

NICHOLAS O'DONOUGHUE

PhD Candidate, Electrical Engineering

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DoD **SECRET** Security Clearance (granted 4 Oct 2005)

OBJECTIVE

To conduct research in the general area of Signal Processing. Interests include detection/imaging algorithms.

EDUCATION

2011(in progress) **PHD ELECTRICAL & COMPUTER ENGINEERING**, Carnegie Mellon University

Dissertation: Stochastic Time Reversal for Radar Detection

Advisor: Prof José M.F. Moura (moura@ece.cmu.edu)

Cumulative QPA: 3.82/4.00

2008 **M.S. ELECTRICAL & COMPUTER ENGINEERING**, Carnegie Mellon University

Course-option

Cumulative QPA: 3.77/4.00

2006 **B.S. COMPUTER ENGINEERING**, Villanova University

Capstone Project: *An Intelligent Patient Monitoring System for Hospital ICUs*

GPA: 3.92/4.00, *Summa Cum Laude*

RESEARCH EXPERIENCE

2011 **CENTER FOR SENSED CRITICAL INFRASTRUCTURE RESEARCH**, Carnegie Mellon University

Investigated the potential application of Time Reversal and Statistical signal processing techniques to ultrasonic guided wave transmission in thin plates and pipes for Structural Health Monitoring.

2010 **SUMMER RESEARCH INTERN**, MIT Lincoln Laboratory

Investigated the potential application of Compressive Sensing (CS) techniques to the first set of experimental airborne data ever collected for Multi-Input Multi-Output (MIMO) Ground Moving Target Indicator (GMTI) Radar.

2006-2010 **NDSEG FELLOW**, Carnegie Mellon University

INSTRUMENTED PIPELINE INITIATIVE

Developed algorithms to detect and image flaws in buried pipelines using Time Reversal signal processing.

TIME REVERSAL IMAGING LABORATORY

Developed detection and imaging algorithms for various Radar scenarios (including SAR and

MIMO Radar) that utilize Time Reversal methods in order to improve performance in highly-cluttered scenarios.

- 2007 **SIGNAL PROCESSING ENGINEER**, The MITRE Corporation
Developed target recognition algorithm for airborne GMTI tracking platforms.
- 2005-2006 **CREST INTERN**, U.S. Army CERDEC
Laboratory validation of sensor network technologies for U.S. Army
- 2004 **QUALITY CONTROL INTERN**, Danaher Motion Corporation
Evaluated customer returns to improve process flow and reduce backlog.

TEACHING EXPERIENCE

- 2010 **TEACHING ASSISTANT**, *18-752 Detection, Estimation & Identification*
Carnegie Mellon University
Responsible for guest lectures and grading for PhD level Signal Processing course.
- 2009 **TEACHING ASSISTANT**, *18-491 Digital Signal Processing*
Carnegie Mellon University
Responsible for recitations, and MATLAB homework for undergraduate Signal Processing course.
- 2002-2006 **MATHEMATICS TUTOR**,
Villanova University
Tutored undergraduates in Calculus, Statistics, Linear Algebra, and Differential Equations

AWARDS AND HONORS

- 2007-2010 **NATIONAL DEFENSE SCIENCE AND ENGINEERING GRADUATE FELLOWSHIP**
- 2009 **BEST STUDENT PAPER**, STRUCTURAL ACOUSTICS AND VIBRATIONS TRACK, 157TH MEETING OF THE ACOUSTICAL SOCIETY OF AMERICA
SINGLE-ANTENNA TIME REVERSAL OF GUIDED WAVES IN PIPES
- 2008 **BEST STUDENT PAPER**, 42ND ASILOMAR CONFERENCE ON SIGNALS, SYSTEMS, AND COMPUTERS
SIGNAL-DOMAIN REGISTRATION FOR CHANGE DETECTION IN TIME REVERSAL SAR
- 2006 **FINALIST**, GATES CAMBRIDGE FELLOWSHIP
- DEAN ROBERT D. LYNCH AWARD**, VILLANOVA UNIVERSITY ENGINEERING ALUMNI SOCIETY
- FALVEY SCHOLARS AWARD**, VILLANOVA UNIVERSITY FALVEY MEMORIAL LIBRARY
- COMPUTER ENGINEERING MEDALLION**, VILLANOVA UNIVERSITY DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

DEAN'S AWARD FOR OUTSTANDING SCHOLARSHIP, VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

DEAN'S AWARD FOR MERITORIOUS SERVICE, VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

BRIAN MCCARTHY SENIOR PROJECT AWARD, VILLANOVA UNIVERSITY DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

2006

DEAN'S LIST (8 OF 8 POSSIBLE SEMESTERS), VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

