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Education

- Ph.D. (Computer Science), Michigan State University, 1983.
- M.S. (Computer Science), Michigan State University, 1980.
- B.Tech. (Electrical Engineering), Indian Institute of Technology, Bombay, 1977.

Academic Experience

1998-99	Visiting Associate Professor in Computer Science, Stanford University, Stanford, CA.
2004-present	Professor of Computer Science and Computer Engineering, Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville, TN. Senior Research Scientist, Institute for Software Integrated Systems (ISIS) Associate Director, Center for Intelligent Systems
2001-2004	Director of Graduate Studies, Computer Science, Vanderbilt University, Nashville, TN.
1990-2004	Associate Professor of Computer Science, Computer Engineering and Management of Technology, Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville, TN. Senior Research Scientist, Institute for Software Integrated Systems (ISIS) Associate Director, Center for Intelligent Systems Research Faculty Member, Learning Sciences Institute.
1996-1998	Director, Computer Engineering Program, Vanderbilt University, Nashville, TN.
1988-1990	Assistant Professor, Department of Computer Science, Vanderbilt University, Nashville, TN.
1983-1987	Assistant Professor, Department of Computer Science University of South Carolina, Columbia, S.C. Research Faculty Member, Intelligent Systems Lab, Dept. of Computer Science, USC.

1978-1982	Graduate Research Assistant in Pattern Recognition and Image Processing Lab, Computer Science Department, Michigan State University, E. Lansing.
1980-1982	Programmer in Computer Laboratory, Dept. of Audiology and Speech Sciences, Michigan State University, E. Lansing.
1977-1978	Graduate Teaching Assistant, Computer Science Dept., Univ. of Rhode Island, Kingston.

Non-Academic Experience

Summer 1990, 1991 & 1992	Consultant to Amoco Research Laboratories. Non numeric data analysis and risk analysis.
Summer 1990	Consultant To Federal Express Air Ops Division. Multi-level diagnosis systems and training systems for mechanics.
Summer 1988	Consultant at Amoco Research Laboratories. Knowledge Based systems for well log interpretation, basin characterization, estimation of production capacities, and risk analysis.
Summer 1984	Consultant to CMS-1 Systems Engg. Group, AT&T Bell Labs, Holmdel, NJ. Designed CMS-1 (Circuit Maintenance System-1), a system for administration and maintenance of trunk lines as an expert system.
Summer 1980 & Dec. 1980	Specialist at Advanced Technology Transfer, Inc., Culver City, CA. Developed fast interactive image processing system (PPP - Picture Processing Package) on the VAX-11/780 computer system.
Summer 1974	IBM Manufacturing Operations, Bombay.

Journal Publications

Published

1. G. Biswas, A.K. Jain, and R.C. Dubes, "An Evaluation of Projection Algorithms," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, vol. PAMI-3, pp. 702-708, 1981.
2. G. Biswas and R.C. Dubes, "Some experiments in 2-D grammatical inference," *Pattern Recognition Letters*, vol. 2, pp. 173-177, 1984.
3. A. Sen and G. Biswas, "Decision Support Systems: An Expert Systems Approach," *Decision Support Systems: The International Journal*, vol. 1, pp. 197-204, 1985.
4. V. Subramanian, G. Biswas, and J.C. Bezdek, "Document Retrieval Using a Fuzzy Knowledge-Based System," *Journal of Optical Engineering*, vol. 25, pp. 445-455, 1986.
5. J.C. Bezdek, G. Biswas, and L. Huang, "Transitive Closure of Fuzzy Thesauri for Information Retrieval Systems," *Intl. Jour. of Man-Machine Studies*, vol. 25, pp. 343-356, 1986.
6. G. Biswas, J.C. Bezdek, M. Marques, and V. Subramanian, "Knowledge-Assisted Document Retrieval: I. The Natural Language Interface," *Journal of the American Society for Information Sciences*, vol. 38, pp. 83-96, 1987.

