CURRICULUM VITAE

Dr. Daniel G. Shapiro

Executive Director, Chief Financial Officer
Institute for the Study of Learning and Expertise
2164 Staunton Court
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President
Applied Reactivity, Inc.
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Interests: Cognitive systems. Machine learning. Artificial intelligence. Applications of Artificial Intelligence. Large scale complex system design. Agent design, development and verification methodology. Decision theory, optimal control, reactive computing and reactive programming languages.

Education:

Ph.D. Stanford University (2001) Department of Management Science and Engineering. Thesis: *Value-Driven Agents*. Defines a novel architecture for cognitive systems that increases agent autonomy, enhances human trust, and offers designers a new development and verification methodology. Value-driven agents act to maximize an internal measure of reward. Research contributes a novel reactive programming language for specifying agent skills (Icarus), an embedded, hierarchical reinforcement learning algorithm that refines such skills from experience, a convergence proof that the learned behavior is optimal, and a formal guarantee that value-driven agents will maximize user utility as a byproduct of satisfying themselves. Provides empirical tests of an implemented value-driven agent in a simulated automotive domain.

M.S. Stanford University (1994) Department of Engineering Economic Systems. Curriculum in decision theory, probability, economics, dynamic systems, and optimal control.

S.M. Massachusetts Institute of Technology (1981) Department of Electrical Engineering and Computer Science, Laboratory for Artificial Intelligence. Thesis: *Sniffer: A System that Understands Bugs*. Developed an expert debugging aid that recognized faulty implementations of a programming cliché (a list insertion) from source code and a trace of program execution. Implemented a lisp interpreter that generated and compared alternate program timelines.

A.B. University of California at Santa Cruz (1976) Chemistry. Thesis: *Planning Mechanisms for Simulated Antithetic Analysis*.

PUBLICATIONS

Dissertation

Shapiro, D., *Value-Driven Agents*, Ph.D. thesis, Stanford University, Department of Management Science and Engineering, 2001.

Books, Journals, and Magazines edited

Shapiro, D., and Fromherz, M. (eds.), AI Magazine Special Issue on the 2011 Innovative Applications of Artificial Intelligence Conference. AAAI Press, in press.

Shapiro, D., Muñoz-Avila, H., and Stracuzzi, D. (eds.), AI Magazine Special Issue on Structured Knowledge Transfer, Spring 2011. AAAI Press.

Shapiro, D., Muñoz-Avila, H., and Stracuzzi, D. (eds.), AI Magazine Special Issue on Structured Knowledge Transfer, Part 2. Summer 2011. AAAI Press.

Rychtyckyj, N., and Shapiro, D. (eds.), AI Magazine Special Issue on the 2010 Innovative Applications of Artificial Intelligence Conference. AAAI Press. Summer 2011.

Shapiro, D., and Göker, M. (eds.), AI Magazine Special Issue on Advancing AI Research and Applications by Learning from What Went Wrong and Why. AAAI Press, Summer 2008.

Ramos, C., Augusto, J., and Shapiro, D. (eds.). IEEE Intelligent Systems Special Issue on Ambient Intelligence, Vol. 23, No. 2. Mar./Apr. 2008.

Remagnino, P., and Shapiro, D. (eds.), Computational Intelligence: Special Issue on Artificial Intelligence Methods for Ambient Intelligence Volume 23 Issue 4, November 2007.

Augusto, J., and Shapiro, D. (eds.), Advances in Ambient Intelligence. (2007). IOS press. ISBN 978-1-58603-800-7

Journal and Magazine Articles

Stracuzzi, D., Fern, A., Ali, K., Hess, R., Pinto, J., Li, N., Könik, T., and Shapiro, D. *Transfer of Learning in American Football: From Observation of Raw Video to Control in a Simulated Environment*. AI Magazine Special Issue on Structured Knowledge Transfer, Part 2. Summer 2011.

Könik, T., O'Rorke, P., and Shapiro, D. Skill Transfer through Goal-Driven Representation Mapping. *Cognitive Systems Research, Special Issue on Analogies - Integrating Cognitive Abilities*, Vol. 10, No. 3, September 2009.

Ichise, R., Shapiro, D., Langley, P. (2004). Structured program induction from behavioral traces, *IEICE Transactions on Information and Systems*, Vol. J87-D-1, No. 6, pp. 730-740 (in Japanese). The Institute of Electronics, Information and Communication Engineers.

