and Prof. Lurimar Smera Batista

Specialization Courses: Introduction to Stochastic Processes, System Identification, Digital Control, Automatic Control II, Mechatronic Systems

Research Experience

Graduate Researcher, *Memorial University of Newfoundland*, St. John's, NL, **2015-2021**

- Derived new electric fields and radar cross-section expressions for monostatic and bistatic HF Radars observing ocean surfaces with extreme wave heights
- Developed a 37% more accurate wind speed estimator for buoy data using a NARX Neural Network
- Simulated more than 200 combinations of ocean conditions and noise levels and generated noise-contaminated radar cross-sections of the ocean surface using Matlab and Python, and developed a new nonlinear method to extract ocean information from noisy bistatic HF radar data from the ocean surface, achieving an average of 97.2% accuracy
- Aided in in-situ maintenance of HF radar sites in the Avalon Peninsula
- Collaborated with other researchers in the implementation of feature extraction and classification methods for GNSS-R and X-band marine radar images

Research Assistant, *C-CORE*, St. John's, NL, **Oct 2018-Feb 2019**

- Simulated the radar cross-section of a satellite calibration standard using Altair FEKO and Ansys HFSS and determined the roughness requirements to have a minimum impact on the radar cross-section
- Aided in the choice of supporting structures by simulating the use of different materials and geometries to minimize their impact on the radar cross-section

Undergraduate Researcher, Instituto Federal da Bahia, Brazil.

2010-2014

- Constructed a magnetic 6-DOF motion tracker using Arduino and Matlab, and developed an alternative closed-form solution to the tracking problem using Singular Value Decomposition
- Coded an automatic FEM mesh generator and a time varying electromagnetic FEM simulator in Fortran and C, which were used to evaluate the impact of sea proximity on electromagnetic field propagation
- Implemented an unsupervised neural network algorithm in Fortran to identify fixed and moving underwater objects in ULF EM data, and compensated for reducing the number of sensors in the simulations
- Used Finite Elements Method to construct a Poisson Equation solver in C, and analyzed numerical errors introduced by different FEM meshing techniques

Teaching Experience

Teaching Assistant, Memorial University of Newfoundland, St. John's, NL.

2016-2020

Courses: ENGI 1020 - Introduction to Programming, ENGI 3821 - Circuit Analysis, ENGI 3424 - Engineering Mathematics, ENGI 4430 - Advanced Calculus for Engineering, ENGI 6813 - Electromagnetic Fields, ENGI 9816 - Antenna Theory.

- Revitalized antenna lab equipment that have not been used for 4 years
- Planned and performed experiments to facilitate the understanding of the topics presented by the instructor
- Marked lab reports, assignments and midterms, and supervised students during lab sessions

Instructor, SENAI CIMATEC, Salvador, Brazil.

March 2012

Course: Basic Mathematics

- Taught Elementary Mathematics to the PRONATEC Courses of Industrial Mechanics and Industrial Pipefitter, for audiences between 16 and 65 years old
- Developed, applied and marked assignments and final exams
- Reported student grades to the department

Professional Experience

Electrical/Electronics Engineer, C-CORE, St. John's, NL.

Mar. 2021—Present

- Worked with a cross-functional team to establish test plans and verification strategies to comply with the requirements established by clients such as Airbus and the European Space Agency
- Provided clarifications to inquiries raised by the client and performed design and documentation adjustments when necessary
- Established minimum requirements and designed multiple verification support equipment for an active P-band satellite calibration system
- Collaborated in a project to deliver a review on the state of the art of high-power microwave technologies for the Defence Research and Development Canada

Technical Translator and Interpreter, WorleyParsons, Camaçari, Brazil.

Sept. 2014 — May 2015

- Performed more than 900 hours of interpretation in a multinational and cross-functional team of technicians and engineers during installation and testing of electrical and instrumentation equipment at the BASF Camaçari Acrylic Center
- Translated technical notes and guidelines for the operation and maintenance of industrial equipment from English to Portuguese
- Aided in the communication between international and local leadership in planning and strategical meetings

Electrical and Instrumentation Engineer(Intern), *Monsanto do Brasil*, Camaçari, Brazil. **Aug. 2012 — Aug. 2013**

- Worked with a cross-functional team on the prioritization and execution of scheduled and unscheduled maintenance
- Developed analytics on valve controller failure based on the text in maintenance tickets
- Improved the Downtime Classification System for the PIA plant, reducing classification time and misclassifications
- Participated in scheduled and unscheduled maintenance procedures during operation and maintenance shutdowns
- Managed the maintenance schedule of critical instruments and calibration standards