7. G. Biswas, J.C. Bezdek, V. Subramanian, and M. Marques, "Knowledge-Assisted Document Retrieval: II. The Retrieval Process," *Journal of the American Society for Information Sciences*, vol. 38, pp. 97-110, 1987.
8. G. Biswas, R. Abramczyk, and M. Oliff, "OASES - An Expert System for Operations Analysis: The System for Cause Analysis," *IEEE Trans. on Systems, Man and Cybernetics*, vol. 17, pp. 133-145, 1987.
9. G. Biswas and T.S. Anand, "An Expert System Shell for Mixed Initiative Reasoning," *Journal of the Indian Institute of Science*, Bangalore, India, vol. 67, pp. 465-490, 1987.
10. G. Biswas, M. Oliff, and A. Sen, "An Expert Decision Support System for Production Control," *Decision Support Systems: The International Journal*, vol. 4, pp. 235-248, 1988.
11. G. Biswas, M. Oliff, and R. Abramczyk, "OASES (Operations Analysis Expert System): An Application in Fiberglass Manufacturing," *International Journal of Expert Systems*, vol. 1, no. 3, pp. 193-216, 1988.
12. P.K. Bose, G. Biswas, and A.M. Rao Padala, "Globe-Trotter: An Intelligent Flight Itinerary Planner," *IEEE Expert*, vol. 4, no. 2, pp. 56-64, 1989.
13. D.M. Scaturro, C. Kendall, J.C. Wendte, G. Biswas, R. Cannon, and J.C. Bezdek, "Judy Creek: A Case Study for a Two Dimensional Sediment Deposition Simulation," *Controls on Carbonate Platform and Basin Development, SEPM Special Publication no. 44*, P.M. Crevello, J.L. Wilson, F.J. Sarg, and J.F. Read, eds., pp. 63-76, 1989.
14. J. Strobel, R. Cannon, C.G.St.C. Kendall, G. Biswas, and J. Bezdek, "Interactive (SEDPACK) Simulation of Clastic and Carbonate Sediments in Shelf to Basin Settings," *Computers and Geosciences*, vol. 15, pp. 1279-1290, 1989.
15. G. Biswas, X. Yu, W.J. Hagins, J. Bezdek, J. Strobel, C.G.St.C. Kendall, and R.L. Cannon, "PLAYMAKER: A Knowledge Based Approach to Characterizing Hydrocarbon Plays," *Intl. Jour. of Pattern Recognition and Artificial Intelligence*, vol. 4, pp. 315-339, 1990.
16. P.P. Shenoy and G. Biswas, "Belief Functions and Belief Maintenance in Artificial Intelligence," Guest Editors introduction, *International Journal of Approximate Reasoning*, vol. 4, nos. 5-6, pp. 319-322, 1990.
17. C. Kendall, J. Strobel, R. Cannon, and G. Biswas, "The Simulation of Sedimentary Fill of Basins," *Journal of Geophysical Research*, vol. 96, pp. 6911-6929, 1991.
18. N. Kaul, G. Biswas, and B. Bhuvu, "Multi-level Qualitative Reasoning applied to CMOS digital circuits," *Intl. Journal of AI in Engineering*, vol. 7, pp. 125-137, 1992.
19. D. Cheong, J. Strobel, G. Biswas, G. Lee, C. Kendall, R. Cannon, and J. Bezdek, "PLAYMAKER: A Knowledge-Based Expert System," *Geobyte*, vol. 7, no. 6, pp. 28-41, 1992.
20. G. Biswas, S. Manganaris, and X. Yu, "Extending Component Connection Modeling for Analyzing Complex Physical Systems," *IEEE Expert*, vol. 8, no. 1, pp. 48-57, February 1993.
21. A.M. Tharpe, G. Biswas, and J. Hall, "AUDEX: An Expert System for Pediatric Auditory Brainstem Interpretation," *Journal of the American Academy of Audiology*, vol. 4, pp. 163-171, 1993.

22. D.L. Hibler and G. Biswas, "Restriction on Qualitative Models to ensure more Specific Behavior," *Intelligent Systems Engineering*, vol. 2, pp. 133-144, 1993.
23. D. Fisher, L. Xu, J. Carnes, Y. Reich, S. Fenves, J. Chen, R. Shiavi, G. Biswas, and J. Weinberg, "Applying AI Clustering to Engineering Tasks," *IEEE Expert*, vol. 8, no. 6, pp. 51-60, December 1993.
24. N. Kaul, G. Biswas, and B. Bhuva, "An AI Approach to Multi-Level, Mixed-mode qualitative simulation of CMOS ICs," *Computers and Electrical Engineering, An International Journal*, vol. 20, pp. 369-382, 1994.
25. A.M. Tharpe, J.A. Rassi, and G. Biswas, "Problem-based Learning: An Innovative Approach to Audiology Education," *American Journal of Audiology*, vol. 4, pp. 19-25, 1995.
26. G. Biswas, K. Kawamura, A. Saad, and M. Curtin, "Intelligent and Environmentally Conscious Manufacturing: State of the Art," *Intl. Journal of Environmentally Conscious Design and Manufacturing*, vol. 4, no. 2, pp. 1-10, 1995.
27. S. Bagchi, G. Biswas, and K. Kawamura, "Interactive Task Planning under Uncertainty and Goal Changes," *Robotics and Autonomous Systems*, vol. 18, nos. 1-2, pp. 157-168, 1996.
28. G. Biswas, T. Arai and M. Iskarous, "Intelligence Group Report," *Robotics and Autonomous Systems*, vol. 18, nos. 1-2, pp. 141-148, pp. 141-148, 1996.
29. G. Biswas, R. Kapadia, and X. Yu, "Combined Qualitative-Quantitative Steady State Diagnosis of Continuous-valued Systems," *IEEE Transactions on Systems, Man, and Cybernetics*, vol. 27, PART A, no. 2, pp. 167-185, 1997.
30. A.M. Tharpe and G. Biswas, "Characterization of Problem Solving in Audiology: Implications for Training," *American Journal of Audiology*, vol. 6, no. 1, pp. 31-42, March 1997.
31. A. Saad, G. Biswas, and K. Kawamura, "Performance Evaluation of Contract Net Based Hierarchical Scheduling for Flexible Manufacturing Systems," *Jour. of Intelligent Automation and Soft Computing*, vol. 3, no. 3, pp. 233-252, 1997.
32. T.R. Crews, G. Biswas, S.R. Goldman, and J.D. Bransford, "Anchored Intelligent Learning Environments," *Intl. Journal of Artificial Intelligence in Education*, vol. 8, pp. 142-178, 1997.
33. G. Biswas, H. Haftbadaran, K. Kawamura, R. Dhingra, D. Hunkeler, J. Lantz, M. Shahinpoor, and T. Quinn, "An Environmentally Conscious Decision Support System Based on a Streamlined LCA and a Cost Residual Risk Evaluation: Fluorescent Light Bulb Case Study," *Intl. Journal of Environmentally Conscious Design and Manufacturing*, vol. 6, no. 3, pp. 9-24 1997.
34. P.J. Mosterman and G. Biswas, "A Theory of Discontinuities in Physical System Models," *Journal of the Franklin Institute: Engineering and Applied Mathematics*, vol. 335B, no. 3, pp. 401-439, Jan. 1998.
35. G. Biswas, J. Weinberg, and D.H. Fisher, "ITERATE: A Conceptual Clustering Algorithm for Data Mining," *IEEE Transactions on Systems, Man, and Cybernetics*, vol. 28C, no. 2, pp. 219-230, May 1998.
36. G. Biswas, K. Kawamura, D. Hunkeler, R. Dhingra, E. Huang, and M. Curtin, "An Environmentally Conscious Decision Support System for Life Cycle Management," *Journal of Industrial Ecology*, vol. 2, no. 1, pp. 127-142, Jan. 1998.

