Curriculum Vitae

Kevin R. Dixon

Carnegie Mellon University
Department of Electrical & Computer Engineering
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Education

Ph.D., Electrical & Computer Engineering — Aug 98–Jan 04
Carnegie Mellon University — *Pittsburgh, PA*

- Thesis: *Inferring User Intent for Learning by Observation*
- Advisor: Prof. Pradeep K. Khosla

B.S., Electrical & Computer Engineering — Aug 95–May 98
Carnegie Mellon University — *Pittsburgh, PA*

- Received University Academic Honors
- Received Carnegie Institute of Technology Research Honors
- Honors project: *Navigation of Multiple Mobile Robots in a Dynamic Environment Using a Hybrid Cognitive and Reactive Approach*
- Advisor: Dr. John B. Hampshire II
- Completed in three years
- GPA: 3.90/4.00

Research Interests

- Machine learning for human-machine interaction
- Statistical modeling
- Intelligent robots
- Statistical pattern recognition
- Adaptive control
- Self-adaptive software systems

Research Experience

Research Assistant — Aug 98–Apr 04
Department of Electrical & Computer Engineering, Carnegie Mellon University — *Pittsburgh, PA*
Advisor: Prof. Pradeep K. Khosla
Research Areas:

- Created system to reduce manipulator- and mobile-robot programming time by learning from human demonstrations.
- Development of control-theoretic representation for hypotheses of user behavior to novel conditions.

- Theoretical analysis of statistical-learning algorithms for predicting human actions based on previous behavior.
- Algorithms for incrementally learning complex skills and behaviors from prior knowledge.
- Organized and managed *Self-Adaptive Software* research group. Responsible for DARPA deliverables, quarterly reports, and hiring and supervision of undergraduate research students (until Jan 01).

Research Assistant Aug 97–Aug 98
Institute for Complex Engineered Systems, Carnegie Mellon University *Pittsburgh, PA*
Advisor: Dr. John B. Hampshire II
Research Areas:
- Distributed agent-based framework for self-adaptive software.
- Probabilistic planning algorithms.

Research Assistant Dec 96–Aug 97
The Robotics Institute, Carnegie Mellon University *Pittsburgh, PA*
Advisor: Dr. John M. Dolan
Research Areas:
- Behavior-based control of mobile robots.
- Interactions between real and simulated robots.

Professional

Research Engineer May 01–Sep 01
ABB Corporate Research *Västerås, Sweden*
Supervisor: Martin Strand
- Developed methodology for predictive robot programming.
- Investigated next-generation robot-programming environments.

Software Engineer Jan 96–Jan 97
Solution Engineering *Hood River, OR*
Supervisor: Michael Van Dooren
- Developed hybrid Simulated Annealing/Genetic Algorithm for combinatorial optimization.
- Wrote control software and interfaces for industrial glass cutting and tempering factories.
- Developed generic planar geometric shape engine to create and modify template shape definitions for industrial glass factories.
- Wrote simulator of glass cutting and tempering processing and production.

Intern Feb 94–Jan 96
Advanced Navigation & Positioning Corporation *Hood River, OR*
Supervisor: Daniel Bubb
- Wrote hardware drivers, interfaces, and debugging tools for Federal Aviation Administration (FAA)-certified aircraft landing system.
- Developed security software to meet FAA regulations.

Teaching

Teaching Assistant Jan 03–May 03
Department of Electrical & Computer Engineering, Carnegie Mellon University *Pittsburgh, PA*

18-220 Fundamentals of Electrical Engineering
Instructor: James F. Hoburg
Course Topics: Linear circuit analysis and design, operational amplifiers, frequency-domain analysis, non-linear circuit analysis, filter analysis

- Taught two recitations and a laboratory section for the course.
- Created questions and graded student exams.

Teaching Assistant Aug 00–Dec 00
Department of Electrical & Computer Engineering, Carnegie Mellon University *Pittsburgh, PA*
18-200 Mathematical Foundations of Electrical Engineering
Instructor: Thomas M. Sullivan
Course Topics: Complex analysis, ordinary differential equations, matrix inversion, eigen decomposition, vector differential operators, vector integral calculus

- Lectured on special course topics.
- Taught all three recitations for the course.
- Created questions and graded student exams.

