Ole J. Mengshoel

Curriculum Vitae

Contact

Carnegie Mellon University, Silicon Valley
NASA Ames Research Center
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Moffett Field, CA 94035-0001

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URL: http://www.cmu.edu/silicon-valley/faculty-staff/mengshoel-ole.html

Research Interests

Monitoring and diagnosis; Bayesian networks; Reasoning and learning under uncertainty; Machine learning and discovery; Evolutionary computation; Stochastic local search; Real-time and embedded systems; Resource allocation; Decision support.

Education

Ph.D., Computer Science, May 1999
University of Illinois at Urbana-Champaign
Urbana, IL

Thesis: *Efficient Bayesian Network Inference: Genetic Algorithms, Stochastic Local Search, and Abstraction*
Advisers: Prof. David C. Wilkins and Prof. David E. Goldberg

B.S., Computer Science, April 1989
Norwegian Institute of Technology
Trondheim, Norway

Employment

11/2008–present	Senior Systems Scientist Carnegie Mellon University, Silicon Valley Moffett Field, CA
5/2006–11/2008	Senior Research Scientist, Research Area Lead USRA/RIACS Moffett Field, CA
5/1999–5/2006	Research Scientist Rockwell Scientific Thousand Oaks, CA

1/1995–5/1999 Research Assistant
Beckman Institute, University of Illinois at Urbana-Champaign
Urbana, IL

5/1998–8/1998 Summer Intern
First Quadrant
Pasadena, CA

8/1994–5/1996 Research Assistant
General Engineering, University of Illinois at Urbana-Champaign
Urbana, IL

4/1989–8/1993 Research Scientist
SINTEF DELAB
Trondheim, Norway

8/1985–4/1989 Teaching Assistant
Department of Computer Science, Norwegian Institute of Technology
Trondheim, Norway

Summers 1987 and 1988 Summer Intern
Basic Communication Group, Norsk Data AS
Oslo, Norway

Summer 1986 Summer Intern
RegnskapsRevisjon AS
Hamar, Norway

Teaching

Fall 2010 *Statistical Discovery and Learning* (Instructor, with Dr. Joy Zhang), Carnegie Mellon University, Silicon Valley, Moffett Field, CA.

Fall 2009 *Statistical Discovery and Learning* (Instructor, with Dr. Joy Zhang), Carnegie Mellon University, Silicon Valley, Moffett Field, CA.

Fall 1985–Spring 1989 *Introductory Computer Science*; *Data Bases*; and *Symbolic Computation* (Teaching Assistant), Department of Computer Science, Norwegian Institute of Technology, Trondheim, Norway.

Advising

Dongzhen Piao, Ph.D. Student, CMU, Fall 2010-present

Michele Cossalter, Ph.D. Student, CMU, Spring 2010-present

Priya Sundararajan, Ph.D. Student, CMU, Spring 2010-present

Lu Zheng, Ph.D. Student, CMU, Spring 2010-present

Xinyao Hu, Graduate Student, CMU, Fall 2009-Summer 2010

Suresh Babu Rajasekaran, Graduate Student, CMU, Fall 2009-Summer 2010

Avinash Jha, Graduate Student, CMU, Fall 2009

Erik Reed, Undergraduate Student, University of Washington, Summer 2010

Craig Harrison, Undergraduate Student, University of Maine, Summer 2010

Brian Ricks, Undergraduate Student, University of Texas at Dallas, Spring 2009 and Summer 2010

Guowei Yang, Ph.D. Student, University of Texas at Austin, Summer 2010

Guido Ciollaro, Undergraduate Student, Mataro School of Engineering, Summer 2010

Brittney Bullis, Undergraduate Student, South Dakota State University, Spring 2010

Stephanie Hunsche, Undergraduate Student, Indiana Institute of Technology, Fall 2009

Godohaldo Perez, Undergraduate Student, University of Puerto Rico at Mayaguez, Summer 2009

Cyril Lan, Undergraduate Student, MIT, Summer 2009

Trevor Tetzlaff, Undergraduate Student, San Francisco State University, Summer 2009

W. Bradley Knox, Ph.D. Student, University of Texas at Austin, Summer 2008

Robert Niffenegger, Undergraduate Student, Purdue, Summer 2008

Zachary Green, Undergraduate Student, California Polytechnic State University at San Luis Obispo, Summer 2008

Yuliya Zabiyaka, Graduate Student, UCLA, Summer 2007

Lois Desplat, Undergraduate Student, San Jose State University, Summer and Fall 2007

Long Term Visitors, Post-Docs, Research Staff

Dr. Carla D. Cotwright-Williams, Assistant Professor, Department of Mathematics, Norfolk State University, Summer 2010.