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41. E.J. Manders, G. Biswas, P.J. Mosterman, L. Barford, and J. Barnett, "Signal Interpretation for Monitoring and Diagnosis: A Cooling System Testbed," *IEEE Trans. on Instrumentation and Measurement*, vol. 49, no. 3, pp. 503-509, 2000.
42. P.J. Mosterman and G. Biswas, "A Comprehensive Methodology for Building Hybrid Models of Physical Systems," *Artificial Intelligence Journal*, vol. 121, pp. 171-209, 2000.
43. S.U. Egarievwe, A.O. Ojiboye, G. Biswas, et al., "Internet Application of Labview in Computer Based Learning," *European Journal of Open and Distance Learning (EURODL)*, an Internet Journal (<http://www1.nks.no/eurodl/eurodl/en/index.html>), Thematic Issue: ICL 2000, November 2000.
44. D. Hunkeler and G. Biswas, "Return on Environment: An Objective Indicator to Validate Life Cycle Assessments?" *Intl. Journal of Life Cycle Assessment*, vol. 5, no. 6, pp. 358-362, 2000.
45. M.M. Matthews, W. Pharr, G. Biswas, and H. Neelakandan, "USCSH: An Active Intelligent Assistance System," *Journal of Artificial Intelligence Review*, vol. 14, pp. 121-141, 2000.
46. S. Bagchi, G. Biswas, and K. Kawamura, "Task Planning under Uncertainty using a Spreading Activation Network," *IEEE Trans. on Systems, Man, and Cybernetics*, vol. 30, no. 6, pp. 639-650, 2000.
47. X.W. Yu, G. Biswas, and J. Weinberg, "MDS – An Integrated Architecture for Associational and Model-Based Diagnosis," *Applied Intelligence: An International Journal*, vol. 14, no. 2, pp. 179-195, 2001.
48. P.J. Mosterman and G. Biswas, "A Hybrid Modeling and Simulation Methodology for Dynamic Physical Systems," *SIMULATION: Transactions of the Society for Modeling and Simulation International*, vol. 78, no. 1, pp. 5-17, Jan. 2002.
49. E.J. Manders, L.A. Barford, and G. Biswas, "An Approach for Fault Detection and Isolation in Dynamic Systems from Distributed Measurements," *IEEE Transactions on Instrumentation and Measurement*, vol. 51, no. 2, pp. 235-240, April 2002.
50. C. Li and G. Biswas, "Unsupervised Learning with Mixed Numeric-and-Nominal Mixed Data," *IEEE Trans. on Knowledge and Data Engineering*, vol. 14, no. 4, pp. 673-690, 2002.