Teaching Assistant Aug 99–Dec 99
Department of Electrical & Computer Engineering, Carnegie Mellon University *Pittsburgh, PA*
18-200 Mathematical Foundations of Electrical Engineering
Instructor: Thomas M. Sullivan
Course Topics: Complex analysis, ordinary differential equations, matrix inversion, eigen decomposition, vector differential operators, vector integral calculus

- Taught all three recitations for the course.
- Created questions and graded student exams.

Teaching Assistant Jan 99–May 99
Department of Electrical & Computer Engineering, Carnegie Mellon University *Pittsburgh, PA*
18-396 Signals and Systems
Instructor: José M. F. Moura
Course Topics: Linear systems theory, convolution, Fourier transforms (CTFS, CTFT, DFT, FFT), Laplace and Z transforms, filter analysis and design

- Taught a recitation and laboratory section for the course.
- Graded student exams and laboratory reports.

Course Assistant Jan 96–Dec 97
Department of Computer Science, Carnegie Mellon University *Pittsburgh, PA*
15-127 Introduction to Computer Science and Computation
Instructor: Lynn M. Baumeister
Course Topics: Data structures, recursive algorithms, introductory complexity analysis

- Lectured when instructor was absent.
- Graded student computer programming assignments.

Student Research Supervision

Bachelor of Science:

Andrea Byrnes	Computer Science	May 99 – May 00
Nathan Clark	Computer Science	Jan 99 – May 99

Dmitry Frumkin	Computer Science	Jan 00 – May 00
Dan Heller	Computer Science	Jan 99 – Dec 99
Jeff Lam	Electrical & Computer Engineering and Computer Science	Jan 00 – Aug 00
Yatish Patel	Electrical & Computer Engineering	Aug 98 – Dec 00
Ted Pham	Electrical & Computer Engineering and Computer Science	July 98 – Jan 00
Charles Tennent	Computer Science	Aug 98 – May 99
Niraj Tolia	Electrical & Computer Engineering and Computer Science	Jan 00 – Apr 01

Honors

Research Fellowship, Department of Electrical & Computer Engineering	1998 – 2004
B.S., with University and Research Honors	1998
Small Undergraduate Research Grant	1997 – 1998
Carnegie Institute of Technology Dean's List (every semester)	1995 – 1998
John Stone Memorial Scholarship	1995 – 1998
Sprint and United Telephone Scholarship	1995 – 1998
Rotary Club of Hood River, Oregon Scholarship	1995 – 1997
Elks Club of Oregon Scholarship	1995 – 1996

Publications

Kevin R. Dixon, John M. Dolan, and Pradeep K. Khosla. Predictive robot programming: Theoretical and experimental analysis. To appear in *International Journal of Robotics Research*, 2004.

Kevin R. Dixon and Pradeep K. Khosla. Learning by observation with mobile robots: A computational approach. In *Proceedings of the IEEE International Conference on Robotics and Automation*, 2004.

Kevin R. Dixon and Pradeep K. Khosla. Trajectory representation using sequenced linear dynamical systems. In *Proceedings of the IEEE International Conference on Robotics and Automation*, 2004.

Kevin R. Dixon. *Inferring User Intent for Learning by Observation*. Ph.D. thesis, Carnegie Mellon University, 2004. Thesis committee: Pradeep K. Khosla, Bruce H. Krogh, Maja J. Matarić, Christiaan J.J. Paredis, and Sebastian B. Thrun.

Kevin R. Dixon and Pradeep K. Khosla. Programming complex robot tasks by prediction: Experimental results. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2003.

Kevin R. Dixon, Martin Strand, and Pradeep K. Khosla. Predictive robot programming. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2002.

Kevin R. Dixon and Pradeep K. Khosla. Unsupervised model-based prediction of user actions. Technical report, Institute for Complex Engineered Systems, Carnegie Mellon University, 2002.

Kevin R. Dixon. *Task Automation by Interpreting User Intent.* Ph.D. thesis prospectus, Carnegie Mellon University, 2001. Thesis committee: Pradeep K. Khosla, Bruce H. Krogh, Maja J. Matarić, Christiaan J.J. Paredis, and Sebastian B. Thrun.

Theodore Q. Pham, Kevin R. Dixon, and Pradeep K. Khosla. Software systems facilitating self-adaptive control software. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2000.

Kevin R. Dixon, Richard J. Malak, and Pradeep K. Khosla. Embedding prior knowledge and previously learned information in reinforcement learning controllers. Technical report, Carnegie Mellon University, Institute for Complex Engineered Systems, 2000.

