# Stephen M. Majercik

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## *Research Interests*

- Nature inspired computation:
    - Swarm intelligence
    - Particle Swarm Optimization
- Computation and the arts:
    - Artificial intelligence techniques applied to the arts
    - Technology as an expressive medium

## *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.

## *Professional Experience*

- Associate Professor, Bowdoin College, Brunswick, Maine, 2007-Present,
  Department Chair, 2007-2011.
- Assistant Professor, Bowdoin College, Brunswick, Maine, 2000-2007.
- Research Assistant, Duke University, Durham, North Carolina, 1997-2000.
- Research Assistant, Glaxo Wellcome, Inc., RTP, 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.

## *Publications*

**Book Chapters**

Stephen M. Majercik.  Stochastic satisfiability.  In *Handbook of Satisfiability*, eds. Armin Biere, Marijn Heule, Hans van Maaren and Toby Walsch, pp. 887-925, IOS Press, 2009.

**Journal Articles**

Stephen M. Majercik.  Alternative Topologies for GREEN-PSO.  Invited article in *Computational Intelligence: Revised and Selected Papers of the International Joint Conference, IJCCI 2013, Vilamoura, Portugal, September 20-22, 2013*, eds. K. Madani, A. D. Correia, A. Rosa, J. Filipe, and J. Kacprzyk, pp.155-171, Springer, 2016.

Stephen M. Majercik.  APPSSAT:  Approximate probabilistic planning using stochastic satisfiability.  Invited article in *International Journal of Approximate Reasoning*, 45(2):  pages 402-419, Elsevier Publishing, 2007.

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):  pages 119-162, Elsevier Publishing, 2003.

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

**Peer-Reviewed Conference Proceedings**

Frank Mauceri and Stephen M. Majercik.  A swarm environment for experimental performance and improvisation.  In *Proceedings of EvoMUSART: The 6th International Conference on Computational Intelligence in Music, Sound, Art and Design*, Lecture Notes in Computer Science, v. 10198, pp. 190-200, Springer, 2017.

Stephen M. Majercik.  Using Fluid Neural Networks to create dynamic neighborhood topologies in Particle Swarm Optimization.  In *Proceedings of the Ninth International Conference on Swarm Intelligence*, Lecture Notes in Computer Science, v. 8667, pp. 270-277, Springer, 2014.

Stephen M. Majercik.  GREEN-PSO: Conserving function evaluations in Particle Swarm Optimization.  In *Proceedings of the Fifth International Conference on Evolutionary Computation Theory and Applications*, pp. 160-167, 2013.

Stephen M. Majercik.  Initial experiments in using communication swarms to improve the performance of swarm systems.  In Proceedings of the Sixth International Workshop on Self-Organizing Systems, Lecture Notes in Computer Science, v. 7166, pp. 109-114, Springer, 2012.

William K. Richard and Stephen M. Majercik. Swarm-based path creation in dynamic environments for search and rescue. In Proceedings of the Fourteenth International Conference on Genetic and Evolutionary Computation, pp. 1401-1402, ACM, 2012.

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, pages 416-422, AAAI Press, 2005.

Stephen M. Majercik. APPSSAT: Approximate probabilistic planning using stochastic satisfiability. In Symbolic and Quantitative Approaches to Reasoning with Uncertainty, Lluis Godo, ed., Lecture Notes in Artificial Intelligence, eds. J.G. Carbonell and J. Siekmann, v. 3571, pages 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, pages 498-507, IEEE Press, 2004.

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

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. Contingent planning under uncertainty via stochastic satisfiability. In Proceedings of the Sixteenth National Conference on Artificial Intelligence, pages 549-556, AAAI Press/MIT Press, 1999.

Stephen M. Majercik. Planning under uncertainty via stochastic satisfiability. In Proceedings of the Sixteenth National Conference on Artificial Intelligence, page 950, AAAI Press/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, pages 954-959, AAAI Press/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, pages 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, pages 27: 1-8, 1997.

