

Curriculum Vitae

Pat Langley

Personal Information

ASU Address:

Computer Science and Engineering
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Education

Carnegie Mellon University, M.S., 1976, Ph.D., 1980, Cognitive Psychology
Texas Christian University, B.A., 1975, Mathematics and Psychology

Employment/Administrative History

Professor of Computer Science / Psychology, Arizona State University, Tempe, AZ (8/06–present)
Director and President, Institute for the Study of Learning and Expertise, Palo Alto, CA (9/88–present)
Consulting Professor of Symbolic Systems, Stanford University, and Head, Computational Learning Laboratory, Center for the Study of Language and Information (1/1/97–9/09)
Head, Adaptive Systems Group, DaimlerChrysler Research & Technology Center (9/1/96–10/31/00)
Senior Research Associate, Robotics Laboratory, Stanford University (1/94–9/96)
Senior Scientist, Learning Systems Department, Siemens Corporate Research (12/92–12/93)
Senior Scientist, AI Research Branch, NASA Ames Research Center (9/89–9/92)
Associate Professor, Department of Computer Science, University of California, Irvine, CA (7/84–6/91)
Research Scientist, The Robotics Institute, Carnegie Mellon University, Pittsburgh, PA (9/81–6/84)
Research Associate, Department of Psychology, Carnegie Mellon University, Pittsburgh, PA (9/79–8/81)

Grants, Contracts, and Gifts

ACTIVE TRANSFER OF KNOWLEDGE FOR PROCESS MODELING, ONR [\$552,386] 10/1/10 – 12/30/12
MENTAL SIMULATION AND LEARNING IN THE ICARUS ARCHITECTURE, ONR [\$358,168] 2/1/10 – 1/31/12
UNDERSTANDING AND AIDING PROBLEM FORMULATION IN CREATIVE CONCEPTUAL DESIGN, NSF [\$741,000] 8/1/10 – 7/31/13 (Co-PIs J. Shah and E. Campana)
A UNIFIED COMPUTATIONAL THEORY OF LANGUAGE AND COGNITION, ONR (MURI program) [~\$4,400,000] 6/1/09 – 5/31/12 (co-PI's N. Cassimatis, J. Hobbs, S. Nirenburg)
SOFTWARE INTEGRATION FOR COMPUTATIONAL COGNITIVE MODELS IN VIRTUAL ENVIRONMENTS, AFOSR [\$228,702] 7/1/09 – 9/14/11 (Subcontract through SET Corporation, PI A. Pope)
AN INTRODUCTORY COURSE IN SCIENCE INFORMATICS, Microsoft Research [\$50,000] 5/1/08 – 4/30/10
SYMPOSIUM ON COMPUTATIONAL APPROACHES TO CREATIVITY IN SCIENCE, NSF [\$18,000] 2/1/08 – 1/31/09 (Co-PI W. Bridewell)
MENTAL SIMULATION AND LEARNING IN THE ICARUS ARCHITECTURE, ONR [\$279,694] 11/1/07 – 12/31/09
COMPUTATIONAL APPROACHES TO CREATIVITY THROUGH GOAL-DIRECTED CROSS-DOMAIN ANALOGY, NSF [\$199,828] 8/16/07 – 2/28/10 (Co-PI S. Kambhampati)
LEARNING HIERARCHICAL TASK MODELS FROM BEHAVIORAL TRACES, Defense Advanced Research Projects Agency [\$1,045,367] 4/1/06 – 3/31/09 (Subcontract through BBN, PI M. Burstein)