Tong, R., & Shapiro, D., Experimental Investigations of uncertainty in a rule-based system for information retrieval, *International Journal of Man Machine Studies 22*, 265-282, 1985. (Invited paper.)

McCune, B., Tong, R., Dean, J., & Shapiro, D., RUBRIC: A system for rule-based information retrieval, *IEEE Transactions on Software Engineering, vol SE-11, no 9*, September 1985, pp

939-945. Also in *Readings in Information Systems*, Sparck-Jones, K., & Willett, P. (eds), Morgan Kaufmann Publishers, Inc., May 1997.

Editorials

Shapiro, D., Muñoz-Avila, H., and Stracuzzi, D. *The Special Issue on Structured Knowledge Transfer*. AI Magazine Special Issue on Structured Knowledge Transfer. Spring 2011. AAAI Press.

Rychtyckyj, N., and Shapiro, D. *Introduction to the Special Issue on the 2010 Innovative Applications of Artificial Intelligence Conference*. Summer 2011. AAAI Press.

Shapiro, D., and Goker, M. (2008). *What Went Wrong and Why: Lessons from AI Research and Development*. AI Magazine Special Issue on Advancing AI Research and Applications by Learning from What Went Wrong and Why. AAAI Press, Summer 2008.

Ramos, C., Augusto, J., and Shapiro, D. (2008). *Ambient Intelligence - The Next Step for Artificial Intelligence*. In Ramos, C., Augusto, J., and Shapiro, D. (eds.). IEEE Intelligent Systems Special Issue on Ambient Intelligence, Vol. 23, No. 2. Mar./Apr. 2008

Remagnino, P., and Shapiro, D. (2007). *Artificial Intelligence Methods for Ambient Intelligence*, in Computational Intelligence: Special Issue on Artificial Intelligence Methods for Ambient Intelligence, Volume 23, Issue 4, November 2007, pp 393-394.

Conference Articles

Könik, K., Ali, K., Shapiro, D., Li, N., and Stracuzzi, D. *Improving Structural Knowledge Transfer with Parametric Adaptation* (2010). The 23rd Florida Artificial Intelligence Research Society Conference (FLAIRS-23), Daytona Beach, Florida.

Li, N., Stracuzzi, D., Cleveland, G., Könik, T., Nejati, N., Shapiro, D., Molineaux, M., and Aha, D. (2009). *Constructing Game Agents from Video of Human Behavior*, Proceedings of the Fifth AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE), Stanford, CA.

Ali, K., Leung, K., Könik, K., Choi, D., and Shapiro, D. (2009). *Knowledge-Directed Theory Revision*, Nineteenth International Conference on Inductive Logic Programming, Leuven, Belgium.

Shapiro, D., Könik, K., and O'Rorke, P. (2008). *Achieving Far Transfer in an Integrated Cognitive Architecture*, Proceedings of the Twenty-third Conference of the Association for the Advancement of Artificial Intelligence, Chicago, IL.

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.

Billman,D., Shapiro, D., & Cummings, K. (2005) *Processes in Diagnostic Reasoning: Information Use in Causal Explanations*. In Program of the Twenty-Seventh Annual Conference of the Cognitive Science Society. pp. 262-267, Erlbaum: Hillsdale, NJ.

Langley, P., Cummings, K., & Shapiro, D. (2004). *Hierarchical skills and cognitive architectures*. Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society. Chicago, IL.

Choi, D., Kaufman, M., Langley, P., Nejati, N., & Shapiro, D. (2004). *An architecture for persistent reactive behavior*. Proceedings of the Third International Joint Conference on Autonomous Agents and Multi Agent Systems. New York: ACM Press.

Shapiro, D., & Langley, P. (2002). *Separating skills from preference: using learning to program by reward*. Nineteenth International Conference on Machine Learning.

Bay, S., Shapiro, D., & Langley, P. (2002). *Revising engineering models: combining computational discovery with knowledge*. European Conference on Machine Learning.

Ichise, R., Shapiro, D., & Langley, P. (2002). *Learning hierarchical skills from observation*. Proceedings of the Fifth International Conference on Discovery Science.

Ichise, R., Shapiro, D., & Langley, P. (2002). *Learning programs from observations of other agents*. Proceedings of the Joint Agent Workshop (JAWS2002), pp. 1-8, in Japanese.