51. C. Li and G. Biswas, "A Bayesian Approach for Learning Hidden Markov Models from Data", special issue on *Markov Chain and Hidden Markov Models*, *Scientific Programming*, vol. 10, no. 3, pp. 201-219, 2002.
52. C. Li and G. Biswas, "Applying the Hidden Markov Methodology for Unsupervised Learning of Temporal Data," special issue of *International Jour. of Knowledge Based Intelligent Engineering Systems*, M. Aledjem and F. Steimann, Guest Eds., vol. 6, no. 3, pp. 152-160, July 2002.
53. C. Li, G. Biswas, M. Dale, and P. Dale, "Matryoshka: A HMM Based Temporal Data Clustering Methodology for Modeling System Dynamics," *Intelligent Data Analysis*, vol. 6, no. 3, pp. 281-308, 2002.
54. M. Dale, P. Dale, C. Li, and G. Biswas, "Assessing Impacts of Small Perturbations using a Model-based Approach," *Ecological Modeling*, vol. 156, no. 2-3, pp. 185-199, Nov. 2002.
55. M. Ji, Z. Zhang, G. Biswas, and N. Sarkar, "Hybrid Fault Adaptive Control of a Wheeled Mobile Robot," *IEEE Transactions on Mechatronics*, vol. 8, no. 2, pp. 226-233, June 2003.
56. G. Biswas, E.J. Manders, J.W. Ramirez, N. Mahadevan, and S. Abdelwahed, "Online Model-Based Diagnosis to Support Autonomous Operation of an Advanced Life Support System," *Habitation: International Journal of Human Support Research*, vol. 10, no. 1, pp. 21-38, 2004.
57. G. Biswas, M.O. Cordier, J. Lunze, L. Trave-Massuyes, and M. Staroswiecki, "Diagnosis of Complex Systems: Bridging the Gap between the FDI and DX communities," Guest Editorial, special issue of *IEEE Trans. on Systems, Man, and Cybernetics, Part B*, vol. 34, no. 5, pp. 2139-2142, Oct. 2004.
58. S. Abdelwahed, J. Wu, G. Biswas, J. Ramirez, and E.J. Manders, "Online Fault-Adaptive Control for Efficient Resource Management in Advanced Life Support Systems," *Habitation: International Journal of Human Support Research*, vol. 10, no. 2, pp. 105-115, 2005.
59. G. Biswas, D. Schwartz, K. Leelawong, N. Vye, and TAG-V, "Learning by Teaching: A New Agent Paradigm for Educational Software," *Applied Artificial Intelligence*, special issue on Educational Agents, vol. 19, no. 3-4, pp. 363-392, March 2005.
60. J. Sztipanovits, G. Biswas, K. Frampton, A. Gokhale, L. Howard, G. Karsai, J. Koo, X. Koutsoukos, and D. Schmidt, "Introducing Embedded Software and Systems Education and Advanced Learning Technology in an Engineering Curriculum," special issue, *ACM Trans. on Embedded Systems (TECS)*, vol. 4, no. 3, pp. 549-568, August 2005.
61. K. Blair, D. Schwartz, G. Biswas, and K. Leelawong, "Pedagogical Agents for Learning by Teaching: Teachable Agents," to appear, *Special issue of Educational Technology on "Pedagogical Agents"*, vol. 47, no. 1, pp. 56-61, January 2007.

To Appear

1. S. Narasimhan and G. Biswas, "Model-based Diagnosis of Hybrid Systems," *IEEE Trans. on Systems, Man, and Cybernetics, Part A*, July 2007.
2. M. Daigle, X. Koutsoukos, and G. Biswas, "Distributed Diagnosis in Formations of Mobile Robots," *IEEE Transactions on Robotics (T-RO)*, to appear, 2007.

3. S.D. Pathak, D.M. Dilts, and G. Biswas, "Understanding the Growth Dynamics of Supply Chain Networks," *IEEE Transactions on Engineering Management*, to appear 2007.

In Review

1. E.J. Manders and G. Biswas, "Detection and Isolation of Abrupt Faults: A combined qualitative and quantitative approach," *Control Engineering Practice*, Dec. 2004.

Invited Papers (Book Chapters)

1. M. Oliff and G. Biswas, "OASES: An Expert System for Operations Analysis," *Applied Expert Systems*, E. Turban and P.R. Watkins, eds., Elsevier Science Publishers (North Holland), pp. 205-229, 1988.
2. G. Biswas and T.S. Anand, "Using the Dempster-Shafer Scheme in a Mixed-Initiative Expert System Shell," *Uncertainty in Artificial Intelligence 3*, L.N. Kanal, T.S. Levitt, and J.F. Lemmer, eds., Elsevier Science Publishers (North Holland), Amsterdam, pp. 223-239, 1989.
3. J. Strobel, F. Soewito, C. Kendall, G. Biswas, J. Bezdek, and R. Cannon, "Interactive Simulation (SEDPACK) of Clastic and Carbonate Sedimentation in Shelf to Basin Settings," *Quantitative Dynamic Stratigraphy*, T.A. Cross, ed., Prentice Hall, Englewood Cliffs, NJ, pp. 433-444, 1989.
4. G. Biswas and M. Oliff, "Expert Systems for Operations Analysis," *Systems and Control Encyclopedia (First Supplement)*, M.G. Singh, ed., Pergamon Press, Oxford, pp. 236-243, 1990.
5. P.K. Basu and G. Biswas, "CAAD in expert mode," *Expert Systems for Management and Engineering*, E. Balagurusamy and J. Howe, eds., Ellis Horwood, London, UK, pp. 209-222, 1990.
6. C. Kendall, P. Moore, J. Strobel, R. Cannon, M. Perlmutter, J. Bezdek, and G. Biswas, "Simulation of the Sedimentary Fill of Basins," *Sedimentary Modeling: Computer Simulations and Methods for Improved Parameter Definition*, Kansas Geological Survey, Lawrence, KS, Bulletin no. 233, E.K. Franseen, et al., eds., pp. 9-30, 1991.
7. J. Weinberg, S. Uckun, G. Biswas, and S. Manganaris, "Qualitative Vector Algebra," *Recent Advances in Qualitative Physics*, B. Faltings and P. Struss, eds., MIT Press, pp. 193-208, 1992.
8. D.L. Hibler and G. Biswas, "TEPS: Thought Experiments and Qualitative Physics Problem Solving," *Recent Advances in Qualitative Physics*, B. Faltings and P. Struss, eds., MIT Press, pp. 345-360, 1992.
9. G. Biswas, J. Weinberg, and G.R. Koller, "Data Exploration in Non-numeric Databases," *Advances in Databases and Artificial Intelligence*, vol. 1, F.E. Petry and L.M. Delcambre, eds., Jai Press, Greenwich, CT, pp. 145-165, 1995.
10. G. Biswas, S.R. Goldman, D. Fisher, B. Bhuvva, and G. Glewwe, "Assessing Design Activity in Complex CMOS Circuit Design," *Cognitively Diagnostic Assessment*, P. Nicholls, S. Chipman, and R. Brennan, eds., Lawrence Erlbaum, Hillsdale, NJ, pp. 167-188, 1995.
11. G. Biswas, J. Weinberg, and C. Li, "ITERATE: A Conceptual Clustering Method for Knowledge Discovery in Databases," *Artificial Intelligence in the Petroleum Industry*, B. Braunschweig and R. Day, eds., Editions Technip, Paris, France, pp. 111-139, 1995.