Dr. Ehsan Sheybani, Assistant Professor, Department of Engineering and Technology, Virginia State University, Petersburg, VA, Summer 2009.

Dr. Severino F. Galan, Associate Professor, Department of Artificial Intelligence, UNED, Madrid, Spain, Spring 2008.

Reviewing

Reviewer for Artificial Intelligence Journal

Reviewer for the Genetic and Evolutionary Computation Conference (GECCO)

Reviewer for IEEE Transactions on Knowledge and Data Engineering

Reviewer for IEEE Transactions on Evolutionary Computation

Reviewer for IEEE Transactions on Systems, Man, and Cybernetics (SMC), Part A

Reviewer for the International Workshop on the Principles of Diagnosis (DX)

Reviewer for the International Joint Conference on Artificial Intelligence (IJCAI)

Reviewer for International Conference on Prognostics and Health Management

Reviewer for International Journal of Prognostics and Health Management

Reviewer for Journal of Machine Learning Research

Reviewer for Knowledge-Based Systems

Reviewer for NASA SBIR/STTR/NRA proposals

Reviewer for National Science Foundation (NSF)

Invited Talks

Carnegie Mellon University, Pittsburgh, PA, CyLab Corporate Partners' Meeting, September 2010. *Towards Autonomous Trustworthy Computing: An Intelligent Systems Perspective.*

Carnegie Mellon University, Silicon Valley, Moffett Field, CA, Talks on Computing Systems (TOCS), June 2009. *Recent Advances in Modeling and Computation using Bayesian Networks.*

Georgia Institute of Technology, Atlanta, GA, December 2009. *Visualization of Analytical Processes.*

NASA Aviation Safety Program Technical Conference, Washington D.C., November 2009. *Probabilistic Methods for Diagnosis of Aircraft Systems.*

Carnegie Mellon University, Pittsburgh, PA, ECE Department, Special Seminar, February 2009. *Recent Advances in Modeling and Computation using Bayesian Networks.*

NASA Ames Research Center, Moffett Field, CA, January 2008. *Bayesian Methods for Diagnosis.*

NASA Ames Research Center, Moffett Field, CA, May 2008. *Bayesian Networks and Probabilistic Risk Analysis.*

Stanford University, CA, Seminar on Computational Learning and Adaptation, March 2006. *Evaluating Bayesian Network Inference and Learning Algorithms: Creating Problem Instances of Increasing Difficulty.*

NASA Ames Research Center, Moffett Field, CA, February 2006. *Evaluating Bayesian Network Inference and Learning Algorithms: Creating Problem Instances of Increasing Difficulty.*

IBM T. J. Watson Research Center, Yorktown Heights, NY, March 1999. *Efficient Inference in Bayesian Networks Using Stochastic Search Algorithms.*

Rockwell Science Center, Palo Alto, CA, March 1999. *Efficient Inference in Bayesian Networks Using Stochastic Search Algorithms.*

Patents

US Patent 7,081,834, *Aviation Weather Awareness and Reporting Enhancements (AWARE) System using a Temporal-Spatial Weather Database and a Bayesian Network Model.* Granted, July 25, 2006.

US Patent 6,856,680, *Contact center autopilot algorithms.* Granted, February 15, 2005.

US Patent 6,853,721, *Contact center autopilot architecture.* Granted, February 8, 2005.

US Patent 6,842,515, *Multi-site responsibility-based routing.* Granted, January 11, 2005.

Research Grants

A Computing Framework for Distributed Decision Making to Ensure Robustness of Complex Man-Made Network Systems: The Case of Electric Power Networks, NSF. Co-PI with Rohit Negi, 2009–2012, $1,499,983.

Visualization of Analytical Processes, NSF. PI, 2009–2011, $497,401.

Advanced Tools And Techniques for V&V of IVHM, NASA. Co-PI with Johann Schumann, 2009–2012, $486,000.

ISWHM: Tools and Techniques for Software and System Health Management, NASA. Co-PI with Johann Schumann, 2008–2011, $196,223.

