Curriculum Vitae

Jude William Shavlik

Professor
Departments of Computer Sciences and
Biostatistics & Medical Informatics
University of Wisconsin – Madison

Addresses

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Academic Degrees

Doctor of Philosophy in Computer Science, University of Illinois, 1988
Master of Science in Molecular Biophysics and Biochemistry, Yale University, 1980
Bachelor of Science in Electrical Engineering, Massachusetts Institute of Technology, 1979
Bachelor of Science in Biology, Massachusetts Institute of Technology, 1979

Professional Experience

1998-present	Professor, Computer Sciences Department and (since 1999) Biostatistics and Medical Informatics Department, University of Wisconsin - Madison; member (since 2000) of the Wisconsin Center for Genomics and (since 1999) the Wisconsin Comprehensive Cancer Center
1994-1998	Associate Professor, Computer Sciences Department, University of Wisconsin - Madison
1996-97	Visiting Associate Professor, Institute for Advanced Computer Studies and Computer Sciences Department, University of Maryland - College Park; also half-time visitor at National Library of Medicine, Bethesda, MD (also Profesor Visitante, Universidad Nacional de San Luis, Argentina, during December 1996)
1988-1994	Assistant Professor, Computer Sciences Department, University of Wisconsin - Madison
1984-1987	Research Assistant, Artificial Intelligence Research Group, Coordinated Science Laboratory, University of Illinois
1982-83	Teaching Assistant, Departments of Physics, Computer Science, and (Fall 1986) Electrical and Computer Engineering, University of Illinois
1980-82	Member of Technical Staff, MITRE Corporation, Bedford, Massachusetts and Pasadena, California (also summer of 1983)
1979-80	National Institutes of Health Trainee, Yale University
1979 (summer)	Research Associate, Advanced Technology Division, United States Department of Transportation, Washington, DC

Research Interests

Artificial Intelligence	Intelligent Agents
Machine Learning	Adaptive Information Retrieval
Computational Biology	Computer Security

Professional Societies

Association for the Advancement of Artificial Intelligence (elected AAAI Fellow in 2006)
International Society for Machine Learning
International Society for Computational Biology

Primary Grants and Awards

Integrating Machine Learning and Physician Expertise for Breast Cancer Diagnosis
National Library of Medicine, 10/1/11-9/30/15, $1,290,000
 (joint with PI Beth Burnside of UW Radiology and co-PI David Page of UW Biostatistics
and Medical Informatics)

Machine Reading
DARPA (via subcontract from SRI), 6/1/09 - 5/31/14 but canceled 12/31/12, $4,200,000
(joint with co-PI David Page of UW Biostatistics and Medical Informatics
and co-PI AnHai Doan of UW Computer Sciences)

Bootstrap Learning
DARPA (via subcontract from SRI), 9/1/07-9/31/11, $2,787,000
(joint with co-PI David Page of UW Biostatistics and Medical Informatics)

Adaptive Information Monitoring and Extraction
National Library of Medicine, 9/1/07 – 8/31/10, $840,000
(joint with PI Mark Craven of UW-Madison and co-PI Richard Maclin of UM-Duluth)

Machine Learning for Improved Mammography Screening
National Cancer Institute, 5/1/07-4/30/11, $1,222,000
(joint with PI Beth Burnside of UW Radiology and two other co-PIs)

Integrated Learning
DARPA (via subcontract from BBN, Inc), 5/1/06-12/31/09, $641,000

Goal-Oriented Privacy Preservation
National Science Foundation, 7/1/05-6/30/08, $1,667,000
(joint with PI David DeWitt of UW Computer Sciences and three other co-PIs)

Machine Learning and Visualization in Structural Biology
National Library of Medicine, 3/1/06-2/28/11, $1,277,000
(joint with co-PI George Phillips of UW Biochemistry)

*Interactive Learning from Advice and Reinforcements: Broadening the Communication Channel
between Machine Learners and their Human Teachers*
Defense Advanced Research Programs Agency, 12/1/03 - 8/31/07, $1,936,000
(joint with co-PI Raymond Mooney of UT-Austin until Jan 31, 2006)

Knowledge-intensive, Interactive and Efficient Relational Pattern Learning
Air Force, 1/1/04 - 3/31/06, $820,000 (joint with David Page and Raghu Ramakrishnan of UW-Madison)

Developing an Advice Module for and Porting the RoboCup Simulator to the TIELT Environment, Naval
Research Laboratory,   9/30/04 - 9/29/05, $29,500 (Rich Maclin, visiting professor at UW-Madison, co-PI).