Community Involvement

Volunteering

Communications Officer, *IEEE - Newfoundland and Labrador Section*, St. John's, NL. **2019-Present**

- Modernized the layout and reactivated the IEEE Newfoundland and Labrador Section Website

Organizing Committee Member, *Annual Newfoundland Electrical and Computer Engineering Conference (NECEC)*, St. John's, NL. **2020, 2021**

- Modernized the layout and reactivated the IEEE Newfoundland and Labrador Section Website

Judge – Special Awards, *Eastern Newfoundland Science & Technology Fair*, St. John's, NL. **2019**

- Evaluated science projects of secondary school students in Eastern Newfoundland for the Special Awards from IEEE and MUN Faculty of Engineering and Applied Science
- Provided feedback to the students regarding contextualization and possible applications of their projects in Science and Engineering

Session Co-Chair, *Oceans '17 MTS/IEEE Aberdeen Conference*, Aberdeen, Scotland, UK. **2017**
Session: Sonar and transducers

Peer-Reviews

Journals

IEEE Geoscience and Remote Sensing Letters

Canadian Journal of Electrical and Computer Engineering

Conferences

2020 IEEE 92nd Vehicular Technology Conference: VTC2020-Fall

Honors and Awards

Awards

Fellow of the School of Graduate Studies, *Memorial University of Newfoundland*, Canada. **2021, 2017**

Awarded in recognition of outstanding academic achievement throughout the graduate program.

Wally Read Best Young Professional Paper Award, *IEEE Newfoundland and Labrador Section*, Canada. **2020**

Awarded to the best young professional paper presented on the Annual Newfoundland Electrical and Computer Engineering Conference (NECEC)

Kenneth Hickey Award in Ocean Sensing, *Memorial University of Newfoundland*, Canada. **2020**

Awarded for excellence in ocean sensing research.

Best Research of the Year (All Categories), Instituto Federal da Bahia, Brazil. **2012**
Chosen as the best research work of the year among 83 competitors.

Funding

C.J. Reddy Student Travel Grant for Graduate Students, IEEE Antennas and Propagation Society, USA. **2020**

Awarded for excellence in research in antennas and propagation. Converted to educational grant due to the COVID-19 pandemic

Honors

Honourable Mention - Student Paper Competition, 2020 IEEE AP-S/URSI Conference, USA. **2020**

Within the top 34 out of 203 submissions to the competition

Finalist of the Student Poster Competition, OCEANS'18 MTS/IEEE Charleston, USA. **2018**

One of the top 20 student papers chosen to be presented in poster form.

Scholarships

Institutional Scholarship Program for Scientific Initiation , National Council for Scientific and Technological Development (CNPq), Brazil. **2011,2013**

R\$ 4,800.00/year (\$2,222.94, 2013 avg. exchange rate)

Institutional Scholarship Program for Technological Development and Innovation , National Council for Scientific and Technological Development (CNPq), Brazil. **2010**

R\$ 4,320.00 (\$2,453.71, 2010 avg. exchange rate)

Memberships

Institute of Electrical and Electronics Engineers (IEEE). **2015-Present**

Societies: IEEE Ocean Engineering Society, IEEE Antennas and Propagation Society, IEEE Microwave Theory and Techniques Society, IEEE Geoscience and Remote Sensing Society

Publications

Refereed Journals

2021 M. T. Silva, W. Huang, and E. W. Gill, "High-frequency radar cross-section of the ocean surface with arbitrary roughness scales: a generalized functions approach", *IEEE Trans. Antennas Propag.*, vol. 69, no. 3, pp. 1643–1657. DOI: 10.1109/tap.2020.3026330.

M. T. Silva, W. Huang, and E. W. Gill, "High-frequency radar cross-section of the ocean surface with arbitrary roughness scales: higher-orders and generalized form", *IEEE Trans. Antennas Propag.*, vol. 69, no. 10, pp. 6723–6738. DOI: 10.1109/TAP.2021.3070153.

2020 M. T. Silva, W. Huang, and E. W. Gill, "Bistatic high-frequency radar cross-section of the ocean surface with arbitrary wave heights", *Remote Sensing*, vol. 12, no. 4, p. 667. DOI: 10.3390/rs12040667.