Autonomous Trustworty Computing Platforms and Devices, CMU CyLab. PI, 2009–2010, $20,000.

Book Chapters

A. Choi, A. Darwiche, L. Zheng, and O. J. Mengshoel. A tutorial on Bayesian networks for system health management. In A. Srivastava and J. Han, editors, *In review, Data Mining in Systems Health Management: Detection, Diagnostics, and Prognostics*. Chapman and Hall/CRC Press, 2011.

O. J. Mengshoel and D. C. Wilkins. Raven: Bayesian networks for human-computer intelligent interaction. In M. S. Vassiliou and T. S. Huang, editors, *Computer Science Handbook for Displays*, pages 209–219. Rockwell Scientific Company, 2001.

Journal Articles

O. J. Mengshoel, D. Roth, and D. C. Wilkins. Portfolios in stochastic local search: Efficiently computing most probable explanations in Bayesian networks. *In press, Journal of Automated Reasoning*, 2010.

O. J. Mengshoel, D. Roth, and D. C. Wilkins. Initialization and restart in stochastic local search: Computing a most probable explanation in Bayesian networks. *In press, IEEE Transactions on Knowledge and Data Engineering*, 2010.

S. F. Galán and O. J. Mengshoel. A novel mating approach for genetic algorithms. *In Review, Evolutionary Computation*, 2010.

O. J. Mengshoel, M. Chavira, K. Cascio, S. Poll, A. Darwiche, and S. Uckun. Probabilistic model-based diagnosis: An electrical power system case study. *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, 40(5): 874–885, 2010.

O. J. Mengshoel. Understanding the scalability of Bayesian network inference using clique tree growth curve. *Artificial Intelligence*, 174(12–13):984–1006, 2010.

S. F. Galán and O. J. Mengshoel. Constraint handling using tournament selection: Abductive inference in partly deterministic Bayesian networks. *Evolutionary Computation*, 17(1):55–88, 2009.

O. J. Mengshoel. Understanding the role of noise in stochastic local search: Analysis and experiments. *Artificial Intelligence*, 172(8-9):955–990, 2008.

O. J. Mengshoel and D. E. Goldberg. The crowding approach to niching in genetic algorithms. *Evolutionary Computation*, 16(3):315–354, 2008.

O. J. Mengshoel, D. C. Wilkins, and D. Roth. Controlled generation of hard and easy Bayesian networks: Impact on maximal clique tree in tree clustering. *Artificial Intelligence*, 170(16–17):1137–1174, 2006.

C. Hubbard, O. J. Mengshoel, C. Moon, and Y. S. Kim. Visual reasoning instructional software system. *Computers and Education*, 28(4):237–250, 1997.

O. J. Mengshoel, S. Chauhan, and S. K. Yong. Intelligent critiquing and tutoring of spatial reasoning skills. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing (AIEDAM)*, 10(3):235–249, 1996.

O. J. Mengshoel. A reformulation technique and tool for knowledge interchange during knowledge acquisition. *International Journal of Human-Computer Studies*, 43(2):177–212, 1995.

O. J. Mengshoel. Knowledge validation: Principles and practice. *IEEE Expert*, 8(3):62–68, 1993.

Conferences

J. Schumann, A. N. Srivastava and O. J. Mengshoel. Who Guards the Guardians? Toward V&V of Health Management Software. *Accepted, 1st International Conference on Runtime Verification (RV-2010)*, November 1–4, 2010, Malta.

S. F. Galán and O. J. Mengshoel. Generalized crowding for genetic algorithms. In *Proc. of the Genetic and Evolutionary Computation Conference 2010 (GECCO-10)*, Portland, OR, 2010.

B. W. Ricks and O. J. Mengshoel. Methods for probabilistic fault diagnosis: An electrical power system case study. In *Proc. of the Annual Conference of the Prognostics and Health Management Society (PHM-09)*, San Diego, CA, September 2009.

T. Kurtoglu, O.J. Mengshoel, and S. Poll. A framework for systematic benchmarking of monitoring and diagnostic systems. In *Proc. of the International Conference on Prognostics and Health Management (PHM-08)*, pages 1–13, October 2008.

