

Mark Richards

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Education

- **Ph.D., Computer Science**, *University of Illinois at Urbana-Champaign*, expected May 2012
GPA: 3.82/4.00
Thesis: Reasoning and Decisions in Partially Observable Games
Advisor: Eyal Amir
- **M.S., Computer Science**, *Brigham Young University*, 2004
GPA: 3.91/4.00
Thesis: Improving Particle Swarm Optimization
Advisor: Dan Ventura
- **B.S., Computer Science**, *magna cum laude*, *Brigham Young University*, 2002
GPA: 3.93/4.00
Minor: Mathematics
- **Research Highlights**
 - Developed a decision-making system to play general, partially observable games by taking games rules in a novel logic description language and automatically generating appropriate artificial intelligence.
 - Implemented a Scrabble-playing agent that makes inferences about an opponent's rack based on previous plays by the opponent. This system outperformed the *de facto* world champion computer system in our experiments and was featured in several media outlets.
- **Coursework Highlights**
artificial intelligence (4), statistics (4), parallel programming (3), numerical analysis (2), linear and non-linear programming, compilers (2), mathematical logic, algorithmic game theory, networks, operating systems (2), software engineering

Refereed Publications

- [Richards and Amir, 2012] Mark Richards and Eyal Amir. Information set sampling in partially observable games. In *AAAI*, Toronto, ON, 2012.
- [Richards and Lathrop, 2011] Mark Richards and Scott Lathrop. A training roadmap for new hpc users. In *TeraGrid*, Salt Lake City, UT, 2011. Best Paper Award.
- [Richards *et al.*, 2010] Mark Richards, Andrew Hsi, Mykolus Dapkus, Daniel Sebastian Pan, and Tom Rudwick. Creating human-like suboptimal players for scrabble. In *Computers and Games*, Louisville, KY, 2010.
- [Richards and Amir, 2009] Mark Richards and Eyal Amir. Information set sampling in general imperfect information positional games. In *IJCAI Workshop on General Intelligence in Game Playing Agents*, Pasadena, CA, 2009.
- [Richards and Amir, 2007] Mark Richards and Eyal Amir. Opponent modeling in scrabble. In *IJCAI*, pages 1482–1487, Hyderabad, India, January 2007.
- [Giunta *et al.*, 2006] Anthony Giunta, Laura Swiler, Brown Shannon, Michael Eldred, Mark Richards, and Eric Cyr. The surfpack software library for surrogate modeling of sparse irregularly spaced multidimensional data. In *11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Portsmouth, Virginia, September 2006. paper AIAA-2006-7049.

[Richards and Ventura, 2004] Mark Richards and Dan Ventura. Choosing a starting configuration in particle swarm optimization. In *Proceedings of the International Joint Conference on Neural Networks*, Budapest, Hungary, July 2004.

[Richards, 2004] Mark Richards. Improving particle swarm optimization. Master's thesis, Brigham Young University, Provo, Utah, February 2004.

[Richards and Ventura, 2003] Mark Richards and Dan Ventura. Dynamic sociometry in particle swarm optimization. In *Proceedings of the Sixth International Conference on Computational Intelligence and Natural Computing*, pages 1557–1560, Cary, North Carolina, September 2003.