- TRANSFER LEARNING IN INTEGRATED COGNITIVE SYSTEMS, Defense Advanced Research Projects Agency [12,242,291] 10/1/05 – 4/30/10 (Co-PIs P. Domingos, L. Holder, and others)
- LEARNING HIERARCHICAL RELATIONAL SKILLS FROM KNOWLEDGE AND EXPERIENCE, Defense Advanced Research Projects Agency [1,571,070] 11/1/03 – 10/31/06
- COMPUTATIONAL INDUCTION OF SCIENTIFIC PROCESS MODELS, NSF [2,650,000] 9/15/03 – 9/14/09 (Co-PIs K. Arrigo and B. Widrow)
- NEW RESEARCH DIRECTIONS IN COGNITIVE ARCHITECTURES, NSF [99,271] 9/1/03 – 6/30/05
- COMBINING SHALLOW SEMANTICS AND DOMAIN KNOWLEDGE, Scottish Enterprise through Edinburgh University and Stanford University [351,000] 4/1/2004 – 3/31/2007 (Co-PI C. Manning)
- SYMPOSIUM ON REASONING AND LEARNING IN COGNITIVE SYSTEMS, ONR [5,100], NSF [4,500] 3/1/04 – 2/28/05 (Co-PI S. Rogers)
- SYMPOSIUM ON MACHINE LEARNING FOR ANOMALY DETECTION, NSF [5,600] 5/1/04 – 11/1/04 (Co-PI S. Bay)
- SYMPOSIUM ON ADVANCES IN COGNITIVE ARCHITECTURES, DARPA [10,000], NSF [7,510] 3/1/03 – 2/28/04 (Co-PI D. Shapiro)
- INTERACTIVE COMPUTATIONAL ASSISTANT FOR VIDEO SEGMENTATION AND CLASSIFICATION, Media X, Stanford University [22,129] 4/1/2003 – 8/31/2003 (Co-PIs C. Manning and M. Gervasio)
- COMPUTATIONAL DISCOVERY OF COMMUNICABLE KNOWLEDGE, Nippon Telegraph and Telephone Company [623,657] 10/16/00 – 10/15/05
- COMPUTATIONAL TECHNIQUES FOR RECONSTRUCTION AND DISCOVERY OF METABOLIC, SIGNAL TRANSDUCTION, AND EVOLUTIONARY PATHWAYS, NASA Ames Research Center [348,500] 7/1/01 – 6/30/04 (Co-PIs A. Pohorille and J. Shrager)
- FILTERING INFORMATION IN COMPLEX TEMPORAL DOMAINS, NASA Ames Research Center [776,000] 3/1/01 – 7/31/04
- COMPUTATIONAL DISCOVERY OF KNOWLEDGE IN EARTH SCIENCE, NASA Ames Research Center [175,000] 7/1/99 – 3/31/01
- ADAPTIVE USER INTERFACES FOR CRISIS RESPONSE TASKS, Office of Naval Research [580,000] 8/1/99 – 7/31/01
- ADAPTIVE CRISIS RESPONSE: INTELLIGENT ASSISTANTS FOR JOINT-FORCE CRISIS RESPONSE, ONR [3,000,000] 9/1/96 – 8/31/99 (co-PI M. Fehling)
- LEARNING OBJECT MODELS FROM VISUAL OBSERVATION AND BACKGROUND KNOWLEDGE, ONR and ARPA [615,832] 6/1/94 – 3/31/00 (co-PI T. Binford)
- MACHINE LEARNING FOR ROBOTIC LOCALIZATION AND NAVIGATION, Office of Naval Research [281,658] 3/1/94 – 2/28/97
- COMPUTATIONAL MODELS OF HUMAN LEARNING WITH INSTRUCTIONAL RELEVANCE, Air Force Office of Scientific Research [308,167] 1/1/94 – 12/31/97 (co-PI N. Nilsson)
- WORKSHOP ON FIELDIED APPLICATIONS OF MACHINE LEARNING, Office of Naval Research [4,800] 6/1/93 – 12/31/93 (Co-PI Y. Kodratoff)
- SYMPOSIUM ON LEARNING METHODS FOR PLANNING AND SCHEDULING, DARPA [5,200], ONR [5,100], AAAI [5,000] 1/1/91 – 12/31/91 (Co-PI S. Minton)
- SYMPOSIUM ON COMPUTATIONAL APPROACHES TO CONCEPT FORMATION, NSF [5,000], ONR [5,000], AAAI [5,000] 1/1/90 – 12/31/90 (Co-PI D. Fisher)
- SYMPOSIUM ON COMPUTATIONAL MODELS OF SCIENTIFIC DISCOVERY, National Science Foundation [7,300], ONR [5,000], American Association for Artificial Intelligence [5,000] 1/1/89 – 12/31/89 (Co-PI J. Shrager)

FOURTH INTERNATIONAL WORKSHOP ON MACHINE LEARNING, NSF [\$7,001], ONR [\$5,000], DARPA [\$5,000], AAAI [\$10,000] 1/1/87 – 12/31/87

A LABORATORY FOR SOFTWARE RESEARCH, National Science Foundation Coordinated Experimental Research Grant, 7/1/86 – 6/30/91 [\$3,131,000] (Co-PI's P. Freeman, N. Leveson, R. Razouk, R. Selby, T. Standish, R. Taylor)