O. J. Mengshoel, A. Darwiche, K. Cascio, M. Chavira, S. Poll, and S. Uckun. Diagnosing faults in electrical power systems of spacecraft and aircraft. In *Proceedings of the Twentieth Innovative Applications of Artificial Intelligence Conference (IAAI-08)*, pages 1699–1705, Chicago, IL, 2008.

A. Poll, A. Patterson-Hine, J. Camisa, D. Nishikawa, L. Spirkovska,

D. Garcia, D. Hall, C. Neukom, A. Sweet, S. Yentus, C. Lee, J. Ossenfort, I. Roychoudhury, M. Daigle, G. Biswas, X. Koutsoukos, , and R. Lutz. Evaluation, selection, and application of model-based diagnosis tools and approaches. In *Proc. of the AIAA Infotech@Aerospace 2007 Conference and Exhibit*, Rohnert Park, CA, May 2007.

O. J. Mengshoel. Macroscopic models of clique tree growth for Bayesian networks. In *Proc. of the Twenty-Second National Conference on Artificial Intelligence (AAAI-07)*, pages 1256–1262, Vancouver, British Columbia, 2007.

C. C. Ruokangas and O. J. Mengshoel. Information filtering using Bayesian networks: Effective user interfaces for aviation weather data. In *Proc. of the 2003 International Conference on Intelligent User Interfaces*, pages 280–283, Miami, FL, 2003.

C. Hayes, R. Penner, H. Ergan, L. Lu, N. Tu, P. Jones, P. Asaro, R. Bargar, O. Chernyshenko, I. Choi, N. Danner, O. J. Mengshoel, J. Sniezek, and D. C. Wilkins. CoRaven: model-based design of a cognitive tool for real-time intelligence monitoring and analysis. In *Proc. of the 2000 IEEE International Conference on Systems, Man, and Cybernetics*, volume 2, pages 1117–1122, Nashville, TN, October 2000.

O. J. Mengshoel and D. E. Goldberg. Probabilistic crowding: Deterministic crowding with probabilistic replacement. In *Proc. of the Genetic and Evolutionary Computation Conference (GECCO-99)*, pages 409–416, Orlando, FL, July 13–17 1999.

D. C. Wilkins, O. J. Mengshoel, O. Chernyshenko, P. M. Jones, R. Bargar, and C. C. Hayes. Collaborative decision making and intelligent reasoning in judge advisor systems. In *Proc. of the 32nd Annual Hawaii International Conference on System Sciences (HICSS-32)*, volume 1, Los Alamitos, CA, USA, 1999. IEEE Computer Society.

P. Jones, C. Hayes, D. Wilkins, R. Bargar, J. Sniezek, P. Asaro, O. J. Mengshoel, D. Kessler, M. Lucenti, I. Choi, N. Tu, and J. Schlabach. CoRAVEN: Modeling and design of a multimedia intelligent infrastructure for collaborative intelligence analysis. In *Proc. of the International Conference on Systems, Man, and Cybernetics*, pages 914–919, San Diego, CA, October 1998.

O. J. Mengshoel and D. C. Wilkins. Genetic algorithms for belief network inference: The role of scaling and niching. In *Proceedings Seventh Annual Conference on Evolutionary Programming*, pages 547–556, San Diego, CA, March 1998.

O. J. Mengshoel, D. E. Goldberg, and D. C. Wilkins. Deceptive and other functions of unitation as Bayesian networks. In *Genetic Program-*

ming 1998: Proceedings of the Third Annual Conference, pages 559–566, Madison, WI, July 1998.

C. Hubbard, O. J. Mengshoel, C. Moon, and Y. S. Kim. Multimedia instructional software for visual reasoning: Visual reasoning tutor (vrt). In *Proc. International Conference on Multimedia Computing and Systems (ICMCS-96)*, pages 261–268, Los Alamitos, CA, June 1996. IEEE Computer Society.

I. Nordbø, O. J. Mengshoel, and I. Sølvberg. Development of complex applications: Integration support for time, uncertainty and incompleteness. In *Proc. of Second World Congress on Expert Systems*, Lisboa, Portugal, January 1994.

O. J. Mengshoel, I. Nordbø, and I. Sølvberg. The knowledge engineering workbench: Experiences from building the knowledge base of a helpdesk application. In *Proc. of the 12th International Conference on Artificial Intelligence, Expert Systems, and Natural Language*, pages 53–65, Avignon, France, June 1992.

