

# CHRISTIAN FRITZ

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## Career Objectives and Research Interests

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My long term career objective is to work at the intersection of basic research and real-world applications, where I believe I can have the largest impact. I am interested in a variety of topics regarding the application of AI planning and knowledge representation techniques to real-world problems. These include planning in highly dynamic, "open-world" environments, integrated planning and execution, execution monitoring, diagnosis, the design of robust plans, the integration of domain-expert knowledge into planning and control, and the application of relevance-based, symbolic reasoning techniques to verification and control of deployed model-based systems. Applications I have worked on or am interested in include autonomous robots, workflows, semantic web, ubiquitous computing, design automation, and manufacturing analysis.

## Appointments

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*Research Scientist,* [09/2010 – present]  
*Intelligent Systems Lab,*  
Palo Alto Research Center Inc. (PARC, formerly Xerox-PARC), Palo Alto CA, USA.

*Post-Doctoral Research Associate,* [05/2009 – 09/2010]  
*Interactive Knowledge Capture Group (Yolanda Gil),*  
University of Southern California Information Sciences Institute, Marina del Rey, CA, USA.  
Projects: "Scientific Workflows", "Bootstrapped Learning".

## Education

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*Ph.D., Computer Science, University of Toronto, Canada* [09/2004 – 04/2009]  
Thesis title: "Monitoring the Generation and Execution of Optimal Plans".  
Advisor: Prof. Sheila McIlraith, Knowledge Representation Group.

*M.Sc. with Honors, Computer Science, RWTH Aachen University, Germany* [09/1998 – 11/2003]  
Thesis title: "Integrating Decision-Theoretic Planning and Programming for Robot Control in Highly Dynamic Domains".  
Advisor: Prof. Gerhard Lakemeyer, Knowledge Based Systems Group.

Including:

- Business Administration minor. Specialization: Technology and Innovation Management.
- Study abroad at Universidad Complutense Madrid, Spain, 2000/2001.

## Scholarships and Awards

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- The 2011 International Conference on Intelligent User Interfaces Best Paper Award Nomination.
- Triplification Challenge 2010 Open Track Award Honorary Mention.
- The International Conference on Automated Planning and Scheduling (ICAPS) 2010 Best Dissertation Award Honorable Mention.
- Wolfond Fellowship, University of Toronto, 2008.

- The International Conference on Automated Planning and Scheduling (ICAPS) 2007 Best Doctoral Consortium Paper Award.
- Springorum-Denkünze (University Medal) RWTH Aachen, 2004.
- Scholarship by sd&m (<http://www.sdm.de>) in 2002 and 2003 (one awarded annually at RWTH Aachen).

## Publications

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### Journal Publications

1. Meghyn Bienvenu, Christian Fritz, and Sheila McIlraith. Specifying and Computing Preferred Plans. *Artificial Intelligence* 175(7-8):1308-1345. 2011.
2. Alexander Ferrein, Christian Fritz, and Gerhard Lakemeyer. Using Golog for deliberation and team coordination in robotic soccer. *KI*, 19(1):24–31, 2005.

### In Collections

3. Jorge Baier, Christian Fritz, Sheila McIlraith. Golog-style Search Control for Planning. In *Knowing, Reasoning, and Acting: Essays in Honour of Hector J. Levesque, Gerhard Lakemeyer and Sheila A. McIlraith* (eds.), College Publications. 2011.