Shapiro, D., Langley, P., & Shachter, R. (2001). *Using background knowledge to speed reinforcement learning*, Fifth International Conference on Autonomous Agents.

Shapiro, D., & Langley, P. (1999). *Controlling physical agents through reactive logic programming*. Third International Conference on Autonomous Agents (pp. 386-387). Seattle: ACM.

Shapiro, D. (1997). *Giving up for no good reason*. Nineteenth Annual Conference of the Cognitive Science Society, Stanford CA.

Cromarty, A., Shapiro, D., & Fehling, M. (1984). *Still planners run deep: shallow reasoning for fast replanning*. Proceedings of the Society of Photo-Optical Engineers, Technical Symposium East. SPIE.

Shapiro, D., & McCune, B. (1983). *The intelligent program editor: a knowledge-based system for supporting program and documentation maintenance*. Proceedings of the Trends and Applications Conference: Automating Intelligent Behavior; Applications and Frontiers, pp 226-232. Gaithersburg, MD. IEEE.

Shapiro, D., Dean, J., & McCune, B. (1984). *A knowledge base for supporting an intelligent program editor*. Proceedings of the Seventh International Conference on Software Engineering, pp. 381-386. Orlando, FL. IEEE.

McCune, B., Tong, R., Dean, J., & Shapiro, D. (1983). *RUBRIC: a system for rule-based information retrieval*. Proceedings of the Seventh International Computer Software and Applications Conference, pp 166-172. IEEE Computer Society.

Tong, R., Shapiro, D., McCune, B., & Dean, J. (1983). *A rule-based approach to information retrieval: some results and comments*. Proceedings of the National Conference on Artificial Intelligence, pp 411-415. William Kauffman.

Tong, R., & Shapiro, D. (1983). *An experiment with multiple-valued logics in an expert system*. Proceedings of the IFAC Symposium on Fuzzy Information, Knowledge Representation and Decision Analysis. Marseille, France.

Tong, R., Shapiro, D., Dean, J., & McCune, B. (1983). *A comparison of uncertainty calculi in an expert system for information retrieval*. Proceedings of the Eigth International Joint Conference on Artificial Intelligence, pp 194-197. Karlsruhe, Germany. William Kauffman.

Refereed Workshop Papers

Shapiro, D. *The Social Agency Problem*. (2011) Association for the Advancement of Artificial Intelligence, Fall Symposium Workshop on Advances in Cognitive Systems.

Li, N., Stracuzzi, D., Cleveland, G., Langley, P., Könik, T., Shapiro, D., Ali, K., Molineaux, M., and Aha, D. *Learning Hierarchical Skill for Game Agents from Video of Human Behavior*. (2009). Twenty-first International Joint Conference on Artificial Intelligence, Workshop on Learning Structural Knowledge from Observations. Pasadena, California,

Lemon, O., Liu, X., Shapiro, D., and Tollander, C. (2006). *Hierarchical Reinforcement Learning of Dialogue Policies in a development environment for dialogue systems: REALL-DUDE*, 10th SemDial Workshop on the Semantics and Pragmatics of Dialogue, (demonstration systems), BRANDIAL 2006

Langley, P., Arai, S., & Shapiro, D. (2004). *Model-Based Learning with Hierarchical Relational Skills*, International Conference on Machine Learning, Workshop on Relational Reinforcement Learning. http://eecs.oregonstate.edu/research/rrl/proceedings.html

Shapiro, D., and Collopy, P. (2004). *Communicating Values to Autonomous Agents*, Stanford Spring Symposium on Interaction between Humans and Autonomous Systems over Extended Operation. Stanford, CA.

Langley, P., Shapiro, D., Aycinena, M., & Siliski, M. (2003). *A value-driven architecture for intelligent behavior*. Proceedings of the IJCAI-2003 Workshop on Cognitive Modeling of Agents and Multi-Agent Interactions (pp. 10-18). Acapulco, Mexico.

Shapiro, D., & Gervasio, M. (2003). *Adaptive interfaces for value-driven agents*. Stanford Spring Symposium, Workshop on Human Interaction with Autonomous Systems in Complex Environments, Stanford University, Stanford, CA.

