

Daniel L. Bryce

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Research Interests

Artificial Intelligence: Automated plan synthesis, plan execution, heuristic search, Markov decision processes, multi-criterion decision making, agents, scheduling, and knowledge-based learning.

Degrees

Ph.D. in Computer Science (2002-2007) *Arizona State University, Tempe, AZ, USA.*

Dissertation: Scalable Planning Under Uncertainty

Best Dissertation Award: International Conference on Automated Planning and Scheduling, 2009

Advisor: Subbarao Kambhampati

B.S. in Computer Science (1997-2001) *Arizona State University, Tempe, AZ, USA.*

Experience

Fall 2008 - present: Assistant Professor

Utah State University, Department of Computer Science, Logan, UT.

As a tenure track assistant professor in the computer science department at Utah State University, my duties include research, teaching, and service in artificial intelligence and systems biology.

Spring 2008: Visiting Lecturer

Stanford University, Department of Computer Science, Stanford, CA.

I co-taught CS227: Reasoning Methods in Artificial Intelligence with Neil Yorke-Smith. The course covers topics including SAT, CSP, temporal reasoning, and planning with a heavy emphasis on course projects. I developed and delivered lectures on planning, including the topics of classical planning, resource and temporal planning, planning under uncertainty, and planning and scheduling.

Summer 2007 - Fall 2008

SRI International, Artificial Intelligence Center, Menlo Park, CA.

As a member of the Artificial Intelligence Center, my duties included research and management on existing projects, business development and proposal writing for near-term projects, and self-directed research on topics relevant to future projects. My research activities included the design of meta-control algorithms for learning and agent architectures as part of the DARPA Bootstrapped Learning program. As part of the same program, I was responsible for managing both internal software engineers and external industry and academic researchers. My proposal writing activities include individual past efforts within NIH and DARPA programs, and past group efforts on DARPA programs. My self-directed research focussed on making AI systems more user-friendly by designing algorithms that accommodate ambiguous and ill-defined domain models.

2002 - 2007: Research Assistant

Arizona State University, Yochan Research Group, Dept. of Computer Science and Engineering, Tempe, AZ.

As part of the Yochan Research Group, I conducted research, participated in writing proposals, and mentored junior graduate students. As part of my research, I developed a set heuristic computation techniques and

heuristic search algorithms for planning with state and action uncertainty. I contributed to proposal writing and research on NSF and DARPA programs and worked with junior graduate students, where one highlight was having a co-authored conference paper nominated for a best paper award.

Summer 2006: Research Fellow

Honeywell Labs, Minneapolis, MN.

While working with Dr. David Musliner, I performed research on meta-computation of heuristics in heuristic search. A major result of fellowship was the design of a Monte Carlo heuristic based on common samples, which improved theoretical complexity and empirical performance of a heuristic search algorithm. The results are contained in a forthcoming journal submission.

Summer 2005: Research Intern

Honeywell Labs, Minneapolis, MN.

I collaborated with Dr. David Musliner to develop a planner for UAV reconnaissance in the DARPA HURT program. The project involved domain modeling and an integration of the NASA Intelligent Distributed Execution Architecture (a symbolic planner) with specialized route planners (using geometric reasoning). The program was awarded the **2006 Distinguished Engineering Project Achievement Award** by the San Fernando Valley Engineers' Council.

Fall 2004: Volunteer Teaching Assistant

Department of Computer Science and Engineering, Arizona State University, Tempe, AZ, USA.

I assisted in the instruction for the graduate level *Planning and Learning Methods in AI* course, taught by Subbarao Kambhampati. My duties included advising students on course research projects and grading. The projects I advised included an analysis of trade-offs between boolean and multi-valued variable state representations, a study of using graphics processing units for heuristic computation in heuristic search, and a study of translating non-deterministic plans to stochastic plans.

Summer 2004: Research Intern

MCT/NASA Internship Program, NASA Ames Research Center, Moffett Field, CA.

