

Stephen M. Majercik

Computer Science Department

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Research Interests

I am interested in developing efficient algorithms for planning, reasoning, and learning in uncertain environments (uncertain initial conditions, probabilistic effects of actions, uncertain state estimation). I have developed and am extending a new planning technique that solves a general class of probabilistic planning problems at state-of-the-art speeds by converting the planning problem into a stochastic satisfiability instance and solving that problem instead. I am also investigating the nature of the stochastic satisfiability problem itself and developing efficient techniques for solving instances of such problems. Finally, I am interested in human-computer collaborative problem solving; currently I am developing a framework for incorporating human advice into a reinforcement learning framework.

Employment

- Assistant Professor, Bowdoin College, Brunswick, Maine, 2000-Present.
- Research Assistant, Duke University, Durham, North Carolina, 1997-2000.
- Graduate Research Assistant, Glaxo Wellcome, Inc., Research Triangle Park, North Carolina, 1996-1997.
- Instructor, University of Southern Maine, Portland, Maine, 1993-1994.
- Business Manager, Portland Stage Company, Portland, Maine, 1986-1987.
- Financial Analyst, Tri-Star Pictures, Inc., New York, New York, 1983-1986.
- Associate Senior Business Analyst, Westinghouse Broadcasting and Cable, Inc., New York, New York, 1981-1983.

Education

- Ph.D. in Computer Science, Duke University, 2000.
Thesis Title: *Planning Under Uncertainty via Stochastic Satisfiability*
Advisor: Michael L. Littman
- M.S. in Computer Science, University of Southern Maine, 1994.
Thesis Title: *Structurally Dynamic Cellular Automata*
Advisor: Stephen A. Fenner

- M.B.A. in Finance, Yale School of Management, 1981.
- M.F.A. in Theatre Administration, Yale School of Drama, 1981.
- A.B. *cum laude* in Government, Harvard University, 1977.

Refereed Publications

Stephen M. Majercik and Byron Boots. DC-SSAT: A Divide-and-Conquer Approach to Solving Stochastic Satisfiability Problems Efficiently. In *Proceedings of the Twentieth National Conference on Artificial Intelligence*, 416-422. The AAAI Press, 2005.

Stephen M. Majercik. APPSSAT: Approximate Probabilistic Planning Using Stochastic Satisfiability. In *Symbolic and Quantitative Approaches to Reasoning with Uncertainty*, Lluís Godo, ed., Lecture Notes in Computer Science, eds. J.G. Carbonell and J. Siekmann, v. 3571, 209-220. Springer, 2005.

Stephen M. Majercik. Nonchronological backtracking in stochastic Boolean satisfiability. In *Proceedings of the Sixteenth International Conference on Tools With Artificial Intelligence*, 498-507. IEEE Press, 2004.

Stephen M. Majercik and Michael L. Littman. Contingent planning under uncertainty via stochastic satisfiability. *Artificial Intelligence Journal Special Issue on Planning With Uncertainty and Incomplete Information*, 147(1-2):119-162, 2003.

Stephen M. Majercik and Andrew P. Rusczeck. Faster probabilistic planning through more efficient stochastic satisfiability problem encodings. In *Proceedings of the Sixth International Conference on Artificial Intelligence Planning and Scheduling*, 163-172, AAAI Press, 2002.

Michael L. Littman, Stephen M. Majercik, and Toniann Pitassi, Stochastic Boolean satisfiability. *Journal of Automated Reasoning*, 27(3):251-296, 2001.

Stephen M. Majercik and Michael L. Littman. Contingent planning under uncertainty via stochastic satisfiability. In *Proceedings of the Sixteenth National Conference on Artificial Intelligence*, 549-556. The AAAI Press/The MIT Press, 1999.

Stephen M. Majercik. Planning under uncertainty via stochastic satisfiability. In *Proceedings of the Sixteenth National Conference on Artificial Intelligence*, 950. The AAAI Press/The MIT Press, 1999. Presented at the SIGART/AAAI-99 Doctoral Consortium.

Stephen M. Majercik and Michael L. Littman. Using caching to solve larger probabilistic planning problems. In *Proceedings of the Fifteenth National Conference on Artificial Intelligence*, 954-959. The AAAI Press/The MIT Press, 1998.

