

# Jason R. Marden

Post-Doctoral Fellow

Information Science and Technology

California Institute of Technology

Mail Code 136-93

Pasadena, CA 91125

626-395-1788

marden@caltech.edu

[www.its.caltech.edu/~marden/](http://www.its.caltech.edu/~marden/)

## Area of Interest

Feedback control and systems theory. Game theoretic methods for coordination of large scale distributed systems. Application to distributed traffic routing, dynamic resource allocation, queueing systems, and sensor networks.

## Research Experience

2007–present     **Junior Fellow.** Information Science and Technology, California Institute of Technology.  
Supervisors: Prof. John Ledyard and Prof. Adam Wierman

Postdoctoral scholar in the Social and Information Sciences Laboratory. Researching game theoretic methods for coordination of large scale distributed systems.

2006–2007     **Research Scientist.** Dept. of Electrical Engineering, University of Hawaii at Manoa.

Supervisor: Prof. Gürdal Arslan

*Project:* Autonomous Sensor Allocation for Submarine Tracking. Designed an optimal distributed control law to be implemented by several autonomous sensors seeking to maximize the probability of detection of an unknown adversary using evolutionary game theory. Funded by Lockheed Martin / Orincon.

## Education

2007     Doctor of Philosophy in Mechanical and Aerospace Engineering

University of California Los Angeles

Dissertation: *Learning in Large-Scale Games and Cooperative Control.*

Advisor: Jeff S. Shamma

2004     Master of Science in Mechanical Engineering

University of California Los Angeles

Thesis: *Coordination of Multiple Agents Using Neuro-Dynamic Programming.*

Advisor: Jeff S. Shamma

2001     Bachelor of Science in Mechanical Engineering (Cum Laude)

University of California Los Angeles

## Awards and Honors

2007     Outstanding Graduating PhD Student in Mechanical Engineering, UCLA.

2007     Post-Doctoral Fellowship, Caltech. Social and Information Sciences Laboratory.

2001     Graduate Fellowship, UCLA. Department of Mechanical and Aerospace Engineering.

2001     Raytheon Excellent Achievement Award.

## Journal Publications

1. J.R. Marden and A. Wierman, "Distributed Welfare Games," submitted to *Operations Research* special issue on "Computational Economics," 2008.
2. J.R. Marden and J.S. Shamma, "Revisiting Log-Linear Learning: Asynchrony, Completeness and a Payoff-based Implementation," submitted to *Games and Economic Behavior*, 2008.
3. J.R. Marden, G. Arslan and J.S. Shamma, "Connections Between Cooperative Control and Potential Games," to appear as a full paper in *IEEE Transactions on Systems, Man and Cybernetics. Part B: Cybernetics*, 2009.
4. J.R. Marden, H.P. Young, G. Arslan, and J.S. Shamma, "Payoff Based Dynamics for Multi-Player Weakly Acyclic Games," *SIAM Journal on Control and Optimization*, special issue on "Control and Optimization in Cooperative Networks," Volume 48, Issue 1, February 2009, pp. 373-396.
5. J.R. Marden, G. Arslan and J.S. Shamma, "Joint Strategy Fictitious Play with Inertia for Potential Games," *IEEE Transactions on Automatic Control*, Volume 54, Issue 2, February 2009, pp. 208-220.
6. G. Arslan, J.R. Marden and J.S. Shamma, "Autonomous Vehicle-Target Assignment: A Game Theoretical Formulation," *ASME Journal of Dynamic Systems, Measurement and Control*, Volume 129, Issue 5, September 2007, pp. 584-596.
7. J.R. Marden and M. Effros, "The Price of Selfishness in Network Coding," 2009 (in preparation).
8. J.R. Marden and M. Effros, "State Based Potential Games," 2009 (in preparation).
9. J.R. Marden and T. Roughgarden, "Generalized Efficiency Bounds in Dynamic Resource Allocation," 2009 (in preparation).