Knowledge-intensive, Interactive and Efficient Relational Pattern Learning
Defense Advanced Research Programs Agency, 7/1/01 - 12/31/03, $1,025,000
(joint with Mark Craven & David Page of UW-Madison and with Raymond Mooney of UT-Austin)

Development of a Maskless Array Synthesizer
National Institutes of Health SBIR Program, 6/1/01-5/20/03, $3,273,668

UW subcontractor to NimbleGen, Inc (my support was for one summer month per year and two RAs)

Adaptive Information Monitoring and Extraction
National Library of Medicine, 9/1/00-9/30/05, $864,000
(joint with PI Mark Craven of UW-Madison)

Selection, Combination, and Evaluation of Effective Software Sensors for
Detecting Abnormal Usage of Computers Running Windows NT/2000
Defense Advanced Research Programs Agency, 10/1/00-9/30/01, $150,000
(joint with Mark Shavlik CEO of Shavlik Technologies)

Vilas Associate
University of Wisconsin Vilas Trust, 7/1/99-6/30/01, $20,000 plus four months of summer support

Learning from Instruction and Experience
National Science Foundation, 6/1/96-9/30/01, $276,300

Providing Verbal Advice to Connectionist Learners
Office of Naval Research, 2/1/95-5/31/98, $452,000

Simplification of Association Rule Sets Extracted via Database Mining
International Business Machines Corporation, San Jose, CA, 2/20/95-7/31/96, $9,000

Using Neural Networks to Automatically Refine Expert System Knowledge Bases
NYNEX Corporation, 7/1/94-6/30/95, $25,000

Applying Machine Learning Techniques to DNA Sequence Analysis
Department of Energy, 2/15/91-2/14/95, $682,000
($175,000 subcontracted to M. Noordewier, Rutgers University)

Using Knowledge-Based Neural Networks to Learn in Dynamic Environments
Office of Naval Research, 8/1/93-1/31/95, $103,000

Integrating Explanation-Based and Neural Approaches to Machine Learning
National Science Foundation, 9/1/90-8/31/94, $170,000

Combining Explanation-Based and Neural Approaches to Machine Learning
Office of Naval Research, 6/1/90-12/31/92, $117,000

Development of a Computer-Configuration System that Learns
International Business Machines Corporation, Rochester, MN, 9/1/90-8/31/91, $27,000

Other Grants

Acquisition of the Second Phase of the Grid Laboratory of Wisconsin (GLOW-II)
National Science Foundation, 8/07 – 8/10, $500,000 (equipment grant)
Miron Livny of UW-Madison PI and 17 other co-PIs

Computation in Informatics and Medicine
National Library of Medicine training grant, initially funded 2002-2007 at approximately
$1M annually, renewed Fall 2006 for another five years at same rate, co-program director

UW Comprehensive Cancer Center Support
National Cancer Institute, 4/1/01-3/31/07, co-supervisor of Cancer Informatics portion

Graduate Student Researchers Program
National Aeronautics and Space Administration, 7/1/94-6/30/97, to support K. Cherkauer

Support for the 1998 Intl. Conf. on Machine Learning
Daimler-Benz Research and Technology, Office of Naval Research, Microsoft Research,
AT&T Research, and NEC Research (NJ)

Support for the 1993 Intl. Conf. on Intelligent Systems for Molecular Biology
National Library of Medicine, American Association of Artificial Intelligence
(AAAI), and the Biomatrix Society

Equipment to Support Algorithm Visualization
AT&T Foundation (with Y. Ioannidis)