**Other Publications**

Stephen M. Majercik. APROPOS[2]: 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. Ph.D. thesis, Department of Computer Science, Duke University, September 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 (held at the Fifth International Conference on Artificial Intelligence Planning and Scheduling), pages 48-54, 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, 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, 1998.

Stephen M. Majercik and Michael L. Littman. Probabilistic planning with MAXPLAN. In Working Notes of the Workshop on Planning as Combinatorial Search (held at the Fourth International Conference on Artificial Intelligence Planning Systems), pages 85-88, 1998.

Stephen M. Majercik and Michael L. Littman. Reinforcement learning for selfish load balancing in a distributed memory environment. In Proceedings of the International Conference of Information Sciences, Paul P. Wang, ed., v. 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.

## *Non-Conference Presentations*

- Member of panel on *Artificial Intelligence,* Maine Calling, Maine Public Broadcasting Network, 2015
- *Nature Inspired Optimization Techniques*, Williams College, Williamstown, Massachusetts, 2014.
- *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.

## *Teaching Experience*

- Bowdoin College, 2000-Present.
  Courses taught:
  - *Introduction to Computer Science*
  - *Data Structures*
  - *Algorithms*
  - *Theory of Computation*
  - *Artificial Intelligence*
  - *Nature Inspired Computation*
  - *Optimization and Uncertainty in Artificial Intelligence*
  - *Artificial Intelligence and Computer Games*
  - *Robotics*
  - *Cryptography and Network Security*
  - *Capstone Experience: Cryptography and Network Security*
  - *Independent Studies and Honors Projects*:
    - Bridget Went, *Creating a Virtual Environment for Language Learning*, Collaborative Independent Study (with Clarissa Hunnewell), Spring 2017.
    - Clarissa Hunnewell, *Creating a Virtual Environment for Language Learning*, Collaborative Independent Study (with Bridget Went), Spring 2017.
    - Sophia Ardell, *Evolving Behavior Trees for Flocking*, Independent Study, Spring 2017.
    - Dominick Sanchez, *DS-PSO: Combining Static and Dynamic Neighborhood Topologies for Particle Swarm Optimization*, Honors Project, Fall 2016, Spring 2017.
    - Laura Griffee, *Computing and the Media Arts*, Synthesizing Project for a Self-Designed Major, Fall 2016, Spring 2017.
    - John Truskowski, *Creating Visual Output for Swarm-PI*, Independent Study, Fall 2016.
    - Juliet Eyraud, *Place-Based Computer Science Education for New Mainers,* Computer Science/Education Independent, Spring and Fall 2016 (co-advisor).
    - Grace Handler, *Modeling Memory in Swarm Performance and Improvisation (Swarm-PI)*, Independent Study, Spring 2016.
    - John Truskowski, *Making Swarm Performance and Improvisation (Swarm-PI) Self-Reflective*, Independent Study, Spring 2016.
    - Konstantine Mushegian, *Enhancing the Robocup Team Logging System*, Independent Study, Spring 2015.
    - Daniel Navarro, *Creating a Simulator for Robotic Behaviors in Robocup*, Independent Study, Spring 2015.