M. T. Silva, R. Shahidi, E. W. Gill, and W. Huang, "Nonlinear extraction of directional ocean wave spectrum from synthetic bistatic high-frequency surface wave radar data", *IEEE J. Ocean. Eng.*, vol. 45, no. 3, pp. 1004–1021, ISSN: 0364-9059. DOI: 10.1109/JOE.2019.2909961.

- 2019 M. T. Silva, E. W. Gill, and W. Huang, "Electromagnetic scattering in curvilinear coordinates using a generalized functions method", *Radio Sci.*, vol. 54, no. 11, pp. 1099–1111, ISSN: 0048-6604. DOI: 10.1029/2018rs006783.
- 2018 M. T. Silva, E. W. Gill, and W. Huang, "An improved estimation and gap-filling technique for sea surface wind speeds using NARX neural networks", *J. Atmos. Oceanic Technol.*, vol. 35, no. 7, pp. 1521–1532, ISSN: 0739-0572. DOI: <https://doi.org/10.1175/JTECH-D-18-0001.1>. [Online]. Available: <http://journals.ametsoc.org/doi/10.1175/JTECH-D-18-0001.1>.
- 2017 M. T. Silva, E. T. F. Santos, L. S. Batista, J. M. Araújo, and L. S. Batista, "Alternative analytical solution for position and orientation in electromagnetic motion tracking systems", *WSEAS Transactions on Systems*, vol. 16, pp. 225–233, ISSN: 2224-2678. [Online]. Available: <http://www.wseas.org/multimedia/journals/systems/2017/a505802-879.php>.
- 2016 M. T. Silva, L. S. Batista, and F. M. V. de Albuquerque, "Feature extraction of structures in sea water using self-organizing maps and electromagnetic waves", *TEMA (São Carlos)*, vol. 16, no. 3, pp. 261–274, ISSN: 2179-8451. DOI: 10.5540/tema.2015.016.03.0261. [Online]. Available: <http://tema.sbmac.org.br/tema/article/view/836>.

Conference Proceedings

- 2020 M. T. Silva, W. Huang, and E. W. Gill, "Second-order correction to the HF radar cross-section of the ocean surface at electromagnetically-high sea states", in *Global OCEANS2020*, IEEE.
- M. T. Silva, E. W. Gill, and W. Huang, "HF radar cross-section of ocean surfaces with arbitrary wave heights", in *Proceedings of the 2020 IEEE International Symposium on Antennas and Propagation and North American Radio Science Meeting*, IEEE. DOI: 10.1109/IEEECONF35879.2020.9330260.
- 2018 M. T. Silva, W. Huang, and E. W. Gill, "Filling gaps in wind speed data - a neural networks approach", in *Proceedings of 2018 OCEANS - MTS/IEEE Kobe Techno-Oceans (OTO)*, Kobe, Japan: IEEE, pp. 1–5, ISBN: 978-1-5386-1654-3. DOI: 10.1109/OCEANSKOBE.2018.8559341. [Online]. Available: <https://ieeexplore.ieee.org/document/8559341/>.
- M. T. Silva, R. Shahidi, E. W. Gill, and W. Huang, "An improved nonlinear extraction of directional ocean wave spectrum from bistatic HFSWR using Tikhonov regularization in Hilbert scales", in *Proceedings of OCEANS 2018 MTS/IEEE Charleston*, Charleston, SC, USA: IEEE, pp. 1–6, ISBN: 978-1-5386-4814-8. DOI: 10.1109/OCEANS.2018.8604551. [Online]. Available: <https://ieeexplore.ieee.org/document/8604551/>.
- 2017 M. T. Silva, E. W. Gill, and R. Shahidi, "A new nonlinear approach to extraction of ocean wave spectra from bistatic Doppler HF-radar data", in *Proceedings of OCEANS 2017 - Aberdeen*, vol. 2017-October, IEEE, pp. 1–6, ISBN: 9781509052783. DOI: 10.1109/OCEANSE.2017.8084790. [Online]. Available: <http://ieeexplore.ieee.org/document/8084790/>.
- 2014 M. T. Silva and L. S. Batista, "Sea proximity influence over EM plane wave scattering using the finite element method", in *Proceedings of the 2014 16th International Symposium on Antenna Technology and Applied Electromagnetics (ANTEM)*, Victoria, BC, Canada: IEEE, pp. 1–2, ISBN: 978-1-4799-2225-3. DOI: 10.1109/ANTEM.2014.6887726. [Online]. Available: <http://ieeexplore.ieee.org/document/6887726/>.
- 2013 M. T. Silva and L. S. Batista, "Modelagem por elementos finitos da influência da maritimidade na propagação de ondas eletromagnéticas", in *Proceedings of the 65a Reunião Anual da Sociedade Brasileira Para o Progresso da Ciência, SBPC*, Recife. [Online]. Available: <http://www.sbpcnet.org.br/livro/65ra/resumos/resumos/7129.htm>.