LEARNING IN A REACTIVE ENVIRONMENT, DARPA, 7/1/85 – 8/30/86 [\$250,127], Army Research Institute [\$1,381,907] 9/1/85 – 8/31/90 (Co-PI's D. Kibler and R. Granger)

MACHINE LEARNING RESEARCH, Hughes Aircraft, [\$60,000] 7/1/85 – 6/30/87 (Co-PI D. Kibler)

FOCUSED RESEARCH PROGRAM IN COMPUTATION AND LEARNING, University of California, Irvine [\$100,000] 7/1/85 – 6/30/88 (Co-PI K. Wexler)

THE EFFECT OF MULTIPLE KNOWLEDGE SOURCES ON LEARNING AND TEACHING, ONR [\$324,926] 7/1/85 – 6/30/88 (Co-PI D. Kibler)

RESEARCH IN MACHINE LEARNING, ONR [\$375,000] 1/1/84 – 12/31/86 (Co-PI J. G. Carbonell)

MODELING THE STRATEGIES OF MATHEMATICS STUDENTS, ONR [\$203,425] 12/1/82 – 11/30/84

DATA-DRIVEN DISCOVERY OF EMPIRICAL LAWS, ONR [\$205,674] 2/15/82 – 12/31/83 (Co-PI H. A. Simon)

AN INFORMATION PROCESSING THEORY OF PROCEDURAL LEARNING, National Science Foundation, Division of Information Science and Technology, 9/1/79 – 8/31/81 [\$53,715]

Research Interests

Computational discovery of scientific knowledge	Unified cognitive architectures
Science informatics and e-science	Computational models of human cognition
Biomedical and health informatics	Problem solving and reasoning
Computational biology and ecology	Dialogue systems and interactive agents
Machine learning and induction	Adaptive interfaces and personalization

Professional Memberships

American Association for Artificial Intelligence (Fellow), Cognitive Science Society (Fellow)
 Association for Computing Machinery (Special Interest Group for Artificial Intelligence)

Courses Taught *(at UCI, Stanford University, and Arizona State University)*

Introduction to Artificial Intelligence – Winter, 1985; Fall, 1986, 1987
 AI Projects/Programming Techniques – Winter, 1986; Spring, 1986, 1988
 Introduction to Machine Learning – Spring, 1985, 1986, 1987, 1991; Winter, 1995; Spring, 1996
 Production System Models of Learning and Development – Winter, 1987
 Projects in Artificial Intelligence – Spring, 1986
 Readings/Projects in Artificial Intelligence – Fall, 1985, 1986; Spring, 1986
 Experimental Methodologies for Machine Learning – Winter, 1988
 Computational Models of Learning and Development – Spring, 1995
 Adaptive Interfaces and User Modeling – Spring, 1999, 2000
 Causal Models in Biomedical Informatics – Winter, 2003
 Reasoning and Learning in Cognitive Systems – Winter, 2004, 2005, 2006
 Computational Approaches to Scientific Reasoning and Discovery – Spring, 2004, 2005
 Cognitive Systems and Intelligent Agents – Spring, 2007, 2008, 2009, 2011, Fall, 2009
 Introduction to Science Informatics – Spring, 2009

Postdoctoral Mentorships

Brian Yamauchi (1995–1996)	Marcus Maloof (1996–1998)
Simon Handley (1997–1998)	Cindi Thompson (1998–2000)
Will Bridewell (2004–2009)	Ljupčo Todorovski (2004–2005)
Stuart Borrett (2005–2007)	Tolga Könik (2005–2010)
David Stracuzzi (2005–2007)	Stephen Racunas (2005–2007)

Doctoral Committees (*completed dissertations in italics*)