### Refereed Conference Publications

3. Christian Fritz and Yolanda Gil. A Formal Framework for Combining Natural Instruction and Demonstration for End-User Programming. In *Proceedings of the 2011 International Conference on Intelligent User Interfaces (IUI), February 13-16, 2011, Palo Alto, CA, USA*. Nominated for Best Paper Award.
4. Yolanda Gil, Varun Ratnakar, Christian Fritz. TellMe: Learning Procedures from Tutorial Instruction. In *Proceedings of the 2011 International Conference on Intelligent User Interfaces (IUI), February 13-16, Palo Alto, CA, USA*. 2011.
5. Oktie Hassanzadeh, Reynold Xin, Christian Fritz, Yang Yang, Jiang Du, Minghua Zhao, Renée J. Miller. BibBase Triplified. In *Proceedings of the 6th International Conference on Semantic Systems, September 1–3, 2010, Graz, Austria*. Triplification Challenge Contestant. To appear.
6. Reynold Xin, Oktie Hassanzadeh, Christian Fritz, Shirin Sohrabi, Yang Yang, Jiang Du, Minghua Zhao, Renée J. Miller. In *Proceedings of The 9th International Semantic Web Conference, Shanghai, China, November 7–11, Poster & Demo Track*. 2010.
7. Yolanda Gil, Paul Groth, Varun Ratnakar, and Christian Fritz. Expressive Reusable Workflow Templates. In *Proceedings of the Fifth IEEE International Conference on e-Science, Oxford, UK, December 9-11, 2009*.
8. Christian Fritz and Sheila McIlraith. Computing Robust Plans in Continuous Domains. In *Proceedings of the 19th International Conference on Automated Planning and Scheduling (ICAPS), pages 346–349, Thessaloniki, Greece, September 19-23, 2009*.
9. Christian Fritz and Sheila McIlraith. Generating Optimal Plans in Highly-Dynamic Domains. In *Proceedings of The 25th Conference on Uncertainty in Artificial Intelligence (UAI), Montreal, Canada, June 18-21, 2009*.
10. Christian Fritz, Rick Hull, and Jianwen Su. Automatic Construction of Simple Artifact-based Workflows. In *Proceedings of the 12th International Conference on Database Theory (ICDT), pages 225–238, Saint-Petersburg, Russia, March 23–26, 2009*.
11. Christian Fritz, Jorge A. Baier, and Sheila A. McIlraith. ConGolog, Sin Trans: Compiling ConGolog into basic action theories for planning and beyond. In *Proceedings of the 11th International Conference on Principles of Knowledge Representation and Reasoning (KR), pages 1509–1512, Sydney, Australia, September 16–19, 2008*.
12. Christian Fritz. Finding state similarities for faster planning. In *Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI), pages 925–930, Chicago, Illinois, USA, July 13–17, 2008*.

13. Jorge A. Baier, Christian Fritz, Meghyn Bienvenu, and Sheila McIlraith. Beyond classical planning: Procedural control knowledge and preferences in state-of-the-art planners. In *Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI), Nectar Track*, pages 1509–1512, Chicago, Illinois, USA, July 13–17, 2008.
14. Christian Fritz and Sheila A. McIlraith. Monitoring plan optimality during execution. In *Proceedings of the 17th International Conference on Automated Planning and Scheduling (ICAPS)*, pages 144–151, Providence, Rhode Island, USA, September 22 - 26, 2007.
15. Jorge A. Baier, Christian Fritz, and Sheila A. McIlraith. Exploiting procedural domain control knowledge in state-of-the-art planners. In *Proceedings of the 17th International Conference on Automated Planning and Scheduling (ICAPS)*, pages 26–33, Providence, Rhode Island, USA, September 22–26, 2007.
16. Christian Fritz and Sheila McIlraith. Decision-theoretic Golog with qualitative preferences. In *Proceedings of the 10th International Conference on Principles of Knowledge Representation and Reasoning (KR)*, pages 153–163, Lake District, UK, June 2–5, 2006.
17. Meghyn Bienvenu, Christian Fritz, and Sheila A. McIlraith. Planning with qualitative temporal preferences. In *Proceedings of the 10th International Conference on Principles of Knowledge Representation and Reasoning (KR)*, pages 134–144, Lake District, UK, June 2–5, 2006.
18. Alexander Ferrein, Christian Fritz, and Gerhard Lakemeyer. On-line decision-theoretic Golog for unpredictable domains. In *Proceedings of 27th German Conference on AI (KI)*, pages 322–336, Ulm, Germany, September 20–24, 2004.
19. Alexander Ferrein, Christian Fritz, and Gerhard Lakemeyer. Extending DTGolog with options. In *Proceedings of the 18th International Joint Conference on Artificial Intelligence (IJCAI)*, pages 1394–1395, Acapulco, Mexico, August 9–15, 2003.