PROFESSIONAL SOCIETIES

Institute of Electrical and Electronics Engineers, Acoustical Society of America, Eta Kappa Nu (Delta-Mu Chapter), Tau Beta Pi (PA Theta Chapter)

VOLUNTEER SERVICE

REVIEWER, IEEE Journal of Selected Topics in Signal Processing

REVIEWER, IEEE Transactions on Aerospace and Electronics Engineering

PRESIDENT, ECE Graduate Student Organization, Carnegie Mellon University

TREASURER, ECE Graduate Student Organization, Carnegie Mellon University

PRESIDENT, Eta Kappa Nu, Delta-Mu Chapter, Villanova University

PUBLICATIONS

Journal Papers

1. O'Donoghue, N; Moura, J.M.F.; "On the Product of Independent Complex Gaussians," submitted to *Transactions on Signal Processing*, 2011.
2. Jin, Yuanwei; Moura, J.M.F.; **O'Donoghue, Nicholas**; "Time Reversal in Multi-Input Multi-Output Radar," *Journal of Selected Topics in Signal Processing*, February 2010.

Conference & Workshop Papers

1. O'Donoghue, N; Moura, J.M.F.; "The Complex Double Gaussian Distribution," submitted to *2012 International Conference on Acoustics, Speech, and Signal Processing (ICASSP '12)*.
2. O'Donoghue, N; Berger, C; Moura, J.M.F.; "A Hybrid-MMSE Approach to Channel Shortening for Underwater Acoustic OFDM," *OCEANS 2011, MTS/IEEE Kona - Oceans of Opportunity*, 19-22 Sep. 2011.
3. O'Donoghue, N; Harley, J.B.; Moura, J.M.F.; "Detection of Targets Embedded in Multipath Clutter with Time Reversal," in *Proc. 2011 International Conference on Acoustics, Speech, and Signal Processing (ICASSP '11)*, Prague: May 22-27, 2011, pp. 3868-3871.
4. O'Donoghue, N; Harley, J; Moura, J.M.F.; "Time Reversal Beamforming of Guided Waves in Pipes with a Single Defect," to appear in *Proc. 44th Annual Asilomar Conference on Signals, Systems, and Computers (Asilomar '10)*, Pacific Grove, CA: November 2010.
5. Jin, Y.; O'Donoghue, N; Moura, J.M.F.; "Time Reversal Adaptive Waveform in MIMO Radar," to appear in *Proc. 2010 Int'l Conf. on Electromagnetics in Adv. Applications (ICEAA '10)*, Sydney: September 2010.

6. Jin, Y; Moura, J.M.F.; **O'Donoghue, N**; Harley, J; "Single Antenna Time Reversal Detection of Moving Target," in *Proc. 2010 International Conference on Acoustics, Speech, and Signal Processing (ICASSP '10)*, Austin, TX: March 14-19, 2010, pp. 3558-3561.
7. Jin, Y.; **O'Donoghue, N**; Moura, J.M.F.; Harley, J; Garrett, J; Oppenheim, I.; Soibelman, L; Ying, Y; He, L; "Cognitive Sensor Network for Structure Defect Monitoring and Classification Using Guided Wave Signals," to appear in *Proc. of 2010 SPIE Smart Structures/NDE Conference*, San Diego, CA, USA: 7-11 March 2010.
8. Ying, Y.; Harley, J.; Garrett, J.H.; Jin, Y.; Moura, J.M.F.; **O'Donoghue, N**; Oppenheim, I.J.; and Soibelman, L.; "Time Reversal for Damage Detection in Pipes," to appear in *Proc. of 2010 SPIE Smart Structures/NDE Conference*, San Diego, CA, USA: 7-11 March 2010.
9. Harley, Joel; **O'Donoghue, Nicholas**; Jin, Yuanwei; Moura, José M.F., "Time Reversal Focusing for Pipeline Structural Health Monitoring," in *Proceedings of Meetings on Acoustics (POMA)*, Vol. 8, January 2010.
10. **O'Donoghue, Nicholas**; Harley, Joel; Moura, José M.F.; Jin, Yuanwei, "Detection of Structural Defects in Pipes using Time Reversal of Guided Waves," to appear in *Proc. 43rd Annual Asilomar Conference on Signals, Systems, and Computers (Asilomar '09)*, Pacific Grove, CA, November 2009.
11. **O'Donoghue, Nicholas**; Harley, J; Moura, J.M.F.; Jin, Y.; Oppenheim, I.; Ying, Y.; States, J.; Garrett, J.; Soibelman, L.; "Single-Antenna Time Reversal of Guided Waves in Pipes, " in *Proceedings of Meeting on Acoustics (POMA)*, Vol. 6, June 2009.
12. Jin, Yuanwei; Moura, José M.F.; **O'Donoghue, Nicholas**, "Experimental Study of Extended Target Imaging by Time Reversal SAR," *Proc. 2009 Int'l Conference on Acoustic, Speech, and Signal Processing (ICASSP '09)*, Taipei, TW, April 18-24, 2009.
13. **O'Donoghue, Nicholas**; Moura, José M.F.; Jin, Yuanwei ; "Signal-Domain Registration for Change Detection in Time-Reversal SAR," in *Proc. 42nd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC '08)*, Pacific Grove, CA, October 2008.
14. Jin, Yuanwei; Moura, José M.F.; **O'Donoghue, Nicholas** ; "Adaptive Time Reversal Beamforming in Dense Multipath Communication Networks," in *Proc. 42nd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC '08)*, Pacific Grove, CA, October 2008.
15. Jin, Yuanwei; **O'Donoghue, Nicholas**; Moura, José M.F.; "Position Location by Time Reversal in Communication Networks," in *Proc. 2008 Int'l Conference on Acoustic Speech and Signal Processing (ICASSP '08)*, Las Vegas, NV, March 30-April 4, 2008, pp.3001-3004.
16. **O'Donoghue, Nicholas A**; Kuklinski, Walter S.; Arabadjis, Constantine ; "Target Recognition using HRR Profile-Based Incoherent SAR (InSAR) Image Formation," in *Proc. 2008 SPIE Conference on Defense & Security*, Orlando, FL, March 2008.
17. Jin, Yuanwei; Moura, José M.F.; **O'Donoghue, Nicholas** ; "Time Reversal Transmission in MIMO Radar," in *Proc. 41st Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC '07)*, Pacific Grove, CA, November 2007, pp.2204-2208.
18. Jin, Yuanwei; Moura, José M.F.; Mulford, Michael; **O'Donoghue, Nicholas**; Samuel, Alphonso ; "Time Reversal Synthetic Aperture Radar Imaging in Multipath," in *Proc. 41st Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC '07)*, Pacific Grove, CA, November 2007, pp.1812-1816.