<i>Douglas Fisher</i> , Member (1984–1987)	<i>Jeff Schlimmer</i> , Member (1985–1987)
<i>Randy Jones</i> , Chair (1985–1989)	<i>Bernd Nordhausen</i> , Chair (1985–1989)
<i>Wayne Iba</i> , Chair (1986–1991)	<i>John Gennari</i> , Chair (1986–1990)
<i>James Wogulis</i> , Member (1986–1990)	Patrick Young, Chair (1986–1988)
Kevin Thompson, Chair (1986–1992)	<i>Donald Rose</i> , Chair (1984–1989)
<i>Klaus Gross</i> , Member (1989–1991)	John Allen, Chair (1988–1992)
<i>Ron Kohavi</i> , Member (1996)	<i>George John</i> , Member (1994–1997)
<i>Ofer Maitan</i> , Member (1997)	<i>Daniel Shapiro</i> , Co-Chair (1997–2000)
Oren Shiran, Co-Chair (2003–2005)	Nan Li, Chair (2006–2009)
<i>Dongkyu Choi</i> , Co-Chair (2003–2010)	<i>Negin Nejati</i> Co-Chair (2003–2011)
Nima Asgharbeygi, Co-Chair (2004–2011)	Chunki Park, Co-Chair (2005–2011)
<i>Lei Tang</i> , Member (2009–2010)	Archana Ramesh, Member (2010–2011)
Glen Hunt, Chair (2011–2011)	Andrea Danielescu, Member (2011–2011)
Chris MacLellan, Chair (2011–2011)	

Masters Committees (*completed theses in italics*)

<i>Ravi Gummadi</i> , Co-Chair (2008–2009)	<i>Anupam Khulbe</i> , Co-Chair (2008–2009)
Durga Bidaye, Co-Chair (2008–2009)	<i>Nishant Trivedi</i> , Chair (2009–2011)

University Service

Industrial Affiliates Committee (Chair), ICS Department, UCI, 1984–1985
 Faculty Chair, ICS Department, UCI, 1984–1985
 Computing Resources Committee, ICS Department, UCI, 1985–1986
 Executive Committee, ICS Department, UCI, 1985–1986
 Organizer, Seminar on Computational Learning and Adaptation, Stanford University, 1994–2006
 Consulting Professor, Symbolic Systems Program, Stanford University – 1996–2008
 Symbolic Systems Program Masters Committee, Stanford University, 1997–1998
 CSLI Distinguished Lecture Series Committee, Stanford University, 1999–2001
 CSLI Advisory Committee, Stanford University, 2003–2007
 Associate Director for Informatics, Arizona State University, 2007–2008
 Executive Committee, Department of Computer Science, Arizona State University, 2008–2009
 Undergraduate Program Committee, Informatics Program, Arizona State University, 2011

Professional Service

Reviewer, National Science Foundation, 1986–1988, 1991, 1994, 1998, 2002, 2004, 2005

Reviewer, International Joint Conference on Artificial Intelligence, 1983, 1985, 1987, 1989, 1995, 2001

Program committee, International Joint Conference on Artificial Intelligence, 1989

Program committee, AAAI Conference on Artificial Intelligence, 1987–1988, 1991, 1996–1997, 2005

Program co-chair, AAAI Integrated Intelligence track, 2007, 2008, 2010

Program chair, International Workshop/Conference on Machine Learning, 1987, 2000

Program committee, International Conference on Machine Learning, 1988/89, 1991/93/97, 2000/02/03/04/05

Reviewer, Annual Meeting of the Cognitive Science Society, 1985, 1993, 1994, 2004, 2010, 2011

Program committee, International Conference on the Foundations of Digital Games, 2009

Reviewer, *Cognitive Science*, 1986, 1987, 1994, 2001–2009

Editorial board, *Cognitive Science*, 2003–2005

Reviewer, *Artificial Intelligence*, 1986, 1988, 1993, 1994

Associate, *Behavioral and Brain Sciences*, 1987–1991

Executive Editor, *Machine Learning*, 1985–1988

Editor, *Machine Learning*, 1989–1990, 1996–1998

Editorial board, *Machine Learning*, 1985–2010

Editorial board, *Journal of Artificial Intelligence Research*, 1993–1996

Reviewer, *Journal of Artificial Intelligence Research*, 1993–1996, 2003, 2005

Editorial board, *Knowledge Discovery and Data Mining*, 1996–2011

Editor, Morgan Kaufmann Series in Machine Learning, 1990–1999

Co-organizer, Symposium on Computational Models of Scientific Discovery, 1989

Co-organizer, Symposium on Computational Approaches to Concept Formation, 1990

Co-organizer, Symposium on Learning Methods for Planning and Scheduling, 1991

Co-organizer, Workshop on Fielded Applications of Machine Learning, 1993

Organizing committee, AAAI Spring Symposium on Integrated Intelligent Architectures, 1991

Program committee, International Conference on AI Planning Systems, 1992, 1994, 1996, 2004