12. Mosterman, P.J., Zhao, F., and Biswas, G., "Sliding Mode Model Semantics and Simulation for Hybrid Systems," *Lecture Notes in Computer Science, Hybrid Systems V*, vol. 1567, Springer Verlag, Heidelberg, Germany, pp. 218-237, 1999.
13. Schwartz, D., Biswas, G., Brophy, S.P., Bransford, J.D., Balac, T., and Bhuva, B., "Computer Tools that Link Assessment and Instruction: Investigating What Makes Electricity Hard to Learn," in S. Lajoie (ed.), *Computers as cognitive tools Volume II No more walls: Theory change, paradigm shifts and their influence on the use of computers for instructional purposes*, Lawrence Erlbaum Assoc., NJ, pp. 273-307, 2000.
14. G. Biswas, D. Schwartz, J. Bransford, and the Teachable Agent Group at Vanderbilt (TAG-V), "Technology Support for Complex Problem Solving: From SAD Environments to AI," in K.D. Forbus and P.J. Feltovich (eds.), *Smart Machines in Education: The Coming Revolution in Educational Technology*, pp. 71-97 (Ch. 3), AAAI/MIT Press, Menlo Park, CA, 2001.
15. G. Karsai, G. Biswas, S. Narasimhan, T. Szemethy, G. Peceli, G. Simon, and T. Kovacsazy, "Towards Fault-Adaptive Control of Complex Dynamic Systems," *Software-Enabled Control: Information Technologies for Dynamical Systems*, T. Samad and G. Balas, eds., IEEE Press, pp 347-368, 2003.

To Appear

1. D.L. Schwartz, K.P. Blair, G. Biswas, and K. Leelawong, "Animations of Thought: Interactivity in the Teachable Agent Paradigm," in *Learning with Animation: Research and Implications for Design*. R. Lowe and W. Schnotz (eds), UK: Cambridge University Press, 2007.
2. A. Patterson-Hine, S. Narasimhan, G. Aaseng, G. Biswas, and K. Pattipati, "A Review of Diagnostic Techniques for ISHM Applications," *Integrated System Health Engineering and Management in Aerospace*, S. Johnson, editor, 2007.
3. D. Kortenkamp, G. Biswas, and E.J.-Manders, "Issues in Integrated Health Management of Integrated Life Support Systems," *Integrated System Health Engineering and Management in Aerospace*, S. Johnson, editor, 2007.