MIDSHIP: Managing Image Datasets with Scalable High Performance

National Science Foundation Infrastructure Grant, 1996-2000, investigator

Determining the DNA Sequence of E. Coli
National Institutes of Health, 9/1/91-8/31/94,
participant (F. Blattner of the UW Department of Genetics, PI)

Support for the 1991 Distinguished Lecture Series on Machine Learning
International Business Machines Corporation, Rochester, MN

Theses Supervised

Broadening the Applicability of Relational Learning
Trevor Walker, Ph. D., 2011 (LinkedIn, Inc)

Techniques for Improved Probabilistic Inference In Protein-Structure Determination via X-Ray Crystallography
Ameet Soni, Ph. D., 2011 (assistant professor, Swarthmore College)

Relational Transfer in Reinforcement Learning
Louis Oliphant, Ph. D., 2009 (assistant professor, Hiram College, OH)

Relational Transfer in Reinforcement Learning
Lisa Torrey, Ph. D., 2009 (assistant professor, St. Lawrence College, NY)

Probabilistic Methods for Interpreting Electron-Density Maps
Frank DiMaio, Ph. D., 2007 (post-doc U. Washington – Seattle)

Novel Uses for Machine Learning and Other Computational Methods for the Design and Interpretation of Genetic Microarrays
Michael Molla, Ph. D., 2007 (research professor at Harvard University)

Learning Ensembles of First-Order Clauses that Optimize Precision-Recall Curves
Mark Goadrich, Ph. D., 2007 (assistant professor at Centenary College of Louisiana)

An Empirical Study of Machine Learning Algorithms Applied to Modeling Player Behavior in a 'First Person Shooter' Video Game
Benjamin Geisler, Masters, 2002 (initially at Raven Software, Madison, WI)

Building Intelligent Agents that Learn to Retrieve and Extract Information
Tina Eliassi-Rad, Ph. D., 2001 (associate professor of computer science, Rutgers)

Computational Methods for Fast and Accurate DNA Fragment Assembly
Carolyn Allex, Ph. D., 1999 (initially at DNA*, Inc., Madison, WI)

Extracting Comprehensible Models of Trained Neural Networks
Mark Craven, Ph. D., 1996 (professor of biostatistics & medical informatics, and of computer sciences, University of Wisconsin - Madison)

Learning from Instruction and Experience: Methods for Incorporating Procedural Domain Theories into Knowledge-Based Neural Networks
Richard Maclin, Ph. D., 1995 (professor and chair of computer science, University of Minnesota, Duluth)

An Anytime Approach to Connectionist Theory Refinement: Refining the Topologies of Knowledge-Based Neural Networks
David Opitz, Ph. D., 1995 (formerly professor of computer science, University of Montana, Missoula)

SIFT: A Self-Improving Fractions Tutor,
Eric Gutstein, Ph. D., 1993 (initially assistant professor of mathematics education, DePaul University, Chicago)

Symbolic Knowledge and Neural Networks: Insertion, Refinement, and Extraction,
Geoffrey Towell, Ph. D., 1991 (initially at Siemens Research Laboratory, Princeton, NJ)

Refining PID Controllers using Neural Networks,
Gary Scott, Masters, 1990 (initially at Forest Products Laboratory, Madison, WI)

Patents

DNA Sequence Assembly System, C. Allex, J. Shavlik, and F. Blattner,
Patent Number 6,223,128, April 24, 2001

Courses Taught

Machine Learning (new graduate course introduced)
Introduction to Artificial Intelligence
Advanced Artificial Intelligence
AI Programming Languages and Tools
Neural Network Approaches to Machine Learning (special-topics course)
Computational Problems in Molecular Biology (special-topics course)
Distinguished Lecturer Series on Machine Learning (special-topics course)
Machine Learning for Computer Vision (special-topics course)
Machine Learning and Information Retrieval (special-topics course)
Machine Learning for Text Analysis (special-topics course)
Learning and Modeling Biological Networks (special-topics course)
Statistical Relational Learning (special-topics course)
Computation and Informatics in Biology and Medicine (seminar associated with training grant)