Langley, P., Shapiro, D., Aycinena, M., & Siliski, M. (2003). A value-driven architecture for intelligent behavior. Proceedings of the IJCAI-2003 Workshop on Cognitive Modeling of Agents and Multi-Agent Interactions. Acapulco, Mexico.

Shapiro, D., & Shachter, R. (2002). *User-agent value alignment*. Stanford Spring Symposium, Workshop on Safe Agent Learning. Stanford University, Stanford, CA.

Shapiro, D. (1999). *Controlling gaming agents via reactive programs*, Stanford Spring Symposium Workshop on Artificial Intelligence and Computer Games.

Schoppers, M., & Shapiro, D. (1997). *Designing embedded agents to optimize end-user objectives*. Proceedings of the Fourth International Workshop on Agent Theories, Architectures and Languages. Providence, RI. Reprinted in *Intelligent Agents, v.4*, Springer Verlag.

Tong, R., Applebaum, L., & Shapiro, D. (1986). *A general purpose inference engine for evidential reasoning research*. Proceedings of the Second Workshop on Uncertainty in Artificial Intelligence, American Association of Artificial Intelligence.

Non-Refereed Workshop Papers

Shapiro, D. (1989). *The astronaut and the banana peel*. Proceedings NASA/JPL Workshop on Space Telerobotics, Pasadena, CA.

Manuscripts

Shapiro, D., Shachter, R., and Langley, P. *User-Agent Value Alignment*.

Shapiro, D., Marker, M., and Langley, P. *A Human-Centered Approach to Model-Based Monitoring of Complex Dynamic Systems*.

Technical Reports

Göker, M., Shapiro, D. (eds.). What Went Wrong and Why: Lessons from AI Research and Applications. Technical Report WS-08-14, AAAI Press, 2008.

A. Abdecker, R. Alami, C Baral, T. Bickmore, E. Durfee, T. Fong, M. Göker, N., Green, M. Liberman, C. Lebiere, J. Martin, G. Mentzas, D. Musliner, N. Nicolov, I., Nourbakhsh, F. Salvetti, D. Shapiro, D. Schreckenghost, A. Sheth, L. Stojanovic, V., SunSpiral, R. Wray, "AAAI Spring Symposium Reports" , AI Magazine, Vol 27, Nr. 3, Fall 2006, pp. 107-112, American Association for Artificial Intelligence (AAAI), Menlo Park, 2006

Shapiro, D., Göker, M. (eds.), What Went Wrong and Why: Lessons From AIResearch and Application, Papers from the AAAI Spring Symposium, March 27-29, 2006, Stanford, CA. Technical Report SS-06-08, AAAI Press, Menlo Park, 2006.

Langley, P., Choi, D., & Shapiro, D. (2004). *A cognitive architecture for physical agents*. Institute for the Study of Learning and Expertise, Palo Alto, CA.

Fehling, M., & Shapiro D., *A systems level perspective on IVHS design*, University of California Institute of Transportation Studies, Richmond Field Station, Bldg 452, 1357 S. 46th St., Richmond, CA 94804-4698, California PATH Reports to Caltrans 96-C10, 6/96.

Shapiro, D., *Extra Vehicular Activity Retriever simulation video* (Parts 1 and II), Image Sciences Division, NASA Johnson Space Center, Houston TX 77058, wo 55033.005, 3/93.

Shapiro, D., *Architectures for semi-autonomous planning*, NASA Lyndon Johnson Space Center, NAS 9-18162, 7/91.

Shapiro, D., *A principled design for the operations management application onboard Space Station Freedom*, Final Report, NASA Lyndon Johnson Space Center, Houston TX 77058, NAS 9-18083, 8/89.

Schoppers, M., & Shapiro, D., *Telerobotic control of teams of semi-autonomous agents*, U.S. Army Tank-Automotive Command, Warren, MI 48397-5000, DAAE07-88-C-R076, 4/89.

Shapiro, D., Shu, R., & Tollander, C., *An Operations Monitoring Assistant,* U.S. Army Communications-Electronics Command, Fort Monmouth, NJ 07703, DAAB07-86-C0051, 11/88.

Shapiro, D., *An Extra Vehicular Activity Retriever scenario*, NASA Lyndon Johnson Space Center, Houston TX 77058, Technical report JSC-23196, 9/88.