Papers Published in Refereed Conference Proceedings

1. G. Biswas and R.C. Dubes, "Two dimensional Inference Experiments with Noisy and Distorted Patterns," *Proc. IEEE Intl. Conf. on Systems, Man and Cybernetics*, Dec. 1983-Jan. 1984, pp. 398-402.
2. A. Sen and G. Biswas, "A Framework for Expert Decision Support Systems Design," *IEEE Intl. Conf. on Computers, Systems and Signal Processing*, India, Dec. 1984, pp. 1177-1181.
3. M.M. Matthews and G. Biswas, "ORACLE: A Knowledgeable User Interface," *IEEE Computer Society's Ninth Annual Software and Applications Conference (Compsac85)*, Chicago, IL, October 9-11, 1985, pp. 287-294.
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5. G. Biswas, C.T. Matthews, M.M. Matthews, P. Rabon, and R. Wilhite, "An Active Assistance System for Vi," *IEEE Intl. Conference on Systems, Man and Cybernetics, Tuscon, AZ*, Nov. 12-15, 1985, pp. 746-750.
6. G. Biswas, M. Oliff, and A. Sen, "Design of an Expert System in Operations Analysis," *IEEE Intl. Conference on Systems, Man and Cybernetics, Tuscon, AZ*, Nov. 12-15, 1985, pp. 121-125.
7. M. Oliff, A. Sen, and G. Biswas, "An Expert System in Operations Analysis: An Opportunity for Productivity Improvement," *American Inst. of Decision Sciences (AIDS) Annual Meeting, Las Vegas*, Nov. 11-13, 1985, pp. 111-113.
8. M.M. Matthews and G. Biswas, "Raising User Proficiency Through Active Assistance: An Intelligent Editor," *Second Conf. on AI Applications (IEEE)*, Miami Beach, Dec. 11-13, 1985, pp. 358-363.
9. G. Biswas, V. Subramanian, and J.C. Bezdek, "A Knowledge Based Systems Approach to Document Retrieval," *Second Conf. on AI Applications (IEEE)*, Miami Beach, Dec. 11-13, 1985, pp. 455-460.
10. C.L. Baker, R.L. Oakman, G. Biswas, and J.C. Bezdek, "Constructing Synonym and Implication Relations of Concept Terms," *Third Annual USC CS Symposium on Knowledge Based Systems: Theory and Applications*, Columbia, March 31 and April 1, 1986.
11. G. Biswas, R. Abramczyk, M. Oliff, and A. Sen, "OASES: An Expert System for Operations Analysis," *Third Annual USC CS Symposium on Knowledge Based Systems: Theory and Applications*, Columbia, March 31 and April 1, 1986.
12. M.M. Matthews and G. Biswas, "ORACLE: An Active Assistance System for Unix," *Third Annual USC CS Symposium on Knowledge Based Systems: Theory and Applications*, Columbia, March 31 and April 1, 1986.
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15. A. M. Rao, G. Biswas, and P.K. Bose, "Assumption Based Reasoning Applied to Personal Flight Planning," *Third IEEE Conference on AI Applications*, Orlando, FL, February 1987, pp. 266-271.
16. G. Biswas, M.M. Matthews, and A. Huang, "An Assistance System for Unix Text Formatters," *ACM Computer Science Conference*, St. Louis, Missouri, February 1987, pp. 53-57.
17. R. Sobczak, M.M. Matthews, and G. Biswas, "A Response Generation Mechanism for an Intelligent Active Assistance System," *ACM Computer Science Conference*, St. Louis, Missouri, February 1987, pp. 128-132.
18. G. Biswas, J.C. Bezdek, and L. Huang, "Thesaurus Building with Transitive Closures for KADRE," *Applications of Artificial Intelligence V*, SPIE, Orlando, Florida, 1987, pp. 432-438.

19. R.L. Sobczak, M.M. Matthews, and G. Biswas, "A Mechanism to Automate the Production of a Keyword table for an Intelligent Active Assistance System," *Applications of Artificial Intelligence V*, SPIE, Orlando, Florida, 1987, pp. 444-447.
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146. C. Li and G. Biswas, "A Bayesian Approach to Temporal Data Clustering using Hidden Markov Models," *Intl. Conference on Machine Learning (ICML 2000)*, Stanford, CA, pp. 543-550, June 2000.
147. P.J. Mosterman, E.J. Manders, and G. Biswas, "Qualitative Dynamic Behavior of Physical System Models with Algebraic Loops," *Eleventh Intl. Workshop on Principles of Diagnosis (DX'00)*, Morelia, Mexico, pp. 155-162, June 2000.
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158. C. Li and G. Biswas, "Applying the Hidden Markov Methodology for Unsupervised Learning of Temporal Data," *Proc. Intl. ICSC Congress: Computational Intelligence: Methods and Applications (CIMA '2001)*, Bangor, Wales, June 19-22, 2001.
159. S. Narasimhan and G. Biswas, "An Approach to Model-Based Diagnosis of Hybrid Systems," *Hybrid Systems: Computation and Control, Fifth Intl. Workshop*, Stanford, CA, Lecture Notes in Computer Science, vol. LNCS 2289, C.J. Tomlin and M.R. Greenstreet, eds., Springer Verlag, Berlin, pp. 308-322, March 2002.
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163. M. Ji, Z. Zhang, G. Biswas, and N. Sarkar, "Hybrid Fault Adaptive Control of a Mobile Robot," *ASME Intl. Mechanical Engineering Congress and Exposition*, New Orleans, LA, Nov., 2002.
164. J. Davis, K. Leelawong, K. Belyne, B. Bodenheimer, G. Biswas, N. Vye, J. Bransford, "Intelligent User Interface Design for Teachable Agent Systems", *International Conference on Intelligent User Interfaces*, pp. 26-34, Miami, FL, January 2003.