Co-presenter – AAAI/IJCAI Tutorial on Machine Learning – 1985, 1986, 1988, 1992

Organizer and co-presenter – CSLI Tutorial on Applications of Machine Learning – 1994–1996, 1998

Organizing committee, AAAI Workshop on Computational Models of Human Learning, 1996

Co-editor, special issue of *Machine Learning* on learning with probabilistic representations, 1997

Program co-chair, Nineteenth Annual Conference of the Cognitive Science Society, 1997

Co-organizer, Symposium on Applications of Reinforcement Learning, 1998

Organizer, Symposium on Computational Discovery of Communicable Knowledge, 2001

Co-organizer, Symposium on Advances in Cognitive Architectures, 2003

Co-organizer, Symposium on Reasoning and Learning in Cognitive Systems, 2004

Co-organizer, Symposium on Machine Learning for Anomaly Detection, 2004

Co-organizer, Symposium on Computational Approaches to Creativity in Science, 2008

Co-organizer, Symposium on Systems Biology of Aging, 2008, 2010

Program chair, AAAI Fall Symposium on Advances in Cognitive Systems, 2011

Books

- [1] Langley, P. (Ed.) (2000). *Proceedings of the Seventeenth International Conference on Machine Learning*. Stanford, CA: Morgan Kaufmann.
- [2] Shafto, M. G., & Langley, P. (Eds.) (1997). *Proceedings of the Nineteenth Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Lawrence Erlbaum.
- [3] Langley, P. (1995). *Elements of Machine Learning*. San Francisco: Morgan Kaufmann.
- [4] Fisher, D. H., Pazzani, M. J., & Langley, P. (Eds.) (1991). *Concept Formation: Knowledge and Experience in Unsupervised Learning*. San Francisco: Morgan Kaufmann.
- [5] Shrager, J., & Langley, P. (Eds.) (1990). *Computational Models of Scientific Discovery and Theory Formation*. San Francisco: Morgan Kaufmann.
- [6] Langley, P. (Ed.) (1987). *Proceedings of the Fourth International Workshop on Machine Learning*. San Francisco: Morgan Kaufmann.
- [7] Langley, P., Simon, H. A., Bradshaw, G. L., & Żytkow, J. M. (1987). *Scientific Discovery: Computational Explorations of the Creative Processes*. Cambridge, MA: MIT Press.
- [8] Klahr, D., Langley, P., & Neches, R. (Eds.) (1987). *Production System Models of Learning and Development*. Cambridge, MA: MIT Press.

Refereed Journal Articles

- [1] Bridewell, W. & Langley, P. (2010). Two kinds of knowledge in scientific discovery. *Topics in Cognitive Science*, 2, 36–52.
- [2] Könik, T., O’Rorke, P., Shapiro, D., Choi, D., Nejati, N., & Langley, P. (2009). Skill transfer through goal-driven representation mapping. *Cognitive Systems Research*, 10, 270–285.
- [3] Langley, P., Choi, D., & Rogers, S. (2009). Acquisition of hierarchical reactive skills in a unified cognitive architecture. *Cognitive Systems Research*, 10, 316–332.
- [4] Langley, P., Laird, J. E., & Rogers, S. (2009). Cognitive architectures: Research issues and challenges. *Cognitive Systems Research*, 10, 141–160.
- [5] Cassimatis, N. L., Bello, P., & Langley, P. (2008). Ability, breadth and parsimony in computational models of higher-order cognition. *Cognitive Science*, 32, 1304–1322.
- [6] Bridewell, W., Langley, P., Todorovski, L., & Džeroski, S. (2008). Inductive process modeling. *Machine Learning*, 71, 1–32.
- [7] Bridewell, W., Billman, D., Sánchez, J. N., & Langley, P. (2006). An interactive environment for the modeling and discovery of scientific knowledge. *International Journal of Human-Computer Studies*, 64, 1099–1114.
- [8] Langley, P., Shiran, O., Shrager, J., Todorovski, L., & Pohorille, A. (2006). Constructing explanatory process models from biological data and knowledge. *Artificial Intelligence in Medicine*, 37, 191–201.
- [9] Langley, P., & Choi, D. (2006). Learning recursive control programs from problem solving. *Journal of Machine Learning Research*, 7, 493–518.
- [10] Asgharbeygi, N., Bay, S., Langley, P., & Arrigo, K. (2006). Inductive revision of quantitative process models. *Ecological Modelling*, 194, 70–79.
- [11] Jones, R. M., & Langley, P. (2005). A constrained architecture for learning and problem solving. *Computational Intelligence*, 21, 480–502.

