

# Danielle C. Tarraf

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## EDUCATION

### Massachusetts Institute of Technology

*Doctor of Philosophy, Mechanical Engineering (Concentration: Control Theory)* 6/2006

Thesis: A finite state machine framework for robust analysis and control of hybrid systems

Advisors: A. Megretski and M. A. Dahleh (EECS Department/Laboratory for Information and Decision Systems)

*Master of Science, Mechanical Engineering* 6/1998

### American University of Beirut

*Bachelor of Engineering, Mechanical Engineering* 7/1996

## PROFESSIONAL EXPERIENCE

### (a) Primary Employment

#### RAND Corporation

*Information Scientist* 7/2016-present

◊ Working on a variety of research projects for the Departments of Defense and Homeland Security. Common themes include:

- Mathematical modeling and analysis of strategic interactions to inform decision-making.
- Defense technologies with emphasis on autonomy, command and control, and cyber and electronic warfare.

◊ Co-leading project teams of up to 20 researchers.

◊ Interfacing with project sponsors and high-level stakeholders to brief research findings and recommendations.

#### Johns Hopkins University

*Assistant Professor, Electrical & Computer Engineering Department* 7/2008-6/2016

◊ Established and led a research program in control theory, particularly as it interfaces with computer science, with motivating applications in autonomy and critical infrastructure networks. Research projects included: Model complexity reduction, robust control, and state estimation for systems over finite alphabets; Verified-by-design finite state machine based control; Robustness of finite alphabet logistic networks; Structural decomposition of dynamic programming problems; Finite alphabet paradigms for mobile autonomy.

◊ Raised \$1,060,702 in grants, interfaced with program managers at sponsoring agencies (NSF, AFOSR).

◊ Recruited and mentored team of student researchers: 1 Postdoc (2010-2011), 2 Ph.D. students (graduated in 2015, 2016), 2 visiting Ph.D. students, 2 M.S. thesis students (graduated in 2012, 2013) and 1 undergraduate student (won the ECE Department 2015 Muly Family Undergraduate Research Award).

◊ Developed and taught courses on: Control systems (Undergraduate); Introduction to linear systems theory (Graduate); Hybrid systems (Graduate); Introduction to robust control (Graduate); Independent studies in dynamic programming and differential games (Graduate).

◊ Served on the departmental strategic planning (2013-2015) and curriculum (2012-2015) committees.

◊ Served on Ph.D. thesis committees for 7 graduate students in Electrical & Computer Engineering, Mathematics, and Applied Math & Statistics. Academically advised 12 Ph.D., 5 M.S. and 19 undergraduate students.

#### California Institute of Technology

*Postdoctoral Scholar, Division of Control & Dynamical Systems* 3/2007-5/2008

◊ Research project: Study of properties of a class of evolving networks.

◊ Course developed and taught: Introduction to Modern Control (Graduate).

#### Massachusetts Institute of Technology

*Postdoctoral Associate, Laboratory for Information & Decision Systems* 8/2006-2/2007

◊ Research project: Relaxations of word problems.

### (b) Visiting Appointments (Selected)

#### Massachusetts Institute of Technology

*Research Affiliate* 9/2016-present

*Visiting Scholar, MIT Institute for Data, Systems and Society* 9/2015-8/2016

#### Air Force Research Lab

*Visiting Faculty, Information Directorate, Cyber Assurance Branch* 5/2016-6/2016

*Summer Faculty Fellow, Space Vehicles Directorate, Guidance, Navigation and Control Program* 6/2015-8/2015

**SKILLS**

- ◇ Programming: Python, Matlab.
- ◇ Languages: English (bilingual proficiency), Arabic (bilingual proficiency), French (working proficiency).

**AWARDS & HONORS**

- ◇ Senior Member of IEEE (2016).
- ◇ Air Force Summer Faculty Fellowship (2015).
- ◇ Johns Hopkins University Alumni Excellence in Teaching Award (2012).
- ◇ Air Force Office of Scientific Research Young Investigator (YIP) Award (2011).
- ◇ National Science Foundation CAREER Award (2010).

**PROFESSIONAL SERVICE & LEADERSHIP (SELECTED)**

- ◇ Member of the Judging Panel for the IBM Watson AI XPrize (2017-present).
- ◇ Member of the IEEE Control Systems Society (CSS) Technical Committee on Hybrid Systems (2015-present).
- ◇ Associate Editor, Nonlinear Analysis: Hybrid Systems, Elsevier (2014-2015).
- ◇ Co-director of the 47<sup>th</sup> Annual Conference on Information Sciences & Systems (2013).
- ◇ Tutorials-workshops co-chair, 22<sup>nd</sup> Mediterranean Conference on Control and Automation (2014).
- ◇ Panelist for the National Science Foundation (2009-2017).
- ◇ Proposal reviewer for the Air Force Office of Scientific Research (2008-2018), Natural Sciences and Engineering Research Council of Canada (2012), and Romanian National Council for Scientific Research (2012).
- ◇ Reviewer for several dozen IEEE, IFAC, ACM and SIAM journals and conferences.

**PUBLICATIONS (SELECTED)**

- ◇ D. Fan and D. C. Tarraf, "Output observability of systems over finite alphabets with linear internal dynamics," IEEE Transactions on Automatic Control, to appear, 2018. Manuscript available at <http://arxiv.org/abs/1607.03193>
- ◇ D. Fan and D. C. Tarraf, "Finite uniform bisimulations for linear systems with finite input alphabets," IEEE Transactions on Automatic Control, vol. 62, no. 8, pp. 4144-4150, August 2017.
- ◇ M. C. Tsakiris and D. C. Tarraf, "Algebraic decompositions of DP problems with linear dynamics," Systems & Control Letters, vol. 85, pp.46-53, November 2015.
- ◇ D. C. Tarraf, "An input-output construction of finite state  $\rho/\mu$  approximations for control design," IEEE Transactions on Automatic control, Special Issue on Control of Cyber-Physical Systems, vol. 59, no.12, pp. 3164-3177, December 2014.
- ◇ D. C. Tarraf and D. Bauso, "Finite alphabet control of logistic networks under discrete uncertainty," Systems & Control Letters, vol. 64, pp. 20-26, February 2014.
- ◇ D. C. Tarraf (Editor), "Control of Cyber-Physical Systems," Lecture Notes in Control and Information Sciences, vol. 449, Springer, 2013.
- ◇ D. C. Tarraf, "A control-oriented notion of finite state approximation," IEEE Transactions on Automatic Control, vol.57, no.12, pp.3197-3202, December 2012.
- ◇ D. C. Tarraf, A. Megretski and M. A. Dahleh, "Finite approximations of switched homogeneous systems for controller synthesis," IEEE Transactions on Automatic Control, vol.56, no.5, pp.1140-1145, May 2011.
- ◇ D. C. Tarraf, A. Megretski and M. A. Dahleh, "A framework for robust stability of systems over finite alphabets," IEEE Transactions on Automatic Control, vol.53, no.5, pp.1133-1146, June 2008.
- ◇ D. C. Tarraf, A. Megretski and M. A. Dahleh, "Finite state controllers for stabilizing switched systems with binary sensors," Editors: G. Buttazzo, A. Bicchi and A. Bemporad, Lecture Notes in Computer Science, vol. 4416, pp.543-557. Springer, April 2007.

*Complete publications list available at:*

Google Scholar Profile: <http://scholar.google.com/citations?user=D-SM10oAAAAJ&hl=en&oi=ao>  
 ResearchGate Profile: [http://www.researchgate.net/profile/Danielle\\_Tarraf](http://www.researchgate.net/profile/Danielle_Tarraf)