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166. E.J. Manders and G. Biswas, "FDI of abrupt faults with combined statistical detection and estimation and qualitative fault isolation," *5th IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes (SAFEPROCESS)*, Washington, D.C., pp. 347-352, June 2003.
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168. G. Biswas, G. Simon, N. Mahadevan, S. Narasimhan, J. Ramirez, G. Karsai, "A robust method for hybrid diagnosis of complex systems," *5th IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes (SAFEPROCESS)*, Washington, D.C., pp. 1125-1130, June 2003.
169. G. Biswas, G. Simon, G. Karsai, S. Abdelwahed, N. Mahadevan, T. Szemethy, J. Ramirez, G. Peceli, and T. Kovacs hazzy, "Self-Adaptive Software for Fault-Adaptive Control," *Third Intl. Workshop on Self-Adaptive Software*, Washington, D.C., June 2003.
170. S. Narasimhan and G. Biswas, "Model-based Diagnosis of Hybrid Systems," *Proc. 18th Intl. Joint Conf. on Artificial Intelligence*, Acapulco, Mexico, pp. 376-381, August 2003.
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172. G. Biswas, E.J Manders, and J. Ramirez, "An Approach to Model Based Diagnosis of ALS subsystems," *Habitation 2004: Conference on Space Habitation Research and Technology Development*, Orlando, FL, Jan. 2004.
173. S. Abdelwahed, J. Wu, and G. Biswas, "Online Multilevel Hybrid Control for Optimal Resource Management in Advanced Life Support Systems," *Habitation 2004: Conference on Space Habitation Research and Technology Development*, Orlando, FL, Jan. 2004.
174. S. Abdelwahed, G. Karsai, and G. Biswas, "System Diagnosis using Hybrid Failure Propagation Graphs," *Proc. 15th Annual Workshop on Principles of Diagnosis*, L. Trave-Massuyes, ed., Carcassonne, France, pp. 99-104, June 2004.
175. E.J. Manders, G. Biswas, J. Ramirez, N. Mahadevan, and J. Wu, "A Model-Integrated Computing Tool Suite for Fault-Adaptive Control," *Proc. 15th Annual Workshop on Principles of Diagnosis*, L. Trave-Massuyes, ed., Carcassonne, France, pp. 137-142, June 2004.
176. S. Gupta, G. Biswas, and J. Ramirez, "An Improved Algorithm for Hybrid Diagnosis of Complex Systems," *Proc. 15th Annual Workshop on Principles of Diagnosis*, L. Trave-Massuyes, ed., Carcassonne, France, pp. 203-208, June 2004.
177. S. Abdelwahed, J. Wu, G. Biswas, J.W. Ramirez, and E.J. Manders, "Online Hierarchical Fault-Adaptive Control for Advanced Life-Support Systems," *Proc. 34th Annual Meeting of Intl. Conf. on Environmental Systems (ICES)*, paper number 2004-01-2441, Colorado Springs, CO, July 2004.

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179. G. Biswas, "Qualitative Modeling and Cognitive Science," *Symposium Presentation at the 26th Annual Cognitive Science Conference*, Chicago, IL, pp. 13, August 2004.
180. K. Viswanath, B. Adebisi, G. Biswas, and K. Leelawong, "A Multi-Agent Architecture Implementation of Learning by Teaching Systems," *4th IEEE Intl. Conference on Advanced Learning Technologies*, Joensuu, Finland, pp. 61-65, Aug. 31-Sept. 4, 2004.
181. G. Biswas, K. Leelawong, K. Belyne, K. Viswanath, D. Schwartz, and J. Davis, "Developing Learning by Teaching Environments that support Self-Regulated Learning," *Proc. of the 7th International Conference on Intelligent Tutoring Systems*, J.C. Lester, R.M. Vicari, and F. Paraguacu, eds., Maceio, Brazil, pp. 730-740, Aug. 30-Sept. 3, 2004.
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183. G. Biswas, S. Abdelwahed, X. Koutsoukos, J. Gandhe and E. Manders, "Toward Distributed Diagnosis of Complex Physical Systems," *42nd Annual Allerton Conf. on Communication, Control, and Computing*, paper number 42-303, Urbana-Champaign, IL, Sept. 29-Oct. 1, 2004.
184. I. Roychoudhury, G. Biswas, X. Koutsoukos, and S. Abdelwahed, "Designing Distributed Diagnosers for Complex Physical Systems," *16th International Workshop on Principles of Diagnosis*, Monterey, CA, pp. 31-36, June 2005.
185. S. Abdelwahed, G. Karsai, and G. Biswas, "A Constraint-based Robust Diagnosis System for Temporal Causal Systems," *16th International Workshop on Principles of Diagnosis*, Monterey, CA, pp. 73-80, June 2005.
186. G. Biswas, P. Bonasso, S. Abdelwahed, E.J. Manders, D. Kortenkamp, J. Wu, and S. Bell, "A Proposed Plan Execution Architecture for Advanced Life Support System Control," *ICAPS Workshop on Plan Execution: A Reality Check*, Monterey, CA, pp. 76-79, June 2005.
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189. S. Abdelwahed, J. Wu, G. Biswas, and E.J.-Manders, "Hierarchical Online Control Design for Autonomous Resource Management in Advanced Life Support Systems," *International Conference on Environmental Systems*, Paper no. 2005-01-2965, Rome, Italy, July 2005.
190. J. Tan, C. Beers, R. Gupta, and G. Biswas, "Computer Games as Intelligent Learning Environments: A River Ecosystem Adventure," *The Twelfth International Conference on AI in Education*, Amsterdam, The Netherlands, pp. 646-653, July 2005.