Professional Activities

Conference Program Committees

International Machine Learning Conference
  ('90, '91,'92, '93, '97, '99, '00 [area chair], '01, '03, '05 [area chair]. '06 [area chair]. '09)
National Conference on Artificial Intelligence
  ('91, '92, '94, '96 [area chair], '00, '06 [area chair], '07 [area chair], '08, '10, '12 [senior PC])
International Conference on Intelligent Systems for Molecular Biology
  ('94, '95, '96, '97. '98, '99, '00, '01, '02. '07)
ACM SIGKDD International Conference on Knowledge Discovery and Data Mining
  ('97, '00, '01, '03, '04)
IEEE International Conference on Data Mining ('01, '03)
SIAM Conference on Data Mining ('04 [area chair])
European Conference on Machine Learning ('91, '93, '05, '10)
International Conference on Intelligent User Interfaces ('02, '03, '04, '10)
International Conference on Inductive Logic Programming ('04. '05, '06, '08, '09, '10, '12)
International Conference on Knowledge Capture ('03, '05. '07, '09, '11)
International Joint Conference on Artificial Intelligence ('09 [senior PC member])
Neural Information Processing Systems ('97 [area chair])

Plus over 70 additional program committees since 1990

Conference Organizing

Co-organizer (with L. Hunter of NIH and D. Searls of Penn) of *First Intelligent Systems for Molecular Biology (ISMB)*, July 1993 (currently the largest conference on bioinformatics)

Chair of the *International Conference on Machine Learning (ICML),* July 1998

General chair of the IEEE *International Conference on Data Mining*, November 2003

Co-chair (with H. Blockeel of Belgium and P. Tadepalli of Oregon State) of the *International Conference on Inductive Logic Programming*, June 2007

Co-organizer (with Y. Gil of USC/ISI and M. Musen of Stanford) of *First International Conference on Knowledge Capture,* October 2001

Chair of three-day workshop on "Learning from Theory and Data," one of eight workshops that constituted the 1991 International Machine Learning Conference (R. Mooney of Univ. of Texas and H. Hirsh of Rutgers, co-organizers)

Co-organizer (with L. Hunter of the National Library of Medicine) of an NSF-NIH invited workshop on "Creating an Infrastructure for Intelligent Systems in Molecular Biology," November 1991

Co-organizer (with T. Petsche and S. Judd of Siemens Corp. Research, NJ) of Third International Workshop on "Computational Learning Theory and Natural Learning Systems," August 1992

Steering committee member for the NSF/DARPA "Workshop on Machine Learning and Vision," June 1992. Co-organizer (with T. Poggio of MIT) of one of three sessions at the workshop, October 1992

Co-organizer (with P. Stolorz of Los Alamos and the Santa Fe Institute) of a post-NIPS workshop on "Computational Approaches to Biological Sequence Analysis: Neural Net versus Traditional Perspectives," December 1992

Co-organizer (with D. Gordon of Naval Research Lab, D. Subramanian of Cornell, and G. Teccuci of George Mason Univ.) of a workshop titled "Agents that Learn from Other Agents" at the Twelfth International Conference on Machine Learning, July 1995

Board of Directors and Steering Committees

Elected member of the inaugural board of directors of the *Intl. Machine Learning Society*, '01-'06

Inaugural board of directors of the *International Society for Computational Biology*, '97-'98

Member of the steering committees for the *International Conference on Intelligent Systems for Molecular Biology*, '95-'98, *International Conference on Machine Learning* ('97,'99-'02), and *International Conference on Knowledge Capture* ('01-)

Member board of directors *Great Lakes Bioinformatics Consortium*, '04-

Review Panels

NSF Review Panel (Division of Information, Robotics, and Intelligent Systems), '91, '93, '99, '00

DOE site review team for Lawrence Berkeley Laboratory Genome Center, January '92

ONR Research Options Evaluation Panel, February '93

NIH Genome Research Review Committee, June and December '93

Ad hoc member, National Institute of Environmental Health Sciences (NIEHS) Board of Scientific Counselors, May '94

Site review team for NSF Biological Research Training Grants program, June '96.