- Ahn Hoang, *Lattice-Based Dynamic Neighborhood Topologies for Particle Swarm Optimization*, Independent Study, Fall 2014.
- Gabrielle Grandin, *Using Probability Matrices for Neighborhood Creation in Particle Swarm Optimization*, Independent Study, Fall 2014.
- Julia Hogan, *Mobile Computing*, Independent Study, Fall 2014.
- Anh Hoang, *Developing Dynamic Neighborhoods for Particle Swarm Optimization*, Independent Study, 2014.
- Kuangji Chen, Ren Ding, Ruben Martinez, David Phipps, and Judy Yang, *Physical Computing*, Independent Studies, 2012-13.
- William Richard, *Using Swarm Intelligence for Search and Rescue*, Honors Project, 2010-11.
- John Burlinson, *Using Pheromones in a Swarm-Based Music Improvisation System*, Honors Project, 2009-10.
- Oliver Radwan, *BD-SSAT: Combining Systematic and Local Search to Solve Stochastic Boolean Satisfiability Problems*, Honors Project, 2007-08.
- Christopher Antoun and Matthew Antoun, *Using Genetic Algorithms to Evolve a Neural Network Controller for Robocode*, Independent Study, 2007.
- Oliver Radwan, *Developing Autonomous State Creation in Artificial Agents*, Independent Study, Spring 2006.
- Melissa Perrin, *Using Negative Advice Effectively in a Reinforcement Learning Framework*, Independent Study, 2004-05.
- Phillippe Alepin, *Using Genetic Programming to Solve Stochastic Satisfiability Problems*, Independent Study, 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, 2003.
- Andrew Rusczek, *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, 2001.
- Homa Mojtabai, *Optimization and Uncertainty in Artificial Intelligence*, Independent Study, 2001.

- University of Southern Maine, 1993-1994.
    - Courses taught:
        - *Structured Problem Solving*
        - *Algorithms in Programming*

## *Funding and Fellowships*

- Bowdoin College Faculty Leave Award, 2017-18.
- HP Technology for Teaching Grant, "Round Table: Problem-Based Learning with Tablets to Engage Heterogeneous Learners in CS 101," 2007.
- Bowdoin College Faculty Research Grant, 2003-06.
- Bowdoin College Faculty Leave Supplement, 2003-04.
- NASA Graduate Student Research Program Fellowship, NASA Ames Research Center, 1998-2000.
- Computer Science Department Fellowship, Duke University, 1994-95.

### *Student Summer Research Fellowships*:

- Bowdoin Faculty Scholarship, Sophia Ardell, 2017.
- SURDNA Summer Research Fellowship, Christopher MacDonald, 2015.
- Kibbe Science Fellowship, John Truskowski, 2015.
- Bowdoin Summer Research Fellowship, Grace Handler, 2015.
- Clare Boothe Luce Fellowship, Gabrielle Grandin, 2014.
- Gibbons Summer Research Internship, Ruben Martinez, 2013.
- Maine Space Grant Consortium Fellowship, William Richard, 2010.
- Maine Space Grant Consortium Fellowship, John Burlinson, 2009.
- Gibbons Summer Research Internship, Octavian Neamtu, 2009.
- SURDNA Summer Research Fellowship, Oliver Radwan, 2007.
- James Stacy Coles Undergraduate Research Fellowship, Mark McGranaghan, 2006.
- SURDNA Summer Research Fellowship, Oliver Radwan, 2005.
- SURDNA Summer Research Fellowship, Melissa Perrin, 2004.
- SURDNA Summer Research Fellowship, Byron Boots, 2002.
- James Stacy Coles Undergraduate Research Fellowship, Andrew Rusczek, 2001.

## *Professional Activities*

- Referee:
  - Journals: Artificial Intelligence Journal, Information Journal, Journal of Cellular Automata, Journal of Computational Intelligence, Journal of Neural Computing and Applications, Journal of Educational Resources in Computing.
  - Conferences and Workshops: International Joint Conference on Computational Intelligence (2017), International Conference on Swarm Intelligence (2014, 2016), Ant Colony Optimization and Swarm Intelligence track at the Genetic and Evolutionary Computation Conference (2014, 2015, 2016, 2017), International Conference on Evolutionary Computation Theory and Applications (2014, 2015, 2016, 2017), International Joint Conference on Artificial Intelligence (1999, 2003), AAAI Workshop on Probabilistic Approaches in Search (2002), Second International Workshop on Quantified Boolean Formulae (2002), European Conference on Artificial Intelligence (2002), Educational Advances in Artificial Intelligence, at the International FLAIRS Conference (2005, 2006, 2007, 2010, 2011), Symposium on Educational

Advances in Artificial Intelligence (2010, 2011), Joint Conference on the Science and Technology of Intelligent Systems (ISIC/CIRA/ISAS) (1998).