191. R. Gupta, Y. Wu, and G. Biswas, "Teaching about Dynamic Processes: A Teachable Agents Approach," *The Twelfth International Conference on AI in Education*, Amsterdam, The Netherlands, pp. 241-248, July 2005.
192. G. Biswas, K. Leelawong, K. Belyne, and B. Adebisi, "Case Studies in Learning by Teaching Behavioral Differences in Directed versus Guided Learning," *The 27th Annual Conference of the Cognitive Science Society*, Stresa, Italy, pp. 274-279, August 2005.
193. J. Wu, G. Biswas, S. Abdelwahed, and E.J. Manders, "A Hybrid Control System Design and Implementation for a Three-tank Testbed," *IEEE Conference on Control Applications*, Toronto, Canada, pp. 645-650, August 2005.
194. M. Daigle, X. Koutsoukos, and G. Biswas, "Relative Measurement Orderings in Diagnosis of Distributed Physical Systems," *43rd Annual Allerton Conference on Communication, Control, and Computing*, September 2005.
195. E.J. Manders, G. Biswas, N. Mahadevan, and G. Karsai, "Component-oriented modeling of hybrid dynamic systems using the Generic Modeling Environment," *Fourth Workshop on Model-Based Development of Computer-Based Systems and Third International Workshop on Model-Based Methodologies for Pervasive and Embedded Software (MBD-MOMPES'06)*, pp. 159-168, March 2006.
196. M. Daigle, X. Koutsoukos, and G. Biswas, "Distributed Diagnosis of Coupled Mobile Robots," *International Conference on Robotics and Automation, (ICRA)*, June 2006.
197. C.D. Beers, E.J. Manders, G. Biswas, and P.J. Mosterman, "Building Efficient Simulations from Hybrid Bond Graph Models," *2nd IFAC Conference on Analysis and Design of Hybrid Systems, (ADHS 06)*, Alghero, Sardinia, Italy, June 2006.
198. J. Tan and G. Biswas, "The Role of Feedback in Preparation for Future Learning: A Case Study in Learning by Teaching Environments," *Intelligent Tutoring Systems: 8th International Conference*, pp. 370-381, Jhongli, Taiwan, June 2006.
199. I. Roychoudhury, G. Biswas, and X. Koutsoukos, "A Bayesian Approach to Efficient Diagnosis of Incipient Faults," *17th International Workshop on Principles of Diagnosis (DX '06)*, pp. 243-264, Penaranda de Duero, Burgos, Spain, June 2006.
200. M. Daigle, X. Koutsoukos, and G. Biswas, "Multiple Fault Diagnosis in Complex Physical Systems," *17th International Workshop on Principles of Diagnosis (DX '06)*, pp. 69-76, Penaranda de Duero, Burgos, Spain, June 2006.
201. J. Tan, G. Biswas, and D.L. Schwartz, "Feedback for Metacognitive Support in Learning by Teaching Environments," *The 28th Annual Meeting of the Cognitive Science Society*, pp. 828-833, Vancouver, Canada, July 2006.
202. G. Biswas and E.J. Manders, "Integrated Systems Health Management to achieve Autonomy in Complex Systems," *6th IFAC Symposium on Fault Detection, Supervision, and Safety of Technical Processes (SAFEPROCESS 2006)*, Beijing, China, pp. 1207-1212, Aug.-Sept. 2006.
203. I. Roychoudhury, M. Daigle, G. Biswas, X. Koutsoukos, and P.J. Mosterman, "A Method for Efficient Simulation of Hybrid Bond Graphs," *International Conference on Bond Graph Modeling, part of Western Multi Conference on Modeling & Simulation*, San Diego, CA, pp. 177-186, January 2007.

204. J.S. Kinnebrew, N. Shankaran, G. Biswas, and D.C. Schmidt, "A Decision-Theoretic Planner with Dynamic Component Reconfiguration for Distributed Real-time and Embedded Systems," *International Joint Conference on Artificial Intelligence Workshop on Space Applications*, Hyderabad, India, January 2007.

In Press

1. D. Suri, A. Howell, D. Schmidt, G. Biswas, J. Kinnebrew, W. Otte, and N. Sankaran, "A Multi-agent Architecture provides Smart Sensing for the NASA Sensor Web," *IEEE Aerospace Conference*, Big Sky, Montana, to appear March 2007.
2. G. Biswas and S. Mahadevan, "A Hierarchical Model-based approach to Systems Health Management," *IEEE Aerospace Conference*, Big Sky, Montana, to appear March 2007.
3. J.S. Kinnebrew, A. Gupta, N. Shankaran, G. Biswas, and D.C. Schmidt, "A Decision-Theoretic Planner with Dynamic Component Reconfiguration for Distributed Real-Time Applications," *The 8th International Symposium on Autonomous Decentralized Systems (ISADS)*, Sedona, AZ, to appear March 2007.
4. J. Tan and G. Biswas, "Simulation-Based Game Learning Environments: Building and Sustaining a Fish Tank," *The First IEEE International Workshop on Digital Game and Intelligent Toy-Enhanced Learning (DIGITEL 2007)*, Jhongli, Taiwan, to appear March 2007.
5. M. Daigle, I. Roychoudhury, G. Biswas, and X. Koutsoukos, "Efficient Simulation of Component-Based Hybrid Models Represented as Hybrid Bond Graphs," *10th International Conