

Christopher R. Ratto
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EDUCATION

Duke University, Durham, NC

M.S., Electrical and Computer Engineering

May 2009

Thesis: "A Context-Dependent Approach to Landmine Detection with Ground-Penetrating Radar"

The Catholic University of America, Washington, DC

B.E.E., Bachelor of Electrical Engineering, Summa Cum Laude

May 2007

Minor: Music

Senior Design: "Iterative Design of Frequency Selective Surfaces"

RESEARCH INTERESTS

Digital signal processing, machine learning, pattern classification, and signal detection theory applied to ground-penetrating radar and other sensing applications.

RESEARCH EXPERIENCE

Duke University, Durham, NC

2007-Present

Graduate Research Assistant

Current research is focused on context-dependent signal processing algorithms for landmine detection with ground-penetrating radar (GPR) and other sensing technologies. Context-dependent algorithms incorporate environmental cues into formulating decision rules and feature selection for discriminating landmine signatures from clutter. Algorithms are evaluated using data collected by the NIITEK GPR at several U.S. government test sites. Work is supported by the U.S. Army's Ground-Standoff Mine Detection System – Future Combat Systems (GSTAMIDS-FCS) and Husky Mounted Detection Subsystem (HMDS) programs.

U.S. Naval Research Laboratory, Washington, DC

2006-2007

Student Career Experience Program (SCEP) – Trainee Electronics Engineer

Worked with an interdisciplinary team in developing of a prototype electronic warfare payload for unmanned vessels, including work in hardware integration and real-time software implementation. Supported additional research in near-earth RF propagation for distributed sensor networks.

The Catholic University of America, Washington, DC

2006-2007

Senior Design Project

Developed iterative design procedures for the rapid prototyping of frequency selective surfaces using genetic algorithms and gradient descent optimization.

AWARDS, HONORS, AND CERTIFICATIONS

James B. Duke Fellow, Duke University

2007

Pratt-Gardner Fellow, Duke University

2007

Anthony Scullen Award for Excellent Academic Performance in Engineering, The Catholic University of America

2007

George McDuffie Award for Outstanding Leadership and Academic Performance in Electrical Engineering and Computer Science, The Catholic University of America

2007

Honors in Social Science, University Honors Program, The Catholic University of America

2007

Tau Beta Pi Record Scholar	2007
Fundamentals of Engineering (EIT) Certification, Commonwealth of Virginia	2006
Tau Beta Pi	2006
Phi Eta Sigma	2004

REFERREED JOURNAL PUBLICATIONS

- **Ratto, C.**, Torrione, P., and Collins, L., "*Exploiting Ground-Penetrating Radar Phenomenology in a Context-Dependent Framework for Landmine Detection and Discrimination*," Submitted to IEEE Transactions on Geoscience and Remote Sensing, September 2009, *in review*.

CONFERENCE PROCEEDINGS

- Torrione, P., **Ratto, C.**, and Collins L., "*Multiple Instance and Context-Dependent Learning in Hyperspectral Data*," IEEE 1st Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS), Grenoble, France, August 2009.
- **Ratto, C. R.**, Torrione, P. A., and Collins, L. M., "*Context-Dependent Feature Selection for Landmine Detection with Ground-Penetrating Radar*," Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XIV. Proceedings of the SPIE, 7303-79, April 2009.

CONFERENCE ABSTRACTS AND PRESENTATIONS

- **Ratto, C.**, Torrione, P., and Collins, L., "*Physics-Based Context Identification of Ground-Penetrating Radar Data*," UXO/Countermine/Range Forum, Orlando, FL, August 2009.
- **Ratto, C.**, Torrione, P., and Collins, L., "*Context-Sensitive Fusion for GSTAMIDS*", 12th Annual Landmine and Buried Explosive Object Detection Research Review Meeting, Alexandria, VA, January 2009.
- **Ratto, C.**, Torrione, P., and Collins, L., "*Context-Dependent Feature Selection for Classification of Simulated Ground-Penetrating Radar Data*", Quantitative Methods in Defense and National Security, National Institute of Statistical Sciences, Durham, NC, May 2008.

CONFERENCE SESSION CHAIR

- "Classification Methods in National Defense", Quantitative Methods in Defense and National Security, National Institute of Statistical Sciences, Durham, NC, May 2008.

TEACHING EXPERIENCE

- Teaching Assistant, ECE 281: Random Signals and Noise, Duke University, Fall 2009