NIH Site Review Team for proposed computational biology resource, June, '99

National Library of Medicine Study Section member (reviewer for Biotechnology Information proposals), July '00 - June '04 (12 meetings), ad hoc member March '05, August '05, March '06, Jan '09, June '10

National Research Council Panel that reviewed NASA Computing, Information, and Communications Technology, May '02 - January '04

Several teleconference reviews for NIH

Referee for National Science Foundation, *Artificial Intelligence, Machine Learning, Neural Computation, Science, Cognitive Science, Connection Science, Computing Surveys, Computer, Communications of the ACM, J. of Molecular Biology, J. of the ACM, J. of Artificial Intelligence Research, J. of Machine Learning Research, J. of Data Mining and Knowledge Discovery, J. of the Learning Sciences, J. of Combinatorial Optimization, IEEE Trans. on Systems, Man, and Cybernetics, IEEE Trans. on Neural Networks, IEEE Trans. on Pattern Analysis and Machine Intelligence, IEEE Trans. on Knowledge and Data Engineering, IEEE Expert, IEEE Parallel and Distributed Technology, Intl. J. of Computational Intelligence and Applications, AI Magazine, Knowledge-Based Systems, Future Generation Computing Systems, ORSA J. of Computing, INFORMS J. of Computing, Genomics, Bioinformatics, Journal of Bioinformatics and Computational Biology, J. Amer. Medical Informatics Association, Tetrahedron Computer Methodology* (a molecular biology journal), *Comparative and Functional Genomics, Computer Applications in the Biosciences, J. Bioinformatics and Computational Biology*, ACM Doctoral Dissertation Awards, Intl. Joint Conf. on Artificial Intelligence, Italian Assoc. for Artificial Intelligence, Hawaii International Conference on Systems Sciences (Biocomputing Track), Computer Vision and Pattern Recognition Conf. Neural Information Processing Conf.

Editor (with L. Hunter and D. Searls) of special issue of *Machine Learning* on "Machine Learning and Molecular Biology" (1995)

Editor (with H. Blockeel and P. Tadepalli) of special issue of *Machine Learning* on "Inductive Logic Programming" (2008)

Major Invited Talks

Combining Symbolic and Neural Learning,
Ninth International Conference on Machine Learning, Aberdeen, Scotland, July 1992
(one of three invited speakers)

Combining Symbolic and Connectionist Approaches to Artificial Intelligence,
Fourth Congress of the Italian Association for Artificial Intelligence, Florence, October 1995
(sole invited speaker for scientific track)

Talking with Your Neural Networks: Putting Inference Rules In and Getting Rules Out,
Fifth Brazilian Symposium on Neural Networks, Belo Horizonte, December 1998
(one of five invited speakers)

Talking to Your Neural Network: Enriching the Dialog Between Human Teachers and Machine Learners, Distinguished Lecture Series speaker, Institute of Cognitive Science, University of Colorado - Boulder, October 1999 (one of six invited annually)

Creating an Instructible and Self-Adaptive Web Browser,
Triangle Computer Science Distinguished Lecture Series speaker, co-sponsored by Duke, North Carolina, and North Carolina State Computer Science Departments, November 1999 (one of nine invited annually)

Using Knowledge-Based Neural Networks to Create an Instructible and Self-Adaptive Web Browser, Seventh International Conference on Neural Information Processing, November 2000, Taejon, Korea (one of four plenary speakers)

Scaling Up ILP: Experiences with Extracting Relations from Biomedical Text,
Fourteenth International Conference on Inductive Logic Programming, September 2004, Porto, Portugal (one of six plenary speakers)

Machine Learning via Advice Taking, International Conference on Machine Learning and Applications, San Diego, December 2009 (one of six invited speakers)