Shapiro, D., & Tollander, C., *The battlefield commander's assistant project*, Army Communications-Electronics Command, DAAB07-84-K516, 1/87.

Stachnic, G., Applebaum, L., Marks, P., Marsh, J., Rosenschein, J., Schoppers, M., & Shapiro, D., *Airland battle management planning study*, Defense Advanced Research Projects Agency, 1400 Wilson Boulevard, Arlington, VA 22209-2308, DAAH01-86-C-0487, 10/86.

Shapiro, D., Finger, J., Courand, G., McCune, B., & Payne, R., *The design of TEMPLAR (a Tactical Expert Mission Planner*), Rome Air Development Center, Rome NY, RADC-TR-84-134, 1984.

McCune, B., Dean, J., Tong, R., & Shapiro, D., *RUBRIC, a system for rule based information retrieval*, Advanced Information and Decision Systems, 1500 Plymouth St, Mountain View CA, TR-1018-1, 2/83.

McCune, B., Dean, J., Shapiro, D., & Tong, R., *Rule-based information retrieval*, Intelligence Applications of Advanced Computer and Information Technology: Focus on Artificial Intelligence, Office of Research and Development, Central Intelligence Agency, Washington, DC, 11/82.

Shapiro, D., McCune, B., & Wilson, G., *Design of an intelligent program editor*, Office of Naval Research, 800 N. Quincy St, Arlington, VA 22217, N00014-82-C-0119, 9/82.

Shapiro, D., & McCune, B., *Searching a knowledge base of programs and documentation*, Air Force Office of Scientific Research, Bolling Air Force Base, D.C. 20332, F49620-81-C-0067, 5/82.

PROFESSIONAL SERVICE

Review Committee, *AAAI Fall Symposium on Advances in Cognitive Systems, 2011.*

Chair, *Innovative Applications of Artificial Intelligence 2011*

Co-Chair, *Innovative Applications of Artificial Intelligence 2010*

Program Committee, *IAAI-08, IAAI-09, IAAI-12*

Editorial board, *Journal of Ambient Intelligence and Smart Environments (JAISE)*

Editorial board, *Journal of Interesting Negative Results in Natural Language Processing and Machine Learning (JINR)*

Co-chair, *Goal Directed Autonomy Workshop, AAAI 2010*

Program Committee*, 5th Workshop on Artificial Intelligence Techniques for Ambient Intelligence (AITAmI'10),* Kuala Lumpur, Malaysia

Program Committee*, 4th Workshop on Artificial Intelligence Techniques for Ambient Intelligence,* Barcelona, Spain, 2009

Program Committee Area Chair, *International Conference on Tools with Artificial Intelligence, ICTAI 2008*

Program Committee, *2008 Symposium on Wildlife and Horticultural Applications in Ambient Intelligence*

Co-chair, *What Went Wrong and Why, AAAI-08 Workshop,* Chicago, IL

Co-chair, *3rd Workshop on Artificial Intelligence Techniques for Ambient Intelligence,* European Conference on Artificial Intelligence, Patras, Greece, 2008

Co-chair, *2nd Workshop on Artificial Intelligence Techniques for Ambient Intelligence,* International Joint Conference on Artificial Intelligence, Hyderabad, India, 2007

Co-chair, *Artificial Intelligence Techniques for Ambient Intelligence workshop,* European Conference on Artificial Intelligence, Riva Del Garda, Italy, 2006

Chair, *What Went Wrong and Why: Lessons from AI Research and Applications workshop,* AAAI Stanford Spring Symposium, 2006

Chair, *Persistent Assistants: Living and Working with AI workshop*, AAAI Stanford Spring Symposium, 2005

Co-organizer, *Symposium on Learning and Motivation in Cognitive Architectures,* CSLI, Stanford University, 3/22-3/23, 2003 (with Pat Langley and John Laird)

Co-chair, *Safe Learning Agents workshop,* AAAI Stanford Spring Symposium, 2002

Program Committee, *International Conference on Machine Learning*, 2002

International Conference on Machine Learning, Stanford CA, 2000 (Staff)

19th Annual Conference of the Cognitive Science Society, Stanford CA, 1997 (Staff)

Chair, *Military Operations Research Society, Artificial Intelligence session* 1987, Co-chair 1986

Member *AAAI*

WORK HISTORY

Institute for the Study of Learning and Expertise (ISLE), Palo Alto, CA; *Executive Director* (1/2008 -), *Chief Financial Officer* (1/2010 -), *Principal Investigator* (9/2000-7/2004, 5/2005 -), *Assistant Director* (9/2000-7/2004, 5/2005-1/2008). Developing and directing a research program in cognitive systems and machine learning. Manage daily operations.