## Proceedings of Refereed Conferences

1. J.R. Marden and A. Wierman, "Overcoming Limitations of Game-Theoretic Distributed Control," submitted to the *48th IEEE Conference on Decision and Control*, 2009.
2. N. Li, J.R. Marden, and J.S. Shamma, "Learning Approaches to the Witsenhouse Counterexample from a View of Potential Games," submitted to the *48th IEEE Conference on Decision and Control*, 2009.
3. J.R. Marden and M. Effros, "The Price of Selfishness in Network Coding," accepted to the *5th Workshop on Network Coding Theory and Applications*, 2009.
4. H. Chen, J.R. Marden, and A. Wierman, "On the Impact of Heterogeneity and Back-end Scheduling in Load Balancing Designs," accepted to *IEEE Conference on Computer Communications (INFOCOM)*, 2008. (acceptance rate 19%)
5. J.R. Marden and A. Wierman, "Distributed Welfare Games," *Proceedings of the 47th IEEE Conference on Decision and Control*, 2008.
6. J.R. Marden, H.P. Young, G. Arslan, and J.S. Shamma, "Payoff Based Dynamics for Multi-Player Weakly Acyclic Games," *Proceedings of the 46th IEEE Conference on Decision and Control*, 2007.
7. J.R. Marden, G. Arslan and J.S. Shamma, "Connections Between Cooperative Control and Potential Games Illustrated on the Consensus Problem," *Proceedings of the European Control Conference*, 2007.

8. J.R. Marden, G. Arslan and J.S. Shamma, "Regret Based Dynamics: Convergence in Weakly Acyclic Games," *Proceedings of the 2007 International Conference on Autonomous Agents and Multiagent Systems*, 2007. (acceptance rate for full papers < 25%)
9. J.R. Marden, G. Arslan and J.S. Shamma, "Joint Strategy Fictitious Play with Inertia for Potential Games," *Proceedings of the 44th IEEE Conference on Decision and Control*, 2005.

### Lectures and Workshop Presentations

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| 02/2009 | "A Game Theoretic Approach to Network Coding," Information Theory and Applications Workshop, UCSD.   |
| 01/2009 | "Noncooperative Cooperation," Decision and Control Laboratory, Georgia Tech.   |
| 10/2008 | "Revisiting Log-Linear Learning: Asynchrony, Completeness and a Payoff-based Implementation," Workshop on Frontiers in Game Theory and Networked Control Systems, MIT.       |
| 10/2008 | "A Game Theoretic Approach to Network Coding: The Price of Selfish Coding," Caltech.   |
| 09/2008 | "Non-cooperative Cooperation," Department of Computer Science, Stanford.   |
| 09/2008 | "Revisiting Log-Linear Learning: Asynchrony, Completeness and a Payoff-based Implementation," Department of Economics, University of Wisconsin–Madison.                      |
| 07/2008 | "Revisiting Log-Linear Learning: Asynchrony, Completeness and a Payoff-based Implementation," GAMES 2008 – Third World Congress of the Game Theory Society, Northwestern.    |
| 06/2008 | "Non-cooperative Cooperation," Center for Control, Dynamical Systems and Computation, University of California – Santa Barbara.  |
| 01/2008 | "A Game Theoretic Formulation of the Sensor Allocation Problem," <i>Information Science and Technology Seminar</i> , Caltech.  |
| 11/2007 | "A Non-Cooperative Approach to Cooperative Control," <i>2007 SISL/Yahoo! Theory Workshop</i> , Huntington Beach, CA.   |
| 09/2007 | "A Game Theoretic Approach to Cooperative Control," Social and Information Sciences Laboratory Seminar Series, Caltech.  |
| 06/2007 | "Payoff Based Dynamics for Multi-Player Weakly Acyclic Games," <i>18th International Conference on Game Theory</i> , Stony Brook University.                                 |
| 05/2007 | "Learning in Large-Scale Games and Cooperative Control with Applications to Distributed Routing," Department of Electrical Engineering, UCLA.                                |
| 02/2007 | "A Game Theoretic Formulation of the Dynamic Sensor Allocation Problem," <i>7th International Conference on Cooperative Control and Optimization</i> , Gainesville, Florida. |
| 01/2007 | "Connections Between Cooperative Control Problems and Potential Games," Center for Neuromorphic Systems Engineering, Caltech.  |
| 06/2006 | "Joint Strategy Fictitious Play with Inertia for Potential Games," <i>17th International Conference on Game Theory</i> , Stony Brook University.                             |
| 05/2005 | "Joint Strategy Fictitious Play with Inertia for Potential Games," <i>11th Southern California Nonlinear Control Workshop</i> , UCSD.  |
| 05/2005 | " $\delta$ -Passive Joint Strategy Fictitious Play for Potential Games," <i>4th Annual UCLA Systems &amp; Controls Symposium 2005</i> , UCLA.                                |

