

**PROMOTION RECOMMENDATION**  
The University of Michigan  
College of Engineering

Approved by the Regents  
May 15, 2008

Satinder Singh Baveja, associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	1993	University of Massachusetts, Computer Science, Amherst, MA
M.S.	1991	University of Massachusetts, Computer Science, Amherst, MA
B.Tech	1987	Indian Institute of Technology, Electrical Engineering, New Delhi, India

Professional Record:

2005-present	Associate Professor (with tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2002-2005	Associate Professor (without tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2001-2002	Chief Scientist, Syntek Capital, San Francisco, CA
1998-2001	Principal Technical Staff Member, Artificial Intelligence Department, AT&T, New Jersey
1996-1998	Assistant Professor, Department of Computer Science, University of Colorado
1995-1996	Senior Research Scientist, Harlequin Inc., Cambridge, MA
1993-1995	Postdoctoral Fellow, Center for Biological and Computational Learning, Department of Brain and Cognitive Science, Massachusetts Institute of Technology

Summary of Evaluation:

Teaching: Professor Baveja has been an effective teacher, both in the classroom, and advising students at all levels. In the classroom, he accomplished a major redesign of the graduate Machine Learning course (EECS 545), for which he consistently achieved excellent Q1/Q2 ratings. He has performed well in teaching other courses in Artificial Intelligence (AI), and has begun to teach a discrete math course at the 200-level. Professor Baveja has graduated two Ph.D. students, and an additional student expected to graduate in 2008. Professor Baveja has proven to be an active, supportive, and valued mentor to his graduate research assistants. He is currently supervising three other Ph.D. candidates and has supervised projects for two undergraduate students. Professor Baveja works closely with his students, reflected in his 24 top-tier publications co-authored with nine different Michigan students.

Research: Professor Baveja is a leading researcher in reinforcement learning (RL), the branch of artificial intelligence dealing with the fundamental problem of learning how to behave optimally in an unknown and uncertain environment based on experience. During his career he has been responsible for several major advances in the field, including theoretical convergent results for some of RL's key algorithms, explicit solution of the central exploration versus exploitation tradeoff, and demonstrated practical application of these techniques. His recent work has developed a radical new "predictive state" framework for RL, which has generated a great deal of excitement and produced a trove of new results and techniques by his group and others. In addition to his breakthrough work in RL, he is well known for contributions to computational game theory. Professor Baveja has established a stellar reputation in the AI research community, as documented by external letters from prominent researchers in the field. The quality of his research is further evidenced by his impressive publication record in archival journals and highly selective conferences in machine learning and artificial intelligence. During his tenure at

Michigan he has established a successful research group, with a healthy pipeline of graduate students and funded by a variety of individual and collaborative grants from government and industry.

Recent and Significant Publications:

- D. Wingate and S. Singh, "Exponential Family Predictive Representations of State," To appear in *Advances in Neural Information Processing Systems* 20, 2008.
- V. Soni, S. Singh and M.P. Wellman, "Constraint Satisfaction Algorithms for Graphical Games," In *Sixth International Joint Conference on Autonomous Agents and Multiagent Systems*, pg. 423-430, 2007.
- E. Talvitie and S. Singh, "An Experts Algorithm for Transfer Learning," In *Twentieth International Joint Conference on Artificial Intelligence*, pg. 1065-1070, 2007.
- D. Wingate, V. Soni, B. Wolfe and S. Singh, "Relational Knowledge with Predictive State Representations," In *Twentieth International Joint Conference on Artificial Intelligence*, pg. 2035-2040, 2007.
- B. Wolfe and S. Singh, "Predictive State Representations with Options," In *23rd International Conference on Machine Learning*, pg. 1025-1032, 2006.
- M. Rudary, S. Singh and D. Wingate, "Predictive Linear-Gaussian Models of Stochastic Dynamical Systems," In *Twenty-First Conference on Uncertainty in Artificial Intelligence*, pg. 501-508, 2005.
- S. Singh, M. R. James and M. Rudary, "Predictive State Representations: A New Theory for Modeling Dynamical Systems," In *Twentieth Conference on Uncertainty in Artificial Intelligence*, pg. 512-519, 2004.
- S. Singh, D. Litman, M. Kearns and M. Walker, "Optimizing Dialogue Management with Reinforcement Learning: Experiments with the NJFun System," *Journal of Artificial Intelligence Research*, Vol. 16, pg. 105-133, 2002.
- M. Kearns and S. Singh, "Near-Optimal Performance for Reinforcement Learning in Polynomial Time," *Machine Learning*, Vol. 49, pg. 209-232, 2002.
- S. Singh, T. Jaakkola, M. Littman and C. Szepesvari, "Convergence Results for Single-Step On-Policy Reinforcement-Learning Algorithms," *Machine Learning*, Vol. 38, pg. 287-308, 2000.

Service: Professor Baveja's service at the University of Michigan includes terms on the CSE Graduate Committee, and on the CSE Faculty Search Committee. In 2006 he was appointed to a leadership role as Director of the Artificial Intelligence Laboratory, and this year, as chair of the CSE Faculty Search Committee. He was also on the CoE research strategy committee and has served on two casebook committees, one as chair. In the 2002-03 academic year, Professor Baveja chaired an ad hoc committee on Undergraduate Enrollment of Women in Computer Science and Engineering. Professionally Professor Baveja has performed significant service to the Machine Learning research community. He has served on the program committee of every major conference in this field. He has also served on the editorial boards of top journals in Artificial Intelligence and Machine Learning.

External Reviewers:

Reviewer A: "Satinder is clearly a leader in this field. Many of his contributions have had a lasting impact, and a number of his papers are highly cited."

Reviewer B: "Satinder is renowned throughout the field of reinforcement learning, in particular, and machine learning more generally, for the extremely high quality of his research, the meticulous care he takes in generating, proving, generalizing, and situating his results, and the fecundity of the research directions that he has taken."

Reviewer C: "Virtually every one of his journal papers and a majority of his conference papers have made important contributions."

Reviewer D: "The portions of Prof. Baveja's work which I can oversee leave an impression of a highly energetic, versatile, mathematically fluent, and productive researcher, who is co-defining a rising (hopefully...) new basic methodology in stochastic system modelling, [sic] and has gathered an apparently brilliant group of young researchers around him."

Reviewer E: "Satinder Singh is a very strong researcher who has been one of the leaders of his field for a number of years. He is actually increasingly productive, expanding on old lines of research and starting new ones, producing excellent students, and leading the field."

Reviewer F: "...Satinder continues to be one of the most influential and prolific researchers in reinforcement learning and related topics in AI."

Summary of Recommendation: Satinder Baveja has established a stellar research record, and his accomplishments over the past five years have significantly bolstered this record. He has established himself as an effective teacher and an excellent researcher at the University of Michigan and has taken on the substantial service expected at his level. Professor Baveja's research has established him as one of the leading machine learning researchers world-wide and has strengthened Computer Science and Engineering at Michigan. It is with the support of the College of Engineering Executive Committee that I recommend him for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.



David C. Munson, Jr.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

May 2008