I collaborated with Dr. David E. Smith to study planning with resources, and uncertain actions. A notable result of the internship was an Artificial Intelligence Journal article that applies Monte Carlo sampling to solving relaxed planning problems in order to compute search heuristics.

Summer 2003: Research Intern

NASA RIACS/Ames Student Summer Research Program, NASA Ames Research Center, Moffett Field, CA.

I collaborated with Dr. David E. Smith to study scalable techniques for planning with partial observability. The major result of the internship was a Journal of Artificial Intelligence Research article that describes a novel data structure, used to efficiently compute search heuristics in partially observable environments.

Funding

“REU Site: Bug Wars: A Collaborative Software Testing Research Experience for Undergraduates”, *National Science Foundation*. This REU Site grant will support 8 students per year to participate in a summer research program on software test case generation. Bug Wars puts students in a competitive atmosphere where students compare test case reduction and prioritization techniques against machine learning and automated planning techniques for test generation. Award Total: \$315,000. Term 3/2012-2/2015. Co-PI with Renee Bryce.

“Simultaneous Planning, Knowledge Engineering, and Learning (SPaKEL)”, *Utah State University*. This project seeks to develop the SPaKEL architecture for mixed-initiative robotic task planning by developing techniques for planning, knowledge engineering, and learning in hierarchical task network models. The fundamental advance proposed by this work is to reduce the time to task completion through robust planning with incompletely known models that can be both refined with domain expert knowledge engineering or self-guided learning. The project will demonstrate a prototype of the proposed system on a simulated mobile robot performing office environment tasks. Award Total: \$18,329. Term 1/2012-12-2012.

- “Controlling a Modular Architecture for Bootstrapped Learning Experiments”, *DARPA Contract HR001-07-C-0060, SRI International Subcontract 27-001321, DARPA Bootstrapped Learning*. The Bootstrapped Learning project is aimed at building a digital student that can be taught complex concepts through multiple laddered lessons. As PI, I am researching agent architectures and learning control strategies to learn concepts taught by natural instruction methods. Award Total: \$450,138. Term: 8/2008-9/2011.
- “ICAPS-10 Doctoral Consortium Travel Awards”, *National Science Foundation*. This grant is to support PhD student travel to ICAPS-10, held in Toronto, Canada. I am the PI and am organizing the Doctoral Consortium at ICAPS-10. Awarded: \$18,000.

Teaching

- CS227 Reasoning Methods in Artificial Intelligence. (Stanford, Spring Quarter 2008, w/ Neil Yorke-Smith.)
- CS6900 Graduate Seminar Lecture (Utah State University, Fall Semester 2008)
- CS6890 ST: Decision Making in AI. (Utah State University, Spring Semester 2009)
- CS5600 Problem Solving and Expert Systems. (Utah State University, Summer and Fall Semesters 2009)
- CS6600 Advanced Intelligent Systems. (Utah State University, Spring 2010)
- CS2420 Data Structures and Algorithms. (Utah State University, Summer 2010)
- CS5600/6600: Introduction to Intelligent Systems (Utah State University, Fall 2010, 2011)
- CS6610 Advanced Intelligent Systems. (Utah State University, Spring 2011, 2012)
- CS6890 ST: Theory and Applications of Search. (Utah State University, Summer 2011)
- CS7910 Special Topics in Intelligent Systems: Automated Planning (Utah State University, Fall 2011)

Honors and Awards

2010

- **Electronic Publishing Editor:** Journal of AI Research.
- **Invited Panelist:** National Conference on Artificial Intelligence (AAAI-10) Workshop on Goal Directed Autonomy.
- **Invited Speaker:** Brigham Young University, Department of Computer Science.

2009

- **ICAPS Distinguished Dissertation Award:** Invited talk, “Reachability Heuristics for Planning Under Uncertainty”, at ICAPS-09.
- **Invited Speaker:** University of Washington, Department of Computer Science.