Projects

- Transfer Learning: directed an $8,300,000, three year, multi-university DARPA effort to acquire knowledge in one domain then exploit it to improve performance in another.
- Design of Large Scale Complex Systems: NSF EAGER grant to radically improve design of complex artifacts. Examined value vs. requirements oriented design methodologies by embedding value-driven agents in an organizational simulation.
- Cognitive architectures: design and develop extensions to the Icarus architecture, e.g., for belief maintenance (over predicate logic, probabilistic, and temporal representations), problem solving, procedural and conceptual knowledge acquisition, and task nomination and abandonment decisions in service of reward maximization.
- Reactive dialogue management: employs Icarus to increase the flexibility of spoken human-machine dialogues. Acquires turn-taking policies by learning from implicit user feedback.
- The benevolent demon: employs Icarus to support discovery learning in the context of computer game. System reacts to student knowledge by structuring educational opportunities.
- Filtering information in complex temporal domains: employs a causal, and hierarchical model of the space station's electric power grid to support interactive fault detection, isolation, and diagnosis from telemetry data. Employs computational learning to acquire accurate device models.
- Monitoring corporate plans: employed hierarchical, causal process models to represent and monitor manufacturing process for plastic parts in a Japanese firm. Employed data mining to recognize good teaming arrangements.

Applied Reactivity, Inc., Los Gatos, CA; *President* (8/2004 –). Developed application technology for discrete logic, reactive control systems that learn.

Projects

- Scaling up Reinforcement Learning of Dialogue Management for Industrial Applications; building a dialogue management system for a commercially relevant task. Making the REALL learning engine accessible to non-expert programmers.
- Javicarus Development in Support of the Reactive Dialogue Management Project; applied, and tailored the Javicarus reactive computing language to problems in dialogue management. Demonstrated a slot-filling dialogue system that learned diverse strategies.

Value Driven Design Institute, *Member, Board of Directors* (2008 -).

Center for the Study of Language and Information, Stanford University; *Senior Researcher* (2002-2004).

Daimler-Chrysler Research & Technology Center, Palo Alto, CA; *Consulting Scientist* (6/97 - 6/99). Pursued thesis research in the context of automotive applications.

California State College Hayward, Dept. of Public Admistration; *Lecturer* (4/97-6/97). Developed and taught a class examining public policy issues with decision analysis tools.

Robotics Research Harvesting, Redwood City, CA; *Consulting Scientist* (1/94 - 4/96). Developed a methodology for constructing artificial agents that improves agent performance measured in user-held terms. Also developed optimal control technology.

Institute for the Study of Learning and Expertise, Palo Alto, CA; *Consulting Scientist* (1/95 - 6/96). Designed and implemented an artificial agent that piloted a virtual plane.

Delphin Systems, Mountain View CA; *Software Engineer* (4/94 - 10/94). Performed comparative study of AI planning engines.

University of Washington at Seattle, Human Interface Technology Laboratory; *Visiting Scientist* (6/93 - 9/93). Implemented boundary-math logic reduction engine with 3D visualization.

California Path Program *Graduate Fellowship*, 9/92 - 6/94. Critiqued designs for Intelligent Vehicle and Highway Systems. Articulated a partial (vs fully) automated alternative.

Electronic Movie Guide, Redwood City CA; *Advertising Consultant* (6/92 - 9/92).

Advanced Decision Systems, Mountain View, CA; *Senior Computer Scientist* (1984-1991), *Computer Scientist* (1981-1983). Principle Investigator for numerous government-sponsored, applied research contracts in artificial intelligence. Acquired funding and led groups of 2-5 people. Emphasis on plan generation, monitoring and execution, mobile robotics, information retrieval, and constraint management. Contributed to the technology underlying Verity.com.