Kevin R. Dixon, Theodore Q. Pham, and Pradeep K. Khosla. Port-based adaptable agent architecture. In *Proceedings of the International Workshop on Self-Adaptive Software*, 2000.

Kevin R. Dixon, Theodore Q. Pham, and Pradeep K. Khosla. Self-adaptive software composed of port-based agents. Technical report, Carnegie Mellon University, Institute for Complex Engineered Systems, 2000.

Kevin R. Dixon, John M. Dolan, Wesley S. Huang, Christiaan J.J. Paredis, and Pradeep K. Khosla. RAVE: A Real and Virtual Environment for multiple mobile robot systems. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, 1999.

Kevin R. Dixon, *et al.* A distributed command and control environment for heterogeneous mobile robot systems. Technical report, Carnegie Mellon University, Institute for Complex Engineered Systems, 1999.

Presentations

"Inferring User Intent for Learning by Observation." Ph.D. Thesis Defense, Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, January 23, 2004.

"A Computational Approach to Inferring User Intent." Naval Research Laboratories, *Washington, DC*, December 8, 2003.

"Programming Complex Robot Tasks by Prediction: Experimental Results." IEEE/RSJ International Conference on Intelligent Robots and Systems, *Las Vegas, NV*, October 30, 2003.

"Predictive Robot Programming." IEEE/RSJ International Conference on Intelligent Robots and Systems (EPFL), *Lausanne, Switzerland*, October 3, 2002.

"Unsupervised Model-Based Prediction of User Actions." Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA), *Lugano, Switzerland*, September 25, 2002.

"Optimal Sequence Prediction Using Probabilistic Finite Automata." Advanced Mechatronics Laboratory, Carnegie Mellon University, *Pittsburgh, PA*, November 5, 2001.

"Adaptive Experience Suggestion, Observation, and Prediction (AESOP)." ABB Corporate Research, *Västerås, Sweden*, September 25, 2001.

"Task Automation by Interpreting User Intent." Ph.D. Thesis Prospectus, Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, April 24, 2001.

"Agent-Based Controllers and Learning by Observation." ABB Corporate Research, *Västerås, Sweden*, October 23, 2000.

"Incremental Reinforcement Learning for Autonomous Agents." Ph.D. Qualifying Examination, Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, December 13, 1999.

"Hidden Markov Models for Speech Recognition." Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, November 15, 1999.

"RAVE: A Real and Virtual Environment for Multiple Mobile Robot Systems." IEEE/RSJ International Conference on Intelligent Robots and Systems, *Kyongju, South Korea*, October 20, 1999.

"Correlation-Based Filtering: Is There Anything That It Cannot Do?" Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, May 8, 1999.

"Learning Linear Mappings of Humans." Department of Electrical and Computer Engineering, Carnegie Mellon University, *Pittsburgh, PA*, November 23, 1998.

"Port-Based Agents for Self-Adaptive Software and Reinforcement Learning." Institute for Complex Engineered Systems, Carnegie Mellon University, *Pittsburgh, PA*, October 9, 1998.

"Behavior-Based Control for Probabilistic Planning, Mapping, Reasoning, and Navigation." Advanced Mechatronics Laboratory, Carnegie Mellon University, *Pittsburgh, PA*, March 24, 1998.

Patents

"An Industrial Robot System and a Method for Programming Thereof." International Patent (WO03045640, SE02/02196). Assignee: Asea Brown Boveri (ABB). Filed November 28, 2002; Granted June 5, 2003.

"Predictive Online Robot Programming Support." European Patent (SE-0103994). Assignee: Asea Brown Boveri (ABB). Filed November 29, 2001; Granted May 30, 2003.

Service

Board Member Aug 00–Present
Carnegie Mellon University *Pittsburgh, PA*
Member of Academic Review Board and University Committee on Discipline.
Duties included:

- Determining academic, plagiarism, and cheating rule violations.
- Hearing complaints on university civil rule violations.

Graduate Student Representative May 00–Jan 03
Carnegie Mellon University *Pittsburgh, PA*
Represented Electrical and Computer Engineering Department in the Graduate Student Assembly.
Duties included:

- Budget and funding allocations (Finance Committee).
- Campus parking matters (Parking Committee).

East Side Tutoring Volunteer Aug 96–May 97
Carnegie Mellon University *Pittsburgh, PA*
Tutored inner-city elementary and middle school-aged children in math, science, and reading.

Personal

Gender: Male
Citizenship: United States
Born: 1977 in California, USA
Family: Married, no children