- ♦ Grants: National Science Foundation (2015), Civilian Research and Development Foundation (2005), Maine Space Grant Consortium Seed Grant Program (2001, 2006).

- Program Committees: International Joint Conference on Computational Intelligence (2017), International Conference on Swarm Intelligence (2014, 2016), Ant Colony Optimization and Swarm Intelligence track at the Genetic and Evolutionary Computation Conference (2014, 2015, 2016, 2017), International Conference on Evolutionary Computation Theory and Applications (2014, 2015, 2016, 2017), AAAI Workshop on Probabilistic Approaches in Search (2002), Second International Workshop on Quantified Boolean Formulae (2002), Educational Advances in Artificial Intelligence, at the International FLAIRS Conference (2005, 2006, 2007, 2010, 2011).
- Planning Committee for the First ICAPS Probabilistic Planning Competition.
- Workshop on Bridging the Gender Gap for Girls and Women in Computing, University of Southern Maine, 2004.
- Council on Undergraduate Research, Member, 2000-04.
- Workshop on Gender Issues in the Sciences, Colby College, 2003.
- Triangle Area Neural Network Society, Membership Chair, 1998-2000.

## *Bowdoin College Service*

- Committees:
  - o Student Fellowships Committee, 2014-17; Chair, 2016-17.
  - o Committee on Appointments, Promotions, and Tenure, 2012-2014.
  - o Steering Committee for the Bowdoin Computational Studies Initiative, 2012
  - o Board of Trustees Information Technology Advisory Committee, 2008-09, 2010-11
  - o Faculty Resources Committee and Faculty Development Committee, 2007-2009.
  - o Student Information Systems Core Group, 2007-2008.
  - o Recording Committee, 2001-03, 2004-07.
- Search Committees:
  - o Assistant Dean of Students for Community Standards/Advisor to the Judicial Board, 2017.
  - o Senior Associate Dean of Student Affairs, 2014.
  - o Tenure-Track Faculty Member in Computer Science Department, 2003, 2006, 2009, 2015, 2017.
  - o Director of the Bowdoin College Museum of Art, 2008-09.
  - o *Ad hoc* committees for various faculty and staff searches
- Working Groups, Panels, and Discussion Groups:
  - o Romney Associates Workshops on Diversity in Hiring
  - o Panel on Interactive Computing in the Classroom
  - o Explaining Complex Concepts Workshop
  - o Working Group on helping under-prepared students in the sciences.
  - o Working Group on techniques for increasing student participation in the classroom.

- o Faculty Panel for Judicial Board Training.
- o Hewlett Discussion Group on Time.
- Advising:
  - o BASE (Bowdoin Advising Program in Support of Academic Excellence) Advisor, 2015-2017.
  - o Faculty Advisor for Reed House, 2008-2011.
  - o Peer Advising Pilot Program, 2008-09.
  - o 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.
  - o Mellon Mays Undergraduate Fellowship Program Mentor, 2003.
- Computer Science Lab Leader, Bowdoin Science Experience: 2006, 2009, 2010, 2013.
- Computer Science Department Retreats: 2002, 2005, 2007, 2015.
- Speaker:
  - o Association of Bowdoin Friends Community Lecture Series, *Computers and Music:  Using Virtual Swarms to Program a Computer to Play Music with a Human*, March, 2011.
  - o Faculty Seminar Series, *Achieving Goals with Chancy Logic:  Planning Under Uncertainty Using Stochastic Satisfiability*, October, 2007.
  - o Presenter at the "Connecting Research and Student Learning" session at the Beneath the Pines program, 2006.