Grants and Contracts:

- Architectures for semi-autonomous planning, NASA Johnson Space Center, 7/89 - 7/91 [Phase I: $50,000, II: $500,000]
- The space station as robot, NASA Johnson Space Center, 1/89 - 7/89 [$50,000]
- An operations monitoring assistant, US Army Communications-Electronics Command, Phase I: 9/85 - 3/86, II: 9/86-11/88 [$50,000, $500,000]
- Telerobotic control of teams of semi-autonomous agents (co-author), U.S. Army Tank-Automotive Command, 9/88 [$50,000]
- A terrain analysis system, US Army Communications-Electronics Command, 9/87 - 3/88 [$50,000]
- A battlefield commander's assistant, US Army Communications-Electronics Command, Phase I: 1/83 - 6/83, II: 1/84 - 1/87 [$50,000, $500,000]
- Air land battle management system (contributor), Defense Advanced Research Projects Agency 10/84 [$750,000]
- A tactical expert mission planner, Rome Air Development Center, 3/83- 9/84 [$1,200,000]
- An autonomous land vehicle (section-lead), Defense Advanced Research Projects Agency, 6/84 – 12/85 [$2,000,000]

Labindustries Inc., Berkeley CA; *Vice President; Member Board of Directors* (1988-1996).

Advanced Decision Systems, Mountain View CA; *Member Board of Directors,* 1984 (elected, declined).

National Science Foundation; *Graduate Fellowship* (9/79 - 6/81).

TEACHING

Courses Developed and Taught:

Cognitive Systems Seminar, CSLI, Stanford University, 2008-2009.

Cognitive Architectures, Symbolic Systems Program, Stanford University, 2002, 2004 (with M. Freed).

Computational Learning Seminar Series, CSLI, Stanford University, 2001-2002 (with P. Langley).

Policy Development for Alternative Futures, California State College Hayward, Dept. of Public Administration, 1997.

Artificial Intelligence I;II;III, Stanford University Department of Engineering Economic Systems, 1993 (with M. Fehling).

Lisp programming, Advanced Decision Systems, Mountain View, 1984.

The sky is falling - really, Massachusetts Institute of Technology inter-session, 1981. (Developed technical background for the science fiction book, *The Flight of the Dragonfly*, Robert L. Forward, Pocket/Timescape Books, New York, 1984.)

Courses Taught:

Computer architecture, Massachusetts Institute of Technology, EE&CS Dept., 1976-1977.

Software engineering, Massachusetts Institute of Technology, EE&CS Dept., 1977-1978.

Seminars and Invited Talks (sample):

A value-driven architecture for intelligent behavior. Symposium on Learning and Motivation in Cognitive Architectures, CSLI, Stanford University, 2003. *Invited talk, with Pat Langley.*

Programming by reward, Computational Learning Seminar, CSLI, Stanford University, 2002; *Value-driven agents*, 2000.

Giving up by losing interest, Nobots series, Stanford University Department of Computer Science, 11/96.

Incorporating experience into decision theory, Decision Analysis Working Group, Stanford University Department of EES&OR, 10/96.

A summary of approaches to artificial agent design, Intelligent Systems seminar, Stanford University Department of EES&OR, 3/95.

Motivations for autonomous robots, Human Interface Technology Laboratory, University of Washington at Seattle, 7/93.

A cyber-space starter kit, Virtual Worlds - Real Challenges conference, SRI International, Menlo Park (with E. Campbell), 6/91.

The astronaut and the banana peel: an Extra Vehicular Activity Retriever scenario, Hewlett-Packard Labs Computer Colloquium, Palo Alto, CA 8/89; Autodesk Research Lab, Sausalito, CA, 7/89.

A reactive program for retrieving lost astronauts, Asilomar Microcomputer Workshop, Monterrey CA, 4/89.

PhD Students:

Nima Asgharbeygi (9/2011 expected): Thesis employs skill-specific reward signals to improve hierarchical reinforcement learning within a cognitive architecture. Acquires skill-specific rewards and value estimation structure from global agent-held utility function.

PERSONAL

I am an avid dancer (I performed in Carnegie hall as a member of a folk dance troupe), a former member of the board of directors of the Royal Scottish Country Dance Society, San Francisco, the creator of the MacShapiro tartan, an amateur Tuvan throat singer, an even more amateur blacksmith and glassblower, a classically trained violinist, and a prize-winning grower of Atlantic Giant pumpkins (2nd place, San Mateo county, 1997, 1999, and 2000 at 506, 440 and 508 lbs; 9th place in California, 2003, at 645 lbs).