Stephen M. Majercik and Michael L. Littman. MAXPLAN: A new approach to probabilistic planning. In *Proceedings of the Fourth International Conference on Artificial Intelligence Planning Systems*, 86-93. AAAI Press, 1998.

Michael L. Littman and Stephen M. Majercik. Large-scale planning under uncertainty: A survey. In *NASA International Workshop on Planning and Scheduling for Space Exploration and Science*, 27:1-8, 1997.

Unrefereed Publications

Stephen M. Majercik. APROPOS²: Approximate probabilistic planning out of stochastic satisfiability. In *Papers from the AAAI Workshop on Probabilistic Approaches in Search* (held at the Eighteenth National Conference on Artificial Intelligence), pages 29-34. AAAI Press, 2002.

Stephen M. Majercik. Planning under uncertainty via stochastic satisfiability. In *Proceedings of the AAAI Fall Symposium on Using Uncertainty Within Computation*, pages 83-84, 2001.

Stephen Michael Majercik. *Planning Under Uncertainty via Stochastic Satisfiability*. PhD thesis, Department of Computer Science, Duke University, September 2000.

Stephen M. Majercik and Michael L. Littman. Approximate planning in the probabilistic-planning-as-stochastic-satisfiability paradigm. In *Second NASA International Workshop on Planning and Scheduling for Space*, pages 60-66, 2000.

Stephen M. Majercik and Michael L. Littman. ZANDER: A model-theoretic approach to planning in partially observable stochastic domains. In *Working Notes of the Workshop on Model-Theoretic Planning*, pages 48-54, Breckenridge, CO, 2000. Held in conjunction with AIPS-2000.

Stephen M. Majercik. C-MAXPLAN: Contingent planning in the MAXPLAN framework. In *Proceedings of the AAAI Spring Symposium on Search Techniques for Problem Solving Under Uncertainty and Incomplete Information*, pages 83-88, Stanford, CA, 1999.

Stephen M. Majercik and Michael L. Littman. MAXPLAN: A new approach to probabilistic planning. In *Proceedings of the AAAI Fall Symposium on Planning with Partially Observable Markov Decision Processes*, pages 121-128, Orlando, FL, 1998.

Stephen M. Majercik and Michael L. Littman. Probabilistic planning with MAXPLAN. In *Working Notes of the Workshop on Planning as Combinatorial Search*, pages 85-88, Pittsburgh, PA 1998. Held in conjunction with AIPS-98.

Stephen M. Majercik and Michael L. Littman. Reinforcement learning for selfish load balancing in a distributed memory environment. In Paul P. Wang, editor, *Proceedings of the International Conference of Information Sciences*, volume 2, pages 262-265, 1997.

Stephen M. Majercik. Structurally dynamic cellular automata. Master's thesis, Department of Computer Science, University of Southern Maine, August, 1994.

Teaching Experience

- Assistant Professor, Bowdoin College, 2000-Present.
Courses taught:
 - *Introduction to Computer Science*
 - *Algorithms*
 - *Theory of Computation*
 - *Optimization and Uncertainty in Artificial Intelligence*
 - *Robotics*
 - *Cryptography and Network Security*
 - *Independent Studies and Honors Projects:*
 - Melissa Perrin, *Using Negative Advice Effectively in a Reinforcement Learning Framework*, Honors Project, 2004-05.
 - Phillippe Alepin, *Using Genetic Programming to Solve Stochastic Satisfiability Problems*, Independent Study, Spring, 2005.
 - Byron Boots, *Chunking: A Modified Dynamic Programming Approach to Solving Stochastic Satisfiability Problems*, Honors Project, 2002-03.
 - Erica Johnson, *Recognizing Useful Advice and Using it Efficiently in a Reinforcement Learning Framework*, Honors Project, 2002-03.
 - William Day, *An AI/OR Hybrid Model for Stochastic Satisfiability*, Independent Study, Spring, 2003.
 - Andrew Rusczyk, *Toward Practical Planning Under Uncertainty via Stochastic Satisfiability*, Honors Project, 2001-02.
 - Joshua Peteet, *Incorporating Advice in a Reinforcement Learning Framework for a Robotic Agent*, Honors Project, 2001-02.
 - Adam Greene, *Using Neural Networks to Classify the HIV Antiviral Properties of Chemical Compounds*, Independent Study, Fall, 2001.
 - Homa Mojtabai, *Optimization and Uncertainty in Artificial Intelligence*, Independent Study, Spring, 2001.
- Teaching Assistant and Guest Lecturer, Duke University, 1995-1998.
Lectured on various topics in Artificial Intelligence and Scientific Computing.
- Instructor, University of Southern Maine, 1993-1994.
Courses taught:
 - *Structured Problem Solving*
 - *Algorithms in Programming*
- Teaching Assistant, University of Southern Maine, 1990-1993.
Helped develop and taught two sections of a programming laboratory course; graded assignments and conducted review sessions for numerous courses.

