Brian Milch

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RESEARCH INTERESTS

Artificial intelligence and machine learning: specifically, learning and inference algorithms for first-order and relational probability models. Applications to information extraction, natural language processing, and computational game theory.

EDUCATION

University of California, Berkeley, CA　　　　　　　　　　　　　　　8/01–12/06

Ph.D. in Computer Science
- Dissertation: "Probabilistic Models with Unknown Objects"
- Committee: Stuart Russell (chair), Michael I. Jordan, Dan Klein, James Pitman
- Designated Emphasis in Communication, Computation and Statistics

Stanford University, Stanford, CA　　　　　　　　　　　　　　　　9/96–6/00

B.S. with distinction and with honors in Symbolic Systems
- Concentration in Artificial Intelligence; advisor: Daphne Koller
- Honors thesis: "Reasoning about Agents' Beliefs and Decisions with Probabilistic Models"
- Minor in Mathematics

EMPLOYMENT

Postdoctoral Associate, **MIT CS and AI Laboratory**　　　　　　　　12/06–6/08
Collaborating with Prof. Leslie Kaelbling and her group on the development of novel algorithms for learning, inference, and planning in relational probabilistic models.

Graduate Student Researcher, **U.C. Berkeley Computer Science Division**　8/02–9/06
Conducted research with Prof. Stuart Russell and other students on relational probabilistic models for reasoning about initially unknown objects that underlie text or sensor data.

Research Intern, **Google Inc.**, Mountain View, CA　　　　　　　　　6/02–8/02
Developed prototype of machine-learning-based system to help advertisers choose keywords for targeting their advertisements on Google.

Software Engineer, Research Group, **Google Inc.**, Mountain View, CA　　4/00–7/01
Developed new technologies in cooperation with Google's research scientists. Gained experience with distributed systems, information retrieval, statistical language modeling, and web graph analysis.

Research Assistant, **Stanford Robotics Laboratory**　　　　　　　　　6/98–6/00
Collaborated with Prof. Daphne Koller and other students to implement the SPOOK system for probabilistic reasoning. Created domain model for battlefield reconnaissance.

Software Development Intern, **Trilogy Development Group, Inc.**, Austin, TX　6/97–9/97
Developed software in C++ for translation of artificial languages. Applied this software to translate simple languages into Trilogy's Configuration Modeling Language.

TEACHING EXPERIENCE

Graduate Student Instructor, CS 188, U.C. Berkeley　　　　　Spring 2004, Fall 2004
Helped teach introductory course in artificial intelligence for undergraduates. Designed and taught weekly tutorial sections, assisted students in office hours and by email, graded exams.

Teaching Assistant, CS 221, Stanford University　　　　　　　　　　　Fall 1999
Helped teach foundational course in artificial intelligence for graduate students and advanced undergraduates. Participated in design of projects and problem sets, led tutorial sections.

Section Leader, CS 106A and 106X, Stanford University　　5 quarters, starting Spring 1997
Taught weekly tutorial sections and graded assignments for C programming courses.

2008   Named one of the "Ten to Watch" in artificial intelligence by *IEEE Intelligent Systems*

2007   Nominated by U.C. Berkeley for ACM Dissertation Award

2005   Siebel Scholarship

2001   University of California Microelectronics Fellowship

2000   NSF Graduate Research Fellowship

1999   Phi Beta Kappa (inducted junior year)

1999   Barry M. Goldwater Scholarship

1997   Stanford President's Award for Academic Excellence

1996   Stanford President's Scholar

1996   National Merit Scholar

Publications in Refereed Journals

M. Henzinger, B.-W. Chang, B. Milch, and S. Brin. "Query-Free News Search". *World Wide Web: Internet and Web Information Systems* 8(2):101-126, 2005.

D. Koller and B. Milch. "Multi-Agent Influence Diagrams for Representing and Solving Games". *Games and Economic Behavior* 45(1):181–221, 2003.

Refereed Book Chapters

B. Milch, B. Marthi, S. Russell, D. Sontag, D. L. Ong, and A. Kolobov. "BLOG: Probabilistic Models with Unknown Objects". In L. Getoor and B. Taskar, eds. *Introduction to Statistical Relational Learning*, pages 373–398. Cambridge, MA: MIT Press, 2007.

Publications in Refereed Conference Proceedings

B. Milch, L. S. Zettlemoyer, K. Kersting, M. Haimes, and L. P. Kaelbling. "Lifted Probabilistic Inference with Counting Formulas". *Proc. 23rd AAAI Conf. on Artificial Intelligence*: 1062–1068, 2008.

A. Deshpande, B. Milch, L. S. Zettlemoyer, and L. P. Kaelbling. "Learning Probabilistic Relational Dynamics for Multiple Tasks". *Proc. 23rd Conf. on Uncertainty in Artificial Intelligence*: 83–92, 2007.