19. Jin, Yuanwei; Moura, José M.F.; Jiang, Yi; Stancil, Dan; **O'Donoghue, Nick**; "Time Reversal Target Classification from Scattered Radiation," in *Proc. 14th Workshop on Statistical Signal Processing (SSP '07)*, Madison, WI, August 2007, pp.317-321.
20. **O'Donoghue, Nicholas**; Marzella, Doug; Kulkarni, Sarvesh; Sloane, Elliot; "Design and development of a prototype for an inexpensive, multi-node mobile, Palm-PDA-based wireless clinical information system platform," in *Proc. 12th Annual Americas Conference on Information Systems (AMCIS '06)*, Acapulco, August 2006, pp.2735-2740.
21. **O'Donoghue, Nicholas**; Kulkarni, Sarvesh; and Marzella, Doug; "Design and Implementation of a Framework for Monitoring Patients in Hospitals Using Wireless Sensors in Ad Hoc Configuration," in *Proc. 28th Annual Int'l Conf. of the IEEE/EMBS*, New York, September 2006, pp.6449-6452

Non-Archival Conferences and Workshops

1. Jin, Yuanwei; Harley, Joel; **O'Donoghue, Nicholas**; States, Joseph; Ying, Yujie; Garrett, James; Moura, José M.F.; Oppenheim, Irving; Soibelman, Lucio; "Focusing of Ultrasonic Waves in Cylindrical Shells," presented at *7th Int'l Workshop on Structural Health Monitoring (IWSHM '09)*, Stanford, CA, September 2009.

NON-PUBLISHED LECTURES

1. Ying, Y.; Soibelman, L.; Harley, J; **O'Donoghue, N**; Garrett, J.H.;Jin, Y.; Moura, J.M.F.; and Oppenheim, I.J.; "A Data Mining Framework for Pipeline Monitoring Using Time Reversal," presented at *Data Mining for Smarter Infrastructure Workshop*, part of *SIAM Conference on Data Mining (SDM 10)*, Columbus, Ohio, USA: April 2010.
2. Oppenheim, Irving; Harley, Joel; **O'Donoghue, Nicholas**; "Instrumented Pipeline Initiative," presented at *3rd Annual CenSCIR Symposium*, Pittsburgh, PA, May 2009.
3. Jin, Yuanwei; Moura, José M.F.; Stancil, Dan; **O'Donoghue, Nicholas**; "Time Reversal SAR Imaging: Experiments, Simulations and Analysis," presented at *ATR Center Summer Workshop & DARPA MTRM Review*, August 2008.
<https://www.osc.edu/ATRC05232008/monday.html>