Invited Talks

- *Planning Under Uncertainty via Stochastic Satisfiability*, University of Southern Maine, Portland, Maine, 2002.
- *Planning Under Uncertainty via Stochastic Satisfiability*, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1999.
- *Planning Under Uncertainty via Stochastic Satisfiability*, Honeywell Technology Center, Minneapolis, Minnesota, 1999.
- *Probabilistic Planning as Probabilistic Satisfiability*, NASA Ames Research Center, Moffett Field, California, 1999.

Fellowships and Honors

- SURDNA Summer Research Fellowship for Oliver Radwan, Faculty Sponsor, 2005.
- SURDNA Summer Research Fellowship for Melissa Perrin, Faculty Sponsor, 2004.
- SURDNA Summer Research Fellowship for Byron Boots, Faculty Co-Sponsor, 2002.
- James Stacy Coles Undergraduate Research Fellowship for Andrew Rusczyk, Faculty Sponsor, 2001.
- NASA Graduate Student Research Program Fellowship, NASA Ames Research Center, 1998--2000.
- Honorable Mention, Department of Defense Graduate Fellowship Competition, 1995.
- Computer Science Department Fellowship, Duke University, 1994--95.
- Honorable Mention, National Science Foundation Graduate Research Fellowship Competition, 1994.
- Phi Kappa Phi Honor Society, University of Southern Maine, 1993.
- Senior Thesis awarded honors *magna cum laude*, Harvard University, 1977.

Professional Activities

- Workshop on Bridging the Gender Gap for Girls and Women in Computing, Participant, University of Southern Maine, 2004.
- Workshop on Gender Issues in the Sciences, Participant, Colby College, 2003.
- Planning Committee for the First ICAPS Probabilistic Planning Competition, Member.
- Referee: Journal of Artificial Intelligence, Journal of Computational Intelligence, International Joint Conference on Artificial Intelligence (2003, 1999), AAI Workshop on Probabilistic Approaches in Search (2002), Second International Workshop on Quantified Boolean Formulae (2002), European Conference on Artificial Intelligence (2002), Maine Space Grant Consortium Seed Grant Program (2001), Joint Conference on the Science and Technology of Intelligent Systems (ISIC/CIRA/ISAS) (1998).
- Program Committees: AAI Workshop on Probabilistic Approaches in Search (2002), Second International Workshop on Quantified Boolean Formulae (2002).
- Council on Undergraduate Research, Member, 2000--Present.

- Triangle Area Neural Network Society, Membership Chair, 1998--2000.

Bowdoin College Service

- Recording Committee, Member, 2001-2003, 2004-Present.
- Pre-Major Student Advisor, 2001-2003, 2004-Present.
- Mellon Mays Undergraduate Fellowship Program, Mentor, 2003.
- Faculty evaluator of Chief Information Officer candidates, 2003.
- Participant in Panel for Judicial Board Training, 2003.
- Participant in 2003 Faculty Search for Computer Science Department that successfully recruited the department's first female member.
- Faculty Advisor for Goldwater Scholarships and Churchill Scholarships, 2003-03. William Klemm won a Goldwater Scholarship and Monica Skoge, Bowdoin's first-ever nominee for a Churchill Scholarship, was a finalist in that competition.
- Participated in Computer Science Department Retreat to discuss the future of the department, 2002.
- Hewlett Discussion Group on TIME, Participant, 2001.
- Dinner for Prospective Applicants of Color, Faculty Host, 2000.
- Letters to Prospective Bowdoin College Applicants, 2000.