2007

- **Invited Tutorial Speaker:** “Planning Graph Based Reachability Heuristics”, at IJCAI-07.
- **University Graduate Fellow:** ASU Graduate Fellowship Award. (1 of 6 University-wide Awardees)
- **Invited Speaker:** UNLV Department of Computer Science.
- **Invited Speaker:** Notre Dame Department of Computer Science.
- **Outstanding Graduate Student Nominee:** ASU College of Engineering.

2006

- **Invited Tutorial Speaker:** “Planning Graph Based Reachability Heuristics”, at ICAPS-06.
- **Dean’s Scholar:** ASU College of Engineering and Applied Sciences Dean’s Scholar.
- **ARCS Foundation Scholar:** Boppart scholar. (1 of 2 Department-wide Awardees)

2005

- **ARCS Foundation Scholar:** Van Denburgh scholar. (1 of 2 Department-wide Awardees)
- **Invited Speaker:** ARCS Fall Benefit.

Refereed Journal Papers

- D. Bryce, “Wumpus World in Introductory Artificial Intelligence”, *ACM Journal of Computing in Small Colleges*, Volume 27, Issue 2, pages 60-66, December 2011.
- D. Bryce, “Planning for Multiple Preference versus Planning with No Preference”, *ISRN Artificial Intelligence*, in press.
- D. Bryce, W. Cushing, and S. Kambhampati, “State Agnostic Planning Graphs: Deterministic, Non-Deterministic, and Probabilistic Planning”, *Artificial Intelligence*, Volume 175, pages 848-889, 2011.
Citeseer impact rating: 1.85 (top 3.76%).
- D. Bryce, M. Verdicchio, and S. Kim. “Planning Interventions in Biological Systems”, *ACM Transactions on Intelligent Systems and Technology: Special Issue on Applications of Automated Planning*. Volume 1, Issue 2, Paper 11, pages 1-26, 2010.
- D. Bryce, S. Kambhampati, and D.E. Smith. “Sequential Monte Carlo in Reachability Heuristics for Probabilistic Planning”, *Artificial Intelligence*, Volume 172/6-7, pages 685-715, 2008.
Citeseer impact rating: 1.85 (top 3.76%).
- D. Bryce and S. Kambhampati. “A Tutorial on Planning Graph Based Reachability Heuristics”, *AI Magazine*, Volume 28, Number 1 (Spring 2007), pages 47-83, 2007.
Citeseer impact rating: 0.72 (top 36.85%)
- D. Bryce, S. Kambhampati, and D.E. Smith. “Planning Graph Heuristics for Belief Space Search”, *Journal of Artificial Intelligence Research*, Volume 26, pages 35-99, 2006.
Citeseer impact rating: 2.45 (top 0.81%).

Refereed Conference Papers

- D. Morwood and D. Bryce “Evaluating Temporal Plans in Incomplete Domains”, *Proceedings of the National Conference on Artificial Intelligence (AAAI-12)*, 2012.
Full Paper Acceptance Rate: 26%
- C. Weber and D. Bryce, “Planning and Acting in Incomplete Domains”, *Proceedings of the Twenty Second International Conference on Automated Planning and Scheduling (ICAPS-11)*, pages 274-281, 2011.
Citeseer impact rating: 1.53 (top 8.51%), formerly AIPS conference. Full Paper Acceptance Rate: 36%.
- A. Kutiyanwala, V. Kulyukin, and D. Bryce. On Self-Sufficiency of Verbal Route Directions for Blind Navigation with Prior Exposure, *In the 25th Annual International Technology & Persons with Disabilities Conference*, 2010.
- R. Mailler, D. Bryce, J. Shen, and C. O’Reilly. “MABLE: A Framework for Learning from Natural Instruction”, *In the Proceedings of the Eighth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2009.
Citeseer impact rating: 0.02. Full Paper Acceptance Rate: 22%
- D. Bryce and S. Kim. “Planning for Gene Regulatory Network Intervention”, *In the Proceedings of the Twentieth International Joint Conference on Artificial Intelligence*, pages 1834-1839, 2007.
Citeseer impact rating: 1.82 (top 4.09%). Full Paper Acceptance Rate: 16%.
- D. Bryce, S. Kambhampati, and D.E. Smith. “Sequential Monte Carlo in Probabilistic Planning Reachability Heuristics”, *In the Proceedings of the Seventeenth International Conference on Automated Planning and Scheduling (ICAPS-06)*, pages 233-242, 2006.
Citeseer impact rating: 1.53 (top 8.51%), formerly AIPS conference. Acceptance Rate: 33%. (Short-listed for Best Paper Award).
- D. Bryce and S. Kambhampati. “Cost Sensitive Reachability Heuristics for Handling State Uncertainty”, *In the Proceedings of the Twenty-First Conference on Uncertainty in Artificial Intelligence (UAI-05)*, pages 60-68, 2005.
Acceptance Rate: 34%.