B. Milch and S. Russell. "General-Purpose MCMC Inference over Relational Structures". *Proc. 22nd Conf. on Uncertainty in Artificial Intelligence*: 349-358, 2006.

B. Milch, B. Marthi, S. Russell, D. Sontag, D. L. Ong, and A. Kolobov. "BLOG: Probabilistic Models with Unknown Objects". *Proc. 19th International Joint Conf. on Artificial Intelligence*: 1352–1359, 2005.

B. Milch, B. Marthi, D. Sontag, S. Russell, D. L. Ong, and A. Kolobov. "Approximate Inference for Infinite Contingent Bayesian Networks". *Proc. 10th International Workshop on Artificial Intelligence and Statistics*, 2005.

M. Henzinger, B.-W. Chang, B. Milch, and S. Brin. "Query-Free News Search". *Proc. 12th International World Wide Web Conf.*, 2003.

H. Pasula, B. Marthi, B. Milch, S. Russell, and I. Shpitser. "Identity Uncertainty and Citation Matching". In *Advances in Neural Information Processing Systems 15*, pages 1401–1408. Cambridge, MA: MIT Press, 2003.

A. Franz and B. Milch. "Searching the Web by Voice". *Proc. 19th International Conf. on Computational Linguistics*: 1213–1217, 2002.

D. Koller and B. Milch. "Multi-Agent Influence Diagrams for Representing and Solving Games". *Proc. 17th International Joint Conf. on Artificial Intelligence*: 1027–1034, 2001.

B. Milch and D. Koller. "Probabilistic Models for Agents' Beliefs and Decisions". *Proc. 16th Conf. on Uncertainty in Artificial Intelligence*: 389–396, 2000 [Runner-up for Best Student Paper award].

A. Pfeffer, D. Koller, B. Milch, and K. T. Takusagawa. "Spook: A System for Probabilistic Object-Oriented Knowledge". *Proc. 15th Conf. on Uncertainty in Artificial Intelligence*: 541–550, 1999.

Thesis

B. Milch. *Probabilistic Models with Unknown Objects*. Ph.D. Thesis, Computer Science Division, University of California, Berkeley, Dec. 2006.

Other Publications

K. Kersting, B. Milch, L. S. Zettlemoyer, M. Haimes, and L. P. Kaelbling. "Reasoning about Large Populations with Lifted Probabilistic Inference". *NIPS 2007 Workshop on Statistical Network Models*, Whistler, British Columbia, Canada, 2007.

A. Deshpande, B. Milch, L. S. Zettlemoyer, and L. P. Kaelbling. "Learning Probabilistic Relational Dynamics for Multiple Tasks". *Dagstuhl Seminar Proceedings 07161: Probabilistic, Logical and Relational Learning — A Further Synthesis*, Wadern, Germany, 2007.

B. Milch and S. Russell. "First-Order Probabilistic Languages: Into the Unknown". In S. Muggleton, R. Otero, and A. Tamaddoni-Nezhad, eds. *Inductive Logic Programming: 16th International Conference (ILP-2006)*, pages 10–24. Lecture Notes in AI 4455. Berlin: Springer, 2007. (Written version of invited talk.)

B. Milch, B. Marthi, S. Russell, D. Sontag, D. L. Ong, and A. Kolobov. "BLOG: Probabilistic Models with Unknown Objects". *Dagstuhl Seminar Proceedings 05051: Probabilistic, Logical and Relational Learning — Towards a Synthesis*, Wadern, Germany, 2005.

B. Milch, B. Marthi, and S. Russell. "BLOG: Relational Modeling with Unknown Objects". *ICML 2004 Workshop on Statistical Relational Learning and Its Connections to Other Fields*, Banff, Alberta, Canada, 2004.

B. Marthi, B. Milch, and S. Russell. "First-Order Probabilistic Models for Information Extraction". *IJCAI 2003 Workshop on Learning Statistical Models from Relational Data*, Acapulco, Mexico, 2003.

D. Koller and B. Milch. "Structured Models for Multi-Agent Interactions". *Proc. 8th Conference on Theoretical Aspects of Rationality and Knowledge*: 233–248, 2001. (Written version of invited talk given by Daphne Koller.)

D. Koller and B. Milch. "Multi-Agent Influence Diagrams for Representing and Solving Games". *AAAI Spring Symposium on Game-Theoretic and Decision-Theoretic Agents*, Stanford, CA, 2001.

Patents

A. M. Franz, M. H. Henzinger, S. Brin, and B. Milch. "Voice interface to a search engine". U.S. Patent 7027987, issued Apr. 11, 2006. Assigned to Google Inc.