Editorial Boards

AI Magazine (Editor-in-chief, 1996-1999; editorial board, 1999-2007)
Machine Learning (Action Editor, 1994-97, 2000-2003; editorial board, 1994-)
Journal of Machine Learning Research (2001-2010)
ACM Transactions on Knowledge Discovery in Data (Associate Editor, 2005-2009)
Cognitive Science (2001-2003)
Journal of Artificial Intelligence Research (1994-1997)
Journal of Data Mining and Knowledge Discovery (1996-)
Journal of Bioinformatics and Computational Biology (2003-)
Neural Information Processing - Letters and Reviews (2003-)
Journal of Cognitive Systems Research (Action Editor, 1998-2010)
International Journal on Computational Intelligence and Applications (1999-2003)
Applied Intelligence (1997-1998)
International Journal on Artificial Intelligence Tools (1992-)

Tutorials

An Overview of Machine Learning, Arthur Andersen & Co., Chicago, October 1987 and January 1988

Machine Learning, IEEE International Computer Science Conference '88, Hong Kong, December 1988

Practical Applications of Machine Learning, IEEE Conference on Applications of Artificial Intelligence '90, Santa Barbara, CA, March 1990

Applying Machine Learning to Classification Tasks, National Conference on Artificial Intelligence (AAAI-92), with H. Hirsh of Rutgers, San Jose, August 1992

Symbolic and Neural Network Approaches to Machine Learning, National Conference on Artificial Intelligence (AAAI-93), with H. Hirsh of Rutgers, Washington, D.C., July 1993

Learning from Examples: Recent Topics in Symbolic and Connectionist Learning, National Conference on Artificial Intelligence (AAAI-94), with H. Hirsh of Rutgers, Seattle, July 1994

Introduction to Machine Learning for Molecular Biologists, International Conference on Intelligent Systems for Molecular Biology (ISMB-96), with S. Salzberg of Johns Hopkins, St. Louis, June 1996

Machine Learning and Genetic Microarrays, International Conference on Machine Learning (ICML-03), with D. Page of UW-Madison, Washington, D.C., August, 2003

Publications

Journal Articles

S. Natarajan, T. Khot, & K. Kersting, & J. Shavlik. Gradient-based Boosting for Statistical Relational Learning: The Relational Dependency Network Case, *Machine Learning* (2012).

A. Soni & J. Shavlik, Probabilistic Ensembles for Improved Inference in Protein-Structure Determination. *Journal of Bioinformatics and Computational Biology* (2012)

T. Ayer, O. Alagoz, J. Chatwal, J. Shavlik, C. Kahn, and E. Burnside, "Breast Cancer Risk Estimation with Artificial Neural Networks Revisited: Discrimination and Calibration," *Cancer,* (2010).

R. Woods, L. Oliphant, K. Shinki, D. Page, J,. Shavlik, and E. Burnside, "Validation of Results from Knowledge Discovery Techniques: Mass Density as a Predictor of Breast Cancer," *Journal of Digital Imaging* (2009).

B-C, Chen, R. Ramakrishnan, J. Shavlik, & P. Tamma, "Bellwether Analysis: Searching for Cost-Effective Query-Defined Predictors in Large Databases," *ACM Transactions on Knowledge Discovery from Data,* 3:1 (2009).

F. DiMaio, A. Soni, G. Phillips & J. Shavlik. Spherical-Harmonic Decomposition for Molecular Recognition in Electron-Density Maps. *Intl. Journal of Data Mining and Bioinformatics 3:2 (2009).*

F. DiMaio, D. Kondrashov, E. Bitto, A. Soni, C. Bingman, G. Phillips and J. Shavlik. "Creating Protein Models from Electron-Density Maps using Particle-Filtering Methods," *Bioinformatics* 23 (2007), pp. 2851-2858.

D. Severtson, L. Pape, C. Page, J. Shavlik, G. Phillips, & P. Brennan, "Biomedical Informatics Training at the University of Wisconsin-Madison," *Methods in Informatics in Medicine* 46 (2007), pp. 149-156.

F. DiMaio, J. Shavlik and G. Phillips. **"**A Probabilistic Approach to Protein Backbone Tracing in Electron Density Maps," *Bioinformatics 22* (2006)*,* special issue based on the papers presented at the *14th Intl. Conf. on Intelligent Systems for Molecular Biology* (ISMB-06), Fortaleza, Brazil*,* pp. e81-e89.

M. Goadrich, L. Oliphant and J. Shavlik, "Gleaner: Creating Ensembles of First-Order Clauses to Improve Recall-Precision Curves," *Machine Learning 64* (2006), pp. 231-262.

O. Mangasarian, J. Shavlik and E. Wild, "Knowledge-Based Kernel Approximation," *J. Machine Learning Research 5* (2004), pp.1127-1141.

M. Molla, M. Waddell, D. Page and J. Shavlik, "Using Machine Learning to Design and Interpret Gene-Expression Microarrays," *AI Magazine* (2004), pp. 23-44.

J. Bockhorst, M. Craven, D. Page, J. Shavlik and J. Glasner, "A Bayesian Network Approach to Operon Prediction," *Bioinformatics 19* (2003), pp. 1227-1235.

J. Tobler, M. Molla, E. Nuwaysir, R. Green and J. Shavlik, "Evaluating Machine Learning Approaches for Aiding Probe Selection for Gene-Expression Arrays," *Bioinformatics* (supplement containing the papers from the *2002 International Conference on Intelligent Systems for Molecular Biology),* 2002, pp. S161-S171.

M. Molla, P. Andreae, J. Glasner, F. Blattner and J. Shavlik, "Interpreting Microarray Expression Data Using Text Annotating the Genes," *Information Sciences 146* (2002), pp. 75-88.

T. Eliassi-Rad and J. Shavlik, "A System for Building Intelligent Agents that Learn to Retrieve and Extract Information," *International Journal on User Modeling and User-Adapted Interaction (special issue on user modeling and intelligent agents), (2002)* pp. 35-88.

C. Allex, J. W. Shavlik and F. Blattner, "Neural Network Input Representations that Produce Accurate Consensus Sequences from DNA Fragment Assemblies," *Bioinformatics 15* (1999), pp. 723-728.

D. W. Opitz and J. W. Shavlik, "Connectionist Theory Refinement: Genetically Searching the Space of Network Topologies," *J. of Artificial Intelligence Research 6* (1997), pp. 177-209.

M. W. Craven and J. W. Shavlik, "Understanding Time-Series Networks: A Case Study in Rule Extraction (invited paper)," *Intl. J. of Neural Systems 8* (1997), pp. 373-384.

M. W. Craven and J. W. Shavlik, "Using Neural Networks for Data Mining" (invited paper), *Future Generation Computer Systems 13* (1997), pp. 211-229.

D. W. Opitz and J. W. Shavlik, "Actively Searching for an Effective Neural-Network Ensemble," *Connection Science 8* (1996), pp. 337-353. (An extended version appears in *Combining Artificial Neural Nets,* A. Sharkey (ed.), Springer, 1999.)

R. Maclin and J. W. Shavlik, "Creating Advice-Taking Reinforcement Learners," *Machine Learning 22* (1996), pp. 255-281. (Reprinted in *Learning to Learn,* S. Thrun and L. Pratt (eds.), Kluwer, 1998.)

D. W. Opitz and J. W. Shavlik, "Dynamically Adding Symbolically Meaningful Nodes to Knowledge-Based Neural Networks," *Knowledge-Based Systems 8* (1995), pp. 301-311.

G. G. Towell and J. W. Shavlik, "Knowledge-Based Neural Networks," *Artificial Intelligence 70* (1994), pp. 119-165.

M. W. Craven and J. W. Shavlik, "Machine Learning Approaches to Gene Recognition," *IEEE Expert 9* (1994), pp. 2-10.

J. Shavlik, "Combining Symbolic and Neural Learning (Extended Abstract)," *Machine Learning 14* (1994), pp. 321-331. (A longer version appears in *Artificial Intelligence and Neural Networks: Steps Toward Principled Integration,* V. Honavar and L. Uhr (eds.), Academic Press, pp. 561-580. 1994.)

G. G. Towell and J. W. Shavlik, "Extracting Refined Rules from Knowledge-Based Neural Networks," *Machine Learning 13* (1993), pp. 71-101.

R. Maclin and J. W. Shavlik, "Using Knowledge-Based Neural Networks to Improve Algorithms: Refining the Chou-Fasman Algorithm for Protein Folding," *Machine Learning 11* (1993), pp. 195-215.

G. M. Scott, J. W. Shavlik and W. H. Ray, "Refining PID Controllers using Neural Networks," *Neural Computation 4* (1992), pp. 736-747.

J. W. Shavlik, G. G. Towell and M. O. Noordewier, "Using Neural Networks to Refine Biological Knowledge," *Intl. J. of Genome Research 1* (1992), pp. 81-107.

M. W. Craven and J. W. Shavlik, "Visualizing Learning and Computation in Neural Networks," *Intl. J. on AI Tools 1* (1992), pp. 399-426.

J. W. Shavlik, R. J. Mooney and G. G. Towell, "Symbolic and Neural Network Learning Algorithms: An Experimental Comparison," *Machine Learning 6* (1991), pp. 111-143. (Reprinted in *Readings in Knowledge Acquisition and Machine Learning,* B. Buchanan and D. Wilkins, Eds., 1993.)

J. W. Shavlik and G. F. DeJong, "Learning in Mathematically-Based Domains: Understanding and Generalizing Obstacle Cancellations," *Artificial Intelligence 45* (1990), pp. 1-45.

J. W. Shavlik, "Acquiring Recursive and Iterative Concepts with Explanation-Based Learning," *Machine Learning 5* (1990), pp. 39-70.

J. W. Shavlik and G. G. Towell, "An Approach to Combining Explanation-Based and Neural Learning Algorithms," *Connection Science 1* (1989), pp. 233-255. (Reprinted in *Applications of Learning and Planning Methods,* N. G. Bourbakis, Ed., 1990.)

Books

H. Blockeel, J. Ramon, J. Shavlik, and P. Tadepalli (eds.) *Proc. 17th Intl Conf. on Inductive Logic Programming*, Lecture Notes in Artificial Intelligence, Vol. 4894, Springer, 2008.

Y. Gil, M. Musen and J. Shavlik (eds.), *Proc. 1st Intl. Conf. on Knowledge Capture,* ACM Press, Oct 2001.

J. Shavlik (ed.), *Proc. 15th Intl. Conf. on Machine Learning ,* Morgan Kaufmann , Madison, WI, July 1998.

T. Petsche, S. Hanson and J. Shavlik (eds.), *Computational Learning Theory and Natural Learning Systems, Vol. 3,* MIT Press, Cambridge, MA, 1995.

L. Hunter, D. Searls and J. Shavlik (eds.), *Proc. 1st Intl. Conf. on Intelligent Systems for Molecular Biology,* AAAI Press, Bethesda, MD, July 1993.

J. W. Shavlik and T. G. Dietterich (eds.), *Readings in Machine Learning,* Morgan Kaufmann, San Mateo, CA, 1990.

J. W. Shavlik, *Extending Explanation-Based Learning by Generalizing the Structure of Explanations*, Research Notes in Artificial Intelligence Series, Pitman Publishing, London, 1990 (extended version of PhD thesis).

Rigorously Reviewed Conference Papers

C. Zhang, F. Niu, C. Re, and J. Shavlik, "Big Data versus the Crowd: Looking for Relationships in All the Right Places," *Proceedings of the 50th Annual Meeting of the Association for Computational Linguistics* (ACL), JeJu, South Korea, 2012.

F. Niu, C. Re, A. Doan and J. Shavlik, "Tuffy: Scaling up Statistical Inference in Markov Logic Networks using an RDBMS," *Proceedings of the 37th Intl. Conf. on Very Large Data Bases* (VLDB), Seattle, Washington, 2011.

G. Kunapuli, R. Maclin and J. Shavlik, "Advice Refinement for Knowledge-Based Support Vector Machines," *Proceedings of the Twenty-Fifth Conference on Neural Information Processing Systems* (NIPS), Granada, Spain, 2011.

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