#### *Refereed Workshop and Symposium Publications*

20. Christian Fritz and Yolanda Gil. Towards the Integration of Programming by Demonstration and Programming by Instruction using Golog. In *AAAI Workshop on Plan, Activity, and Intent Recognition (PAIR) 2010*, Atlanta, GA, USA, July 12, 2010.
21. Yolanda Gil and Christian Fritz. Reasoning about the Appropriate Use of Private Data through Computational Workflows. In *Proceedings of The AAAI Spring Symposium on Intelligent Privacy Management*, Stanford University, CA, USA, March 23–25, 2010.
22. Christian Fritz and Sheila A. McIlraith. Planning in the face of frequent exogenous events. In *Proceedings of The 1st International Symposium on Search Techniques in Artificial Intelligence and Robotics (at AAAI08)*, Chicago, IL, USA, July 13–14, 2008.
23. Christian Fritz. Monitoring the execution of optimal plans. In *The 17th International Conference on Automated Planning and Scheduling (ICAPS) Doctoral Consortium*, Providence, Rhode Island, USA, September 22, 2007. **Best Paper.**
24. Christian Fritz and Sheila McIlraith. Monitoring plan optimality during execution: Theory and implementation. In *Proceedings of the 18th International Workshop on Principles of Diagnosis (DX)*, pages 298–305, Nashville, TN, USA, May 29–31, 2007.
25. Christian Fritz and Sheila McIlraith. Compiling qualitative preferences into decision-theoretic Golog programs. In *Proceedings of The 6th Workshop on Nonmonotonic Reasoning, Action, and Change (at IJCAI05)*, Edinburgh, UK, August 1, 2005.
26. Alexander Ferrein, Christian Fritz, and Gerhard Lakemeyer. On-line decision-theoretic Golog for unpredictable domains. In *Proceedings of The 4th International Cognitive Robotics Workshop (at ECAI04)*, Valencia, Spain, August 23–24, 2004.

#### *Theses*

27. Christian Fritz. Monitoring the Generation and Execution of Optimal Plans. Ph.D. thesis, University of Toronto, Canada, April, 2009.
28. Christian Fritz. Integrating decision-theoretic planning and programming for robot control in highly dynamic domains. Master's thesis, RWTH Aachen University, Germany, November, 2003.

#### *Non-Refereed Documents*

29. Jorge A. Baier, Christian Fritz, and Sheila A. McIlraith. Exploiting procedural domain control knowledge in state-of-the-art planners (extended version). *Technical Report CSRG-565, University of Toronto*, September, 2007.
30. Christian Fritz and Sheila McIlraith. Compiling qualitative preferences into decision-theoretic Golog programs: Extended version with proofs. *Technical Report CSRG-522, University of Toronto*, May, 2005.
31. Alexander Ferrein, Christian Fritz, and Gerhard Lakemeyer. Allemaniacs 2004 team description. RoboCup 2004, Lisbon, Portugal.

## Other Professional Experience

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*Summer Intern,* July – September 2007  
*Alcatel-Lucent Bell Labs, Murray Hill, NJ, USA.*

Following an artifact-centric design methodology that was developed at the IBM T.J. Watson Research Center in recent years in the context of service oriented architectures, I was working on the automated design of flexible workflows. My advisor Rick Hull (Bell Labs), Jianwen Su (Professor, University of California, Santa Barbara), and I collaborated with researchers and consultants at IBM T.J. Watson, NY. Our goal was to leverage techniques from the field of AI planning to the problem of designing workflows for business processes which are built around distinguished business artifacts and a set of services manipulating these artifacts.

*Research Assistant,* February – July 2004  
*Knowledge Based Systems Group (KBSG), RWTH Aachen University, Germany.*

In this position I supervised and participated in the development of the robot control software deployed on our soccer robots that competed in the RoboCup Mid-Size league. In 2004 our team competed at the German Open in Paderborn, Germany, and at the World Cup in Lisbon, Portugal. Team website: <http://robocup.rwth-aachen.de/>

In this position I also supervised seminar courses. This included advising and grading students on written and orally-presented summaries of papers selected from current topics in the field of artificial intelligence. KBSG website: <http://www-kbsg.informatik.rwth-aachen.de>.

*Student Researcher, RoboCup,* November 2001 – November 2003  
*Knowledge Based Systems Group (KBSG), RWTH Aachen University, Germany.*

As a founding member of our RoboCup team (“AllemaniACs”), I developed various software modules for our robot control software system, including the high-level control module. For this purpose, I extended the robot programming language Golog for on-line decision-theoretic planning. During this time I also acquired a lot of teamwork experience and improved my knowledge of various programming languages and software development tools. In 2002 and 2003 our team competed at the German Open and at the World Cup in Padova, Italy, 2003. The AllemaniACs later won the World Cup in the service robotics league (“RoboCup@home”) in 2006 and 2007 and the German Open in 2007 and 2008.