Workshops and Symposia

J. Schumann, O. J. Mengshoel, A. N. Srivastava, A. Darwiche. Towards Software Health Management with Bayesian Networks. *Accepted, 2010 FSE/SDP Workshop on the Future of Software Engineering Research*, November 7–8, 2010, Santa Fe, NM.

B. W. Ricks and O. J. Mengshoel. Methods for probabilistic fault diagnosis: An electrical power system case study. In *Proc. of the 21st International Workshop on Principles of Diagnosis (DX-10)*, pages 127–134, Portland, OR, October 2010.

W. B. Knox and O. J. Mengshoel. Diagnosis and reconfiguration using Bayesian networks: An electrical power system case study. In *Proc. of the IJCAI-09 Workshop on Self-⋆ and Autonomous Systems (SAS): Reasoning and Integration Challenges*, 2009.

O. J. Mengshoel, S. Poll, and T. Kurtoglu. Developing large-scale Bayesian networks by composition: Fault diagnosis of electrical power systems in aircraft and spacecraft. In *Proc. of the IJCAI-09 Workshop on Self-⋆ and Autonomous Systems (SAS): Reasoning and Integration Challenges*, 2009.

B. W. Ricks and O. J. Mengshoel. The diagnostic challenge competition: Probabilistic techniques for fault diagnosis in electrical power systems. In *Proc. of the 20th International Workshop on Principles of Diagnosis (DX-09)*, Stockholm, Sweden, 2009.

S. Narasimhan and O. J. Mengshoel. Using Bayesian networks for can-

didate generation in consistency-based diagnosis. In *Proc. of the 19th International Workshop on Principles of Diagnosis (DX-08)*, Leura, Australia, September 2008.

O. J. Mengshoel, A. Darwiche, and S. Uckun. Sensor validation using Bayesian networks. In *Proc. of the 9th International Symposium on Artificial Intelligence, Robotics, and Automation in Space (iSAIRAS-08)*, Los Angeles, CA, February 2008.

S. Poll, A. Patterson-Hine, J. Camisa, D. Garcia, D. Hall, C. Lee, O. J. Mengshoel, C. Neukom, D. Nishikawa, J. Ossenfort, A. Sweet, S. Yentus, I. Roychoudhury, M. Daigle, G. Biswas, and X. Koutsoukos. Advanced diagnostics and prognostics testbed. In *Proc. of the 18th International Workshop on Principles of Diagnosis (DX-07)*, pages 178–185, Nashville, TN, 2007.

O. J. Mengshoel. Designing resource-bounded reasoners using Bayesian networks: System health monitoring and diagnosis. In *Proc. of the 18th International Workshop on Principles of Diagnosis (DX-07)*, pages 330–337, Nashville, TN, 2007.

O. Kipersztok and O. J. Mengshoel. Combining cognitive causal models with reasoning and text processing methods for decision support. In *Proc. of The Second Bayesian Modelling Applications Workshop*, Banff, Canada, July 2004.

O. J. Mengshoel and D. C. Wilkins. Abstraction for belief revision: Using a genetic algorithm to compute the most probable explanation. In *Satisficing Models: Papers from the 1998 AAAI Spring Symposium*, pages 46–53, Menlo Park, CA, 1998. AAAI Press. Techical Report SS-98-05.

O. J. Mengshoel, D. C. Wilkins, and S. Uckun. Filtering and visualizing uncertain battlefield data using Bayesian networks. In *In Proc. of the 2nd Annual Federated Laboratory Symposium, Advanced Displays and Interactive Displays*, College Park, MD, February 1998.

O. J. Mengshoel and D. C. Wilkins. Abstraction and aggregation in belief networks. In *Abstractions, Decisions, and Uncertainty: Papers from the AAAI Workshop*, pages 53–58, Menlo Park, CA, July 1997. AAAI Press. Techical Report WS-97-08.

O. J. Mengshoel and D. C. Wilkins. Recognition and critiquing of erroneous agent actions. In *Agent Modeling: Papers from the AAAI Workshop*, pages 61–68, Menlo Park, CA, 1996. AAAI Press. Technical Report WS-96-02.

O. J. Mengshoel and D. C. Wilkins. Towards an approach to exploiting domain structure for planning. In *Proc. of the AAAI Workshop*

on Structural Issues in Planning and Temporal Learning, Portland, OR, August 1996.