INVITED
TALKS

Invited Talks and Tutorials at Conferences
- "Inference on Relational Models Using Markov Chain Monte Carlo", Invited tutorial, 23rd Conf. on Uncertainty in Artificial Intelligence, Vancouver, Canada, Jul. 19, 2007.
- "First-Order Probabilistic Languages: Into the Unknown", Invited talk, 16th International Conf. on Inductive Logic Programming, Santiago de Compostela, Spain, Aug. 27, 2006.
- "First-Order Probabilistic Languages: Into the Unknown" (with Stuart Russell), Invited tutorial, Conf. on Neural Information Processing Systems (NIPS), Vancouver, Canada, Dec. 5, 2005.

Invited Talks at Seminars
- "Probabilistic Models with Unknown Objects", Univ. of Massachusetts, Boston, Nov. 14, 2007.
- "Hierarchical Bayesian Transfer Learning for Probabilistic Planning Rules", Univ. of Massachusetts, Amherst, Oct. 17, 2007.
- "Probabilistic Models with Unknown Objects", Northeastern University, Jan. 10, 2007.
- "Bayesian Logic", Intel Berkeley Research Lab, Dec. 14, 2005.

- "BLOG: Probabilistic Models with Unknown Objects", Univ. of British Columbia, Dec. 12, 2005.
- "———", Stanford University, Nov. 7, 2005.
- "BLOG: Probabilistic Models with Unknown Objects", Univ. of Illinois, Urbana-Champaign, Oct. 31, 2005.
- "———", Univ. of Massachusetts, Amherst, Jun. 9, 2005.
- "———", Massachusetts Institute of Technology, Jun. 6, 2005.

Guest Lectures
- "BLOG: Probabilistic Models with Unknown Objects". CS 282: Probabilistic Reasoning (Prof. Avi Pfeffer), Harvard Univ., Nov. 29, 2007.
- "Relational Probability Models" and "Learning and Structural Uncertainty in RPMs". 9.66: Computational Cognitive Science (Prof. Josh Tenenbaum), Massachusetts Institute of Technology, Nov. 27 and 29, 2007.
- "Relational Probability Models" and "Unknown Objects and BLOG", Graduate Summer School on Probabilistic Models of Cognition, Institute for Pure and Applied Mathematics, Los Angeles, CA, Jul. 16, 2007.
- "First-Order Probabilistic Models". 9.66: Computational Cognitive Science (Prof. Josh Tenenbaum), Massachusetts Institute of Technology, Dec. 7, 2006.
- "BLOG: Probabilistic Models with Unknown Objects". CS 289: Knowledge Representation and Use in Computers (Prof. Stuart Russell), Univ. of California, Berkeley, Dec. 6, 2004.
- "Decisions and Games". CS 289: Knowledge Representation and Use in Computers (Prof. Stuart Russell), Univ. of California, Berkeley, Dec. 3, 2001.

ACADEMIC SERVICE

Journal reviewing: *Artificial Intelligence*; *Machine Learning*; *Journal of Artificial Intelligence Research*; *Journal of Machine Learning Research*; *Games and Economic Behavior*; *Theoretical Computer Science*; *Autonomous Agents and Multi-Agent Systems*; *Decision Analysis*; *Annals of Mathematics and Artificial Intelligence*.

Co-chair, ICML 2006 Workshop on Open Problems in Statistical Relational Learning, Pittsburgh, PA, Jun. 29, 2006.

Program committee member: National Conference on Artificial Intelligence (AAAI 2006, 2008); Conference on Uncertainty in Artificial Intelligence (UAI 2005, 2006, 2007, 2008); International Conference on Machine Learning (ICML 2007, 2008); International Symposium on Artificial Intelligence and Mathematics (ISAIM 2008); International Conference on Artificial Intelligence and Statistics (AISTATS 2007); Conference on Inductive Logic Programming (ILP 2007); European Conference on Machine Learning/Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD 2006); Workshop on Mining and Learning with Graphs (MLG 2006, 2007, 2008).

Additional conference reviewing: International Joint Conference on Artificial Intelligence (IJCAI 2005, 2007); Conference on Uncertainty in Artificial Intelligence (UAI 2003); Conference on Neural Information Processing Systems (NIPS 2005); World Wide Web Conference poster track (WWW 2004, 2005, 2006).

Co-Organizer, Machine Learning Tea (MIT Computer Science and Artificial Intelligence Laboratory), 2006–07.

Chair, Faculty Candidate Evaluation Committee (UC Berkeley Computer Science Graduate Student Association), 2004–05.

Student member, Graduate Admissions Committee (UC Berkeley Computer Science Div.), 2004–05.

Student rep, Committee on Educational Policy (UC Berkeley Academic Senate), 2003–04.

Student rep, Graduate Study Committee (UC Berkeley College of Engineering), 2002–03.

Student rep, Area One Program Committee (Stanford University), 1999–2000.

Student rep, Dean's Advisory Committee on Curriculum (Stanford School of Humanities and Sciences), 1998–99.