Technical Presentations

- *A general game player for partially observable games*, UIUC Graduate Symposium, 2012.
- *A training roadmap for new HPC users*, TeraGrid, Salt Lake City, 2011.
- *Imperfect information games*, Metron Technical Staff, Reston, VA, 2009.
- *Information set sampling*, GIGA Workshop, Pasadena, CA, 2009.
- *Multiple target tracking using Markov Chain Monte Carlo*, Metron, Reston, VA, 2009.
- *Artificial Intelligence and Scrabble* Girls' Adventures in Math, Eng. and Science Camp, UIUC, 2007.
- *Opponent modeling in Scrabble*, IJCAI, Hyderabad, India, 2007.
- *Inferring an opponent's rack in Scrabble* UIUC CS department recruits, 2007.
- *Opponent modeling in Scrabble*, Symposium on decision making under uncertainty, UIUC, 2006.
- *A morphosyntactic parser for Russian*, Statistical NLP class, BYU, 2003.
- *A distributed genetic algorithm using MPI*, Computer networks class, BYU, 2003.
- *A slightly more practical quantum search*, Mini-symposium on quantum computing, BYU, 2003.
- *Building and analyzing empirical models*, Sandia 8th Student Symposium, Albuquerque, NM, 2003.
- *Improving particle swarm optimization*, BYU Spring Research Conference, 2003.
- *A classification scheme for Russian documents*, NLP class, BYU, 2002.
- *Scrabble by Posse*, Multi-agent systems class, BYU, 2002.

In the Media: Articles About My Work

- M. Boon, *The new user's roadmap to HPC*, Internation Science Grid This Week, 24 August 2011.
- L. D. Paulson, *Scrabble Program Wins by Inference*, Computer Magazine, March 2007 issue (Vol. 40, No. 3).
- K. Sackley, *Winning Computer Program Created by Graduate Student Beats World Champion Scrabble Player*, Daily Illini, 28 February 2007.
- D. Graham-Rowe, *Robot Learns to Play Dirty Scrabble*, New Scientist Magazine, issue 2586, 16 January 2007.

Awards, Grants, and Fellowships

- *Mavis Memorial Fund Fellowship* (\$5000), University of Illinois College of Engineering, 2007.
- *NASA Space Grant Fellowship* (\$3000), Rocky Mountain Space Grant Consortium, 2002-03.
- *Heritage/National Merit Scholarship*, Brigham Young University, 1997-02.
- *Computer Programming Champion*, UCET, 1994.
- *Eagle Scout*, Boy Scouts of America, 1993.

Teaching

- **Teaching Assistant**, BYU and UIUC, 2000-present
 - Responsibilities have frequently included developing and grading exams, programming projects, homework sets, and quizzes. Most semesters have included at least some lecturing.
 - Petascale Computing, NCSA, July 2011.
 - Parallel Programming, UIUC, Spring 2007 and Spring 2009.
 - Artificial Intelligence, UIUC, Spring 2008, Spring 2012.
 - Computer Architecture, UIUC, Fall 2005, Spring and Fall 2006.
 - Computer Networks, UIUC, Fall 2005.
 - Theory of Computer Science, BYU, 2003.
 - Operating Systems, BYU, Summer 2002.
 - Discrete Mathematics, BYU, Fall 2000 and Winter 2001.
 - Web Programming (advanced high school students), BYU, Summer 2000.
- **Instructor**, UIUC, Principal Scholars Program, Fall 2008
 - Developed and taught five-week class to area high school students on using PowerPoint to give presentations
- **Instructor**, UIUC, Computer Architecture, Summer 2006
 - Selected and managed course content, including development of new programming assignments, homework, and exams.
 - Emphasized timeliness in coursework feedback, including next-day turnaround on exams.
 - Sent individualized email to each student who missed class.
- **Counselor** *Boy Scouts of America*, 2000-01, 2007-11
 - Contributed over 40 hours of service in developing and teaching classes for computers and communications merit badges.
 - Helped over 100 11- to 15-year-old boys satisfy merit badge requirements.

Mentoring

- Mentored four freshmen from UIUC College of Engineering on project related to general partially observable games, Fall 2011. The students won the award for Best Poster at the end-of-semester symposium.
- Mentored five CS undergraduates on research project to develop human-like computer Scrabble players, Fall 2009 and Spring 2010. The students won the department award for best undergraduate research project (\$600). Results were accepted for publication in peer-reviewed conference.
- Advised CS undergraduate on senior thesis, UIUC, 2008.
- Committed 4-5 hours per week to coach teams of students at Urbana Middle School in FIRST Lego League competition, Fall 2005 and Fall 2006. Led 2006 team to 3rd place overall finish among more than 20 teams, including 1st-place finish in the technical presentation and 4th place in robot performance.
- Completed a weekend of formal training for tutors through BYU's Jacobsen Center, 2002. Provided weekly tutoring for two undergraduates from underrepresented groups.