Y. S. Kim, C. Moon, S. Chauhan, C. Hubbard, O. J. Mengshoel, and H. Zhao. Visual reasoning tutor (vrt): Instructional software system for missing view problem. In *Proc. ASEE Engineering Design Graphics Division Conference*, Ames, IA, November 1995.

O. J. Mengshoel. Definite clause grammars for knowledge interchange during knowledge acquisition. In *Proc. Knowledge Acquisition Workshop*, pages 11.1–11.20, Banff, Canada, January 1994.

O. J. Mengshoel and I. Sølvberg. Acquisition and modelling of uncertain, incomplete and time-varying knowledge. In N. Aussenac, G. Boy, B. Gaines, M. Linster, J.-G. Ganascia, and Y. Kodratoff, editors, *Knowledge Acquisition for Knowledge-Based Systems: Proc. of the 7th European Workshop (EKAW-93)*, pages 300–319, Berlin, Heidelberg, 1993. Springer.

O. J. Mengshoel. KVAT: A tool for incremental knowledge validation in a knowledge engineering workbench. In M. Grisoni, editor, *Proc. of the European Workshop on the Verification and Validation of Knowledge-Based Systems (EUROVAV-91)*, pages 133–146, Cambridge, England, July 22-24 1991. Logica Ltd., Cambridge, UK.

Short Papers, Abstracts, Miscellaneous

K. Pipatsrisawat, A. Darwiche, O. J. Mengshoel, and J. Schumann. Software health management: A short review of challenges and existing techniques. In *Proc. of 1st International Workshop on Software Health Management (SHM 2009)*, Pasadena, CA, July 2009.

O. J. Mengshoel. Evolutionary computation in Bayesian networks. In *In Proc. of the Late Braking Papers of the Third Annual Genetic Programming Conference*, page 159, Madison, WI, July 1998.

O. J. Mengshoel. Belief network inference in dynamic environments. In *Proc. of the Fourteenth National Conference on Artificial Intelligence (AAAI-97)*, page 813, Providence, RI, 1997.

Technical Reports

O. J. Mengshoel, D. Roth, and , D. C Wilkins. Stochastic Greedy Search: Computing the Most Probable Explanation in Bayesian Networks. Technical Report UIUCDCS-R-2000-2150, Department of Computer Science, University of Illinois at Urbana-Champaign, February 2000, Urbana, IL.

O. J. Mengshoel, D. Roth, and , D. C Wilkins. Hard and Easy Bayesian Networks for Computing the Most Probable Explanation. Technical Re-

port UIUCDCS-R-2000-2147, Department of Computer Science, University of Illinois at Urbana-Champaign, January 2000, Urbana, IL.

Software

ProDiagnose: Software for detection and diagnosis using probabilistic techniques.

Honey-bee Optimization: Implemented using Java and discrete event simulation engine.

Configuration and Scheduling of Real-Time Systems: Software implemented using Java and Swing.

Scheduling Analysis and Visualization of Programmable Logic Controllers: Software implemented using Java and Swing.

Insider Intrusion Detection using Machine Learning: Implemented using Java, Markov chains, discrete event simulation, feature construction, naive Bayes.

Contact Center Autopilot: Software for real-time monitoring and control of contact centers.

AWARE decision engine: Pre-flight briefing software, for pilots, using Bayesian networks to drive display of weather hazards.

Information Fusion Toolbox: Software implemented using Java, XML, Servlet, and Bayesian networks; integrated with tracker software.

CoRaven: Collaborative intelligence analysis using sonification, visualization, and probabilistic reasoning; implemented in Java and Swing using Bayesian networks.

Raven: Stochastic Search for computing MPEs in Bayesian Networks; Generation of hard and easy Bayesian networks; implementation in C++.

Genetic Algorithm for Multi-Objective Optimization: Implemented in C++, SQL database, and linear regression software.

Visual Critiquer: A spatial reasoning tutor, used in introductory engineering courses to improve spatial visualization abilities of students. Implemented in C and rule-based language Clips.

Knowledge Reformulation Tool: A tool for translation and interchange of knowledge during knowledge acquisition; implemented in Common Lisp, Prolog, and PCE.

Knowledge Validation Tool: GUI-oriented tool for validating expert systems, implemented in PCE and Common Lisp.

October 21, 2010