*Summer Intern,* July – October 2001  
*SAP AG, Walldorf, Germany.*

My main duties concerned the extension of the internally-used product management system to display and edit product release information. This included the definition of interfaces and their discussion and negotiation with other departments. I learned how to use the ABAP Workbench and Data Dictionary of the SAP R/3 system and acquired programming skills in the ABAP/4 programming language.

## Teaching

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*Teaching Assistant, “Programming on the Web” (CSC 309, University of Toronto). Summer 2007.*

Teaching Assistant, “Principles of Programming Languages” (CSC 324, University of Toronto).  
Summer 2005, Fall 2005, Summer 2006, Winter 2007, and Summer 2008.

Teaching Assistant, “Introduction to Artificial Intelligence” (CSC 384, University of Toronto).  
Winter 2005, Winter 2006, Fall 2006, Fall 2007, Winter 2008, and Fall 2008.

My duties included giving lectures, designing and marking assignments and exams, conducting tutorials, holding office hours, and answering student questions via email, on the course newsgroup, or in person.

## Academic Service

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I have co-organized the following workshop:

- “Generalized Planning: Macros, Loops, Domain Control”, held at The 19<sup>th</sup> Intl. Conference on Automated Planning and Scheduling (ICAPS), September 20<sup>th</sup>, 2009, Thessaloniki, Greece.

I have served on grant proposal review panels of:

- NSF, Intelligent Information Systems Division (2010)

I have served on the (senior-)program committee of:

- The International Conference on Principles of Knowledge Representation and Reasoning (KR), 2012.
- The AAI Conference on Artificial Intelligence (AAI), 2010, 2011.
- The International Joint Conference on Artificial Intelligence (IJCAI), 2011.
- The International Conference on Automated Planning and Scheduling (ICAPS), 2011, 2012.
- The International Conference on Intelligent User Interfaces (IUI), 2011.
- The International Workshop on Nonmonotonic Reasoning, Action and Change (NRAC), 2011.
- The AAI-2011 Workshop on Generalized Planning (GenPlan), 2011.

I have reviewed for the following journals, conferences, and workshops:

- Artificial Intelligence (AIJ), Elsevier, 2006, 2008, 2009, 2010.
- Robotics and Autonomous Systems (RAS), Elsevier, 2010.
- AI Communications, The European Journal on Artificial Intelligence, 2007.
- Knowledge Engineering Review, 2010.
- The Intl. World Wide Web Conference (WWW), 2010.
- The Intl. Joint Conference on Artificial Intelligence (IJCAI), 2003, 2007, 2009.
- The AAI Conference on Artificial Intelligence (AAI), 2008.
- The Intl. Conference on Principles of Knowledge Representation and Reasoning (KR), 2006, 2008.
- The Intl. Conference on Automated Planning and Scheduling (ICAPS), 2007, 2008, 2009, 2010.
- The Intl. Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2004.
- The German Conference on Artificial Intelligence (KI), 2004.
- The Intl. Symposium on Logical Formalizations of Commonsense Reasoning, 2009.
- The North East Student Colloquium on Artificial Intelligence (NESCAI), 2006.
- The Intl. Cognitive Robotics Workshop (CogRob), 2004.

## Skills

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- Experienced team worker, programmer, and player.
- Expert Prolog programmer.
- Proficiency in Java, JSP, Python, Perl, CGI, C/C++, JavaScript, AJAX, Haskell, ABAP (SAP).
- Experienced with semantic web technology: RDF, OWL2, SPARQL, etc.
- Experienced with UNIX shell scripting and system tools.

- Experienced Windows network and Linux system administrator.
- Languages:
  - English: fluent.
  - German: fluent.
  - Spanish: very good. All my courses and exams at Univ. Complutense Madrid were in Spanish.

## **Personal Interests**

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Skiing, Ultimate Frisbee, running, rock climbing, and programming. Operating and extending [www.BibBase.org](http://www.BibBase.org), a web service that makes it easy for scientists to disseminate their publications on their web page, via RSS feeds, and via indexing on [data.BibBase.org](http://data.BibBase.org).

## **References**

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On request.