- [12] Schroedl, S., Wagstaff, K., Rogers, S., Langley, P., & Wilson, C. (2004). Mining GPS traces for map refinement. *Knowledge Discovery and Data Mining*, 9, 59–87.
- [13] Thompson, C. A., Göker, M. H., & Langley, P. (2004). A personalized system for conversational recommendations. *Journal of Artificial Intelligence Research*, 21, 393–428.
- [14] Ichise, R., Shapiro, D., & Langley, P. (2004). Structured program induction from behavioral traces. *IEICE Transactions on Information and Systems*, J87-D-1, 730–740 (in Japanese).
- [15] Todorovski, L., Džeroski, S., Langley, P., & Potter, C. (2003). Using equation discovery to revise an Earth ecosystem model of carbon net production. *Ecological Modelling*, 170, 141–154.
- [16] Bay, S. D., Shragar, J., Pohorille, A., & Langley, P. (2003). Revising regulatory networks: From expression data to linear causal models. *Journal of Biomedical Informatics*, 35, 289–297.
- [17] Maloof, M. A., Langley, P., Binford, T. O., Nevatia, R., & Sage, S. (2003). Improved rooftop detection in aerial images with machine learning. *Machine Learning*, 53, 157–191.
- [18] Langley, P. (2000). The computational support of scientific discovery. *International Journal of Human-Computer Studies*, 53, 393–410.
- [19] Kocabas, S., & Langley, P. (2000). Computer generation of process explanations in nuclear astrophysics. *International Journal of Human-Computer Studies*, 53, 377–392.
- [20] Blum, A. L., & Langley, P. (1997). Selection of relevant features and examples in machine learning. *Artificial Intelligence*, 97, 245–271.
- [21] Yamauchi, B., & Langley, P. (1997). Place recognition in dynamic environments. *Journal of Robotic Systems*, 14, 107–120.
- [22] Langley, P., Pfeleger, K., & Sahami, M. (1997). Lazy acquisition of place knowledge. *Artificial Intelligence Review*, 11, 315–342.
- [23] Langley, P., & Simon, H. A. (1995). Applications of machine learning and rule induction. *Communications of the ACM*, 38, November, 55–64.
- [24] Nordhausen, B., & Langley, P. (1993). An integrated framework for empirical discovery. *Machine Learning*, 12, 17–47.
- [25] Langley, P., & Żytkow, J. M. (1989). Data-driven approaches to empirical discovery. *Artificial Intelligence*, 40, 283–312.
- [26] Gennari, J. H., Langley, P., & Fisher, D. H. (1989). Models of incremental concept formation. *Artificial Intelligence*, 40, 11–61.
- [27] Iba, W., & Langley, P. (1987). A computational theory of motor learning. *Computational Intelligence*, 3, 338–350.
- [28] Żytkow, J. M., Langley, P., & Simon, H. A. (1987). Computer system of discovery STAHL. *Studia Filozoficzne or Zagadnienia Naukoznawstwa*, 23, 518–536.
- [29] Rose, D., & Langley, P. (1986). Chemical discovery as belief revision. *Machine Learning*, 1, 423–451.
- [30] Langley, P. (1985). Learning to search: From weak methods to domain-specific heuristics. *Cognitive Science*, 9, 217–260.
- [31] Langley, P., Larson, P., Silas, S., & Wertz, S. (1983). A proof of CNQNP from CPQ by the rule of detachment in Jeffrey’s system 5.6. *International Logic Review*, 14, 37–40.
- [32] Bradshaw, G. L., Langley, P., & Simon, H. A. (1983). Studying scientific discovery by computer simulation. *Science*, 222, 971–975.
- [33] Langley, P. (1983). Representational issues in learning systems. *IEEE Computer*, 16, 47–51.

- [34] Langley, P. (1983). Learning search strategies through discrimination. *International Journal of Man-Machine Studies*, 18, 513–541.
- [35] Langley, P. (1982). Language acquisition through error recovery. *Cognition and Brain Theory*, 5, 211–255.
- [36] Simon, H. A., Langley, P., & Bradshaw, G. L. (1981). Scientific discovery as problem solving. *Synthese*, 47, 1–27.
- [37] Langley, P. (1981). Data-driven discovery of physical laws. *Cognitive Science*, 5, 31–54.
- [38] Langley, P., Neches, R., Neves, D., & Anzai, Y. (1980). A domain-independent framework for learning procedures. *International Journal of Policy Analysis and Information Systems*, 4, 163–197.
- [39] Langley, P. (1979). A production system model for the induction of mathematical functions. *Behavioral Science*, 24, 121–139.

Refereed Conference Papers

- [1] Bridewell, W., & Langley, P. (2011). A computational account of everyday abductive inference. *Proceedings of the Thirty-Third Annual Meeting of the Cognitive Science Society*. Boston.
- [2] Iba, W. F., & Langley, P. (2011). Exploring moral reasoning in a cognitive architecture. *Proceedings of the Thirty-Third Annual Meeting of the Cognitive Science Society*. Boston.
- [3] Langley, P., Trivedi, N., & Banister, M. (2010). A command language for taskable virtual agents. *Proceedings of the Sixth Conference Artificial Intelligence and Interactive Digital Entertainment*. Stanford, CA: AAAI Press.
- [4] Langley, P. (2010). An interactive environment for explanatory biological modeling. *Proceedings of the Thirty-Second Annual Meeting of the Cognitive Science Society*. Portland, OR.
- [5] Danielescu, A., Stracuzzi, D. J., Li, N., & Langley, P. (2010). Learning from errors by counterfactual reasoning in a unified cognitive architecture. *Proceedings of the Thirty-Second Annual Meeting of the Cognitive Science Society*. Portland, OR.
- [6] Park, C., Bridewell, W., & Langley, P. (2010). Integrated systems for inducing spatio-temporal process models. *Proceedings of the Twenty-Fourth AAAI Conference on Artificial Intelligence*. Atlanta: AAAI Press.
- [7] Li, N., Stracuzzi, D. J., Langley, P., & Nejati, N. (2009). Learning hierarchical skills from problem solutions using means-ends analysis. *Proceedings of the Thirty-First Annual Meeting of the Cognitive Science Society*. Amsterdam.
- [8] Stracuzzi, D. J., Li, N., Cleveland, G., & Langley, P. (2009). Representing and reasoning over time in a cognitive architecture. *Proceedings of the Thirty-First Annual Meeting of the Cognitive Science Society*. Amsterdam.
- [9] Li, N., Stracuzzi, D., & Langley, P. (2008). Learning conceptual predicates for teleoreactive logic programs. *Proceedings of the Eighteenth International Conference on Inductive Logic Programming: Late-Breaking Papers*. Prague: Springer.
- [10] Li, N., Choi, D., & Langley, P. (2007). Adding goal priorities to teleoreactive logic programs. *Proceedings of the First International Symposium on Skill Science*. Tokyo, Japan.
- [11] Könik, T., Choi, D., Shapiro, D., Park, C., Nejati, N., Langley, P., & Stracuzzi, D. (2007). Structural transfer of cognitive skills. *Proceedings of the Eighth International Conference on Cognitive Modeling*. Ann Arbor, MI.
- [12] Choi, D., Könik, T., Nejati, N., Park, C., & Langley, P. (2007). A believable agent for first-person shooter games. *Proceedings of the Third Annual Artificial Intelligence and Interactive Digital Entertainment Conference* (pp. 71–73). Stanford, CA: AAAI Press.

- [13] Bridewell, W., Langley, P., Racunas, S., & Borrett, S. R. (2006). Learning process models with missing data. *Proceedings of the Seventeenth European Conference on Machine Learning* (pp. 557–565). Berlin: Springer.
- [14] Langley, P., & Choi, D. (2006). A unified cognitive architecture for physical agents. *Proceedings of the Twenty-First National Conference on Artificial Intelligence*. Boston: AAAI Press.
- [15] Nejati, N., Langley, P., & Könik, T. (2006). Learning hierarchical task networks by observation. *Proceedings of the Twenty-Third International Conference on Machine Learning* (pp. 665–672). Pittsburgh.
- [16] Asgharbeygi, N., Langley, P., & Stracuzzi, D. (2006). Relational temporal difference learning. *Proceedings of the Twenty-Third International Conference on Machine Learning* (pp. 49–56). Pittsburgh.
- [17] Choi, D., & Langley, P. (2005). Learning teleoreactive logic programs from problem solving. *Proceedings of the Fifteenth International Conference on Inductive Logic Programming* (pp. 51–68). Bonn, Germany: Springer.
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