Academic and Community Service

- **Member** *Fellowship, Assistantship, and Admissions Committee*, UIUC CS Dept. 2007-8
 - Reviewed over 100 applications for admission to graduate programs in the CS department.
 - One of three students selected to committee.
- **Member** *Teaching Evaluation and Improvement Committee*, CS Dept. 2006-7
 - Provided unique perspective as only member who has taught a CS class in the department but is also still

- a student.
 - Helped develop questionnaire for end-of-semester course evaluations.
 - Helped develop guidelines for instructor peer evaluation in department.
- **Judge** *ICTM State Math Contest for Illinois high school students*, annually 2005-10
 - Over 30 hours of judging for oral competitions.
 - Provided feedback on process of selecting appropriate problems for the competition.
- **Chairman** *Cub Scout Committee, Pack 111*, Champaign, IL, 2004-07
 - Managed team of eight adult leaders for pack of 20-25 boys (8- to 10-year-olds).
 - Developed and managed \$1500 annual budget.
 - Planned and conducted monthly activities, including frequent emphasis on activities related to science and engineering.
- **Full-time Church Representative**, Far East Russia, July 1998-June 2000
 - Automated process for production of registration documentation for local government.
 - Organized and taught free English conversation classes to community.
 - Served as translator, interpreter for American colleagues.
 - Managed unit finances.

Software Development Experience

- **NCSA/Shodor Education Foundation** Champaign, IL, 2011-present
Intern (part-time)
 - Proposed and developed a training roadmap for new users in high performance computing. Roadmap provides visual flowchart of necessary skills and tools and includes links to online self-training resources for each topic.
 - Roadmap developed using SVG, HTML, PHP, and MySQL.
 - Work on the training roadmap was published at *TeraGrid* 2011 and received the best paper award.
- **Metron Scientific Solutions** Reston, VA, Summer 2009 and 2010
Intern
 - Researched data association techniques for use in data fusion and multi-target tracking. Presented results to department technical staff. Implemented proposed Markov Chain Monte Carlo algorithm in Java using Eclipse IDE.
 - Proposed and implemented a resource allocation scheme for surveillance application, using dynamic programming.
- **Sandia National Laboratories** Albuquerque, NM, 2003-04
Full-time Technical Staff (2004), Intern (2003)
 - Main developer of Surfpack C++ library for surface-fitting methods.
 - Used GNU autotools, m4, and Bourne shell scripting to create build system.
 - Implemented front-end scripting language using lex and yacc.
 - Developed unit-testing suite using CPPUNIT.
 - Algorithms implemented include linear regression, moving least squares, radial basis functions, Kriging interpolation, multivariate adaptive regression splines
 - Added support for analytical derivatives where applicable.
 - Presented results at student symposium in 2003. Later published in AIAA/ISSMO 2006.
- **Oxford Worldwide Group** Provo, UT, Summer and Fall 2001
Intern
 - Worked independently to design and implement neural network for proprietary biometric application.
 - Used Microsoft Visual Studio C++ for development and debugging.

- **Pack 111 Prairielands Council BSA**, Champaign, IL, 2004-07
Committee Chairman
 - Developed race management software for annual Pinewood Derby races, using PHP and MySQL. System significantly increased throughput while simultaneously increasing probability that the fastest cars would win the awards, compared to previous method.

References

- Eyal Amir, Associate Professor of Computer Science
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- Scott Lathrop, XSEDE Director for Education and Outreach
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- Chris Husband, Analyst (formerly with Metron)
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