## Industrial Work Experience

- 2004–present **Engineering Consultant.** InfoLenz Corporation.  
*Project:* Optimization of Manufacturing Plan for Jet Engine Maintenance. Optimized part supply plan for a five year overhaul plan of a fleet of over 500 jet engines by minimizing the number of stocked parts while adhering to a maximum probability of missing a part using neuro-dynamic programming and reinforcement learning. The designed supply plan is currently in the process of being implemented.  
*Project:* Optimization of JEM-EF Maintenance by Neuro-Dynamic Programming. Optimized maintenance policy for the exposure facility of a space station while adhering to system availability requirements and monetary constraints using dynamic and neuro-dynamic programming.
- 2005–2007 **Cofounder and Instructor.** SoCal Test Prep. Los Angeles, CA.  
Cofounded a test preparation company to help students prepare for graduate school entrance exams. Focused on developing students analytical and problem solving skills. SoCal Test Prep instructed approximately 20 students with a high success rate.
- 1998–2007 **Controls Analyst.** Raytheon Systems Corporation, Space and Airborne Systems. El Segundo, CA.  
Developed and implemented a procedure for dynamically balancing a beam steering mirror. Designed and developed an optical analysis program, HexMat, to aid in visualization and sensitivity calculation of any optical system. Received Raytheon Excellent Achievement Award for development of HexMat.

## Teaching Experience

- Winter 2008 *Co-Instructor.* Topics in Algorithmic Game Theory, Caltech.  
Fall 2007 *Co-Instructor.* Queueing Network Games, Caltech.  
Winter 2006 *Teaching assistant.* MAE174 Probability and Statistics, UCLA.  
**Average Reviews: 8.00 / 9** (available upon request)  
Winter 2005 *Teaching assistant.* MAE174 Probability and Statistics, UCLA.  
**Average Reviews: 8.14 / 9** (available upon request)  
Fall 2002 *Teaching assistant.* MAE171A Introduction to Feedback and Control Systems, UCLA.  
**Average Reviews: 8.75 / 9** (available upon request)

## Advising Experience

- 2008–present *Graduate mentor* for Kenneth McKell, University of Hawaii at Manoa, on distributed resource allocation.
- 2007–present *Graduate mentor* for Na Li, Caltech, on game theoretic control of sensor networks.  
2008 *Undergraduate mentor* for Sherwin Doroudi, Caltech, 2008 SURF. A game theoretic approach to the sensor coverage problem.
- 2007 *Undergraduate mentor* for Na Li, UCLA and Zhejiang University, on a game theoretic approach to the team decision problem.
- 2006 *Undergraduate mentor* for Pedram Vaghefinazari, UCLA, on interactive webpage development for distributed traffic control.
- 2004 *Undergraduate mentor* for Matthew W. Messina, UCLA, on development of interactive simulations for undergraduate controls class.

## Professional Services

*Referee for Journals and Conferences:* Conference on Decision and Control (CDC), American Control Conference (ACC), Machine Learning Journal, IEEE Transactions on Control Systems Technology, IEEE Transactions on Automatic Control, Automatica, SIAM Journal on Control and Optimization, ASME Journal of Dynamic Systems, Measurement and Control, International Journal on Game Theory

## References

Professor Jeff S. Shamma  
Dept of Electrical and Computer Engineering  
Georgia Institute of Technology  
Atlanta, GA 30332-0250  
Tel: (404) 894-3148  
shamma@gatech.edu

Professor H. Peyton Young  
Department of Economics  
University of Oxford and  
The Brookings Institution  
Washington, DC 20036  
Tel: (202) 797-6025  
pyoung@brookings.edu

Professor Munther A. Dahleh  
Dept of Electrical Eng. and Computer Science  
Massachusetts Institute of Technology  
Cambridge, MA 02139-4307  
Tel: (617) 253-3892  
dahleh@mit.edu

Professor Adam Wierman  
Department of Computer Science  
California Institute of Technology  
Pasadena, CA 91125  
Tel: (626) 395-6569  
adamw@caltech.edu

Professor Michelle Effros  
Department of Electrical Engineering  
California Institute of Technology  
Pasadena, CA 91125  
Tel: (626) 395-3729  
effros@caltech.edu

Professor William H. Sandholm  
Department of Economics  
University of Wisconsin  
Madison, WI 53706  
Tel: (608) 263-3858  
whs@ssc.wisc.edu