- 2012 M. T. Silva and L. S. Batista, "Modelagem por elementos finitos da propagação de ondas eletromagnéticas em regiões litorâneas", in *Proceedings of the VII Congresso Norte e Nordeste de Pesquisa e Inovação, 2012*, IFTO, Palmas, pp. 1–6. [Online]. Available: <http://propi.ifto.edu.br/ocs/index.php/connepi/vii/paper/view/4771>.
- 2011 M. T. Silva and L. S. Batista, "Comparação de malhas automáticas para o método dos elementos finitos aplicados à simulação matemática da equação de Poisson", in *Proceedings of the VI Congresso Norte e Nordeste de Pesquisa e Inovação, 2011*, IFRN, Natal, pp. 205–214. [Online]. Available: <http://portal.ifrn.edu.br/pesquisa/editora/livros-para-download/vi-connepi-engenharia-iv>.
- Presentations/Conferences Without Proceedings***
- 2020 M. T. Silva, E. W. Gill, and W. Huang, "Effects of electromagnetically-large waves on the second-order radar cross section of the ocean surface in the HF band", in *29th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2020)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador, Canada.
- 2019 M. T. Silva, E. W. Gill, and W. Huang, "First-order high-frequency scattering for ocean surfaces with large roughness scales", in *28th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2019)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador, Canada.
- M. T. Silva, E. W. Gill, and W. Huang, "High-frequency radar cross-section for an ocean surface with arbitrary heights", in *Radiowave Oceanography Workshop 2019*, Ocean Networks Canada, Victoria, BC, Canada.
- 2018 M. T. Silva, R. Shahidi, E. W. Gill, and W. Huang, "Empirical initial value estimation for nonlinear extraction of ocean wave spectra from bistatic HF radar data", in *27th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2018)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador.
- 2017 M. T. Silva, E. W. Gill, and W. Huang, "The use of artificial neural networks in hindcasting and filling gaps in buoy wind speed data under extreme winds", in *26th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2017)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador.
- 2016 M. T. Silva, E. W. Gill, and R. Shahidi, "A change of variables for ocean wave spectrum extraction from bistatic second-order Doppler HF-radar data", in *25th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2016)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador.
- 2015 M. T. Silva, L. S. Batista, and F. M. V. de Albuquerque, "Dimensionality reduction on EM data for underwater object detection using self-organizing maps", in *24th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC 2015)*, IEEE Newfoundland and Labrador Section, St. John's, Newfoundland and Labrador.
- 2013 M. T. Silva and L. S. Batista, "Artificial intelligence applied to the control and monitoring of marine environments", in *II Simpósio de Guerra de Minas*, Marinha do Brasil, Salvador, Brazil.
- 2012 M. T. Silva and L. S. Batista, "Numerical simulation of structures under electromagnetic fields", in *IX Seminário de Iniciação Científica, Tecnológica e Inovação*, IFBA, Vitória da Conquista, BA, Brazil.

2011 M. T. Silva and L. S. Batista, "Automatic and adaptive mesh generator for finite elements method applications", in *VIII Seminário de Iniciação Científica do Instituto Federal da Bahia*, IFBA, Salvador, Brazil.

Theses

2021 M. T. Silva, "Generalized Functions Approach to the Derivation of the High-Frequency Radar Cross-Section of Ocean Surfaces with Electromagnetically-Large Waves", Ph.D. Thesis, Memorial University of Newfoundland. [Online]. Available:

<http://research.library.mun.ca/id/eprint/15038>.

2017 M. T. Silva, "A nonlinear approach to ocean wave spectrum extraction from bistatic HF-radar data", M.Eng. Thesis, Memorial University of Newfoundland. [Online]. Available:

<https://research.library.mun.ca/12819/>.

2014 M. T. Silva, "Electromagnetic position and orientation tracking system with six degrees-of-freedom", B.Eng. Thesis, Instituto Federal de Educação, Ciência e Tecnologia da Bahia, p. 108.