- W. Cushing and D. Bryce. "State Agnostic Planning Graphs and their application to belief-space planning", *In the Proceedings of the Twentieth National Conference on Artificial Intelligence (AAAI-05)*, pages 1131-1138, 2005.
CiteSeer impact rating: 1.87 (top 3.60%). Acceptance Rate: 16%. (Short-listed for Best Paper Award).
- D. Bryce and S. Kambhampati. "Heuristic Guidance Measures for Conformant Planning", *In Proceedings of the 14th International Conference on Automated Planning and Scheduling (ICAPS-04)*, pages 365-375, 2004.
Acceptance Rate: 31%.

Book Chapters

- D. Bryce and S. Kim. "Planning Interventions for Gene Regulatory Networks as Partially Observable Markov Decision Processes", in (Eds. S. Das, D. Caragea, W. H. Hsu, and S. M. Welch) *Computational Methodologies in Gene Regulatory Networks*, 2010.

Refereed Workshop and Symposium Papers

- M. Freed, D. Bryce, J. Shen, and C. O'Reilly. "Interactive Bootstrapped Learning for End User Programming", *AAAI 2011 Workshop on Simple Living*, 2011.
- C. Weber, D. Morwood, and D. Bryce. "Goal Directed Knowledge Acquisition", *2011 International Conference on Machine Learning Workshop on Planning and Acting with Uncertain Models*, 2011.
- A. Olsen and D. Bryce. "POND-Hindsight: Hindsight Optimization in POMDPs", *2011 International Planning Competition*, 2011.
- C. Weber and D. Bryce. "Reactive, Proactive, and Passive Learning about Incomplete Actions", *3rd Workshop on Learning and Planning*, 2011.
- A. Olsen and D. Bryce. "Randward and Lamar: Randomizing the FF Heuristic", *2011 International Planning Competition*, 2011.
- J. Robertson and D. Bryce. "Reachability Heuristics for Planning in Incomplete Domains", *In the ICAPS'09 Workshop on Heuristics for Domain Independent Planning*, 2009.
- C. Morrison, D. Bryce, I. Fasel, and A. Rebguns. "Augmenting Instructable Computing with Planning Technology", *In the ICAPS'09 Workshop on the International Competition for Knowledge Engineering in Planning and Scheduling*, 2009.
- D. Bryce. "The Value(s) of Probabilistic Plans", *In the Workshop on a Reality Check for Planning and Scheduling under Uncertainty (held at ICAPS-08)*, 2008.
- D. Bryce, W. Cushing, and S. Kambhampati. "Model-lite Planning: Diverse Multi-Option Plans and Dynamic Objective Functions", *In the 3rd Workshop on Planning and Plan Execution for Real-World Systems: Principles and Practices for Planning in Execution (held at ICAPS-07)*, 2007.
- D. Bryce and S. Kim. "Planning Interventions for Gene Regulatory Networks", *In the IEEE/NLM Life Science Systems and Applications Workshop (LSSA-06)*, 2006.
- D. Bryce and D.E. Smith. "Using Correlation to Compute Better Probability Estimates in Plan Graphs", *In the Seventeenth International Conference on Automated Planning and Scheduling Workshop on Planning under Uncertainty and Execution Control for Autonomous Systems (ICAPS-06)*, 2006.
- D. Bryce, S. Kambhampati, and D.E. Smith. "Planning in Belief Space with a Labelled Uncertainty Graph", *In the American Association for Artificial Intelligence Workshop on Learning and Planning in Markov Processes – Advances and Challenges (AAAI-04)*, 2004.
- D. Bryce and S. Kambhampati. "Heuristic Guidance Measures for Conformant Planning", *In The 13th International Conference on Automated Planning and Scheduling Workshop on Planning Under Uncertainty and Incomplete Information (ICAPS-03)*, 2003.
- D. Bryce and S. Kim. "Planning Interventions for Gene Regulatory Networks", *Poster at the TGEN 06 Retreat*, 2006.
- D. Bryce. "Monte Carlo in Probabilistic Planning Reachability Heuristics", *In the Seventeenth International Conference on Automated Planning and Scheduling Doctoral Consortium (ICAPS-06)*, 2006.

- D. Bryce and S. Kambhampati. “Cost Sensitive Conditional Planning”, *In the Poster Session of the 15th International Conference on Automated Planning and Scheduling (ICAPS-05)*, 2005.
- D. Bryce. “Scaling Decision Theoretic Planning”, *In the Doctoral Consortium of the 15th International Conference on Automated Planning and Scheduling (ICAPS-05)*, 2005.
- D. Bryce. “Planning Graph Heuristics for Incomplete and Non-Deterministic Domains”, *In The 14th International Conference on Automated Planning and Scheduling Doctoral Consortium (ICAPS-04)*, 2004.
- D. Bryce, M. Do, and S. Kambhampati. “The Generation and Inspection of Metric-Temporal Plans within the Sapa Planning Framework”, *In the 13th International Conference on Automated Planning and Scheduling Software Demonstrations (ICAPS-2003)*, 2003.

Students Advised

Jared Robertson (MS, Fall 2011, Xactware)
 Christopher Weber (MS, Spring 2011, Amazon)
 Alan Olsen (MS, Spring 2011)
 Daniel Morwood (PhD, Spring 2015)

Professional Service

Reviewer: NSF CISE Program Proposal Reviews, 2010 and 2011.

Organizer: Doctoral Consortium, held at ICAPS-10, 2010. (with Scott Sanner).

Organizer: Workshop on a Advances in Planning and Scheduling under Uncertainty, held at ICAPS-10, 2010. (with Scott Sanner, Julien Bidot, Hector Palacios, and Olivier Buffet).

Organizer: Workshop on a Reality Check for Planning and Scheduling under Uncertainty, held at ICAPS-08, 2008. (with Mausam and Sungwook Yoon).

Organizer: 6th International Planning Competition, Uncertainty Tracks, 2008. (with Olivier Buffet)

Senior Program Committee Member: IJCAI-11.

Program Committee Member: AAAI-07, ICAPS-07, AAAI-08, ICAPS-08, IJCAI-09, ICAPS-09, ICAPS-09 HDIP workshop, ICAPS-10, AAAI-10, ICAPS-11, ICAPS-12, AAAI-12.

Doctoral Consortium Mentor: ICAPS-08 (Saket Joshi), ICAPS-09 (Andrey Kolobov).

Reviewer: IJCAI-07, Journal of Artificial Intelligence Research, Artificial Intelligence, BMC Bioinformatics, IEEE/ACM Transactions on Computational Biology and Bioinformatics, ACM Transactions on Intelligent Systems and Technology.

Auxiliary Reviewer: ICAPS-03, IJCAI-03, AAMAS-03, ICAPS-04, AAAI-04, IWPSS-04, AAAI-05, ICAPS-06.

Organizations: AAAI.

University Service

Research & Graduate Advisory Committee: USU Computer Science Department representative to College of Science.

Undergraduate Research Fellow Advisor: USU Computer Science Department representative to University.

Professional Development

2010 Educational Advances In AI Symposium: Attended to improve skills for teaching AI.

2010 Faculty Doctoral Mentoring Institute: Attended to improve mentoring for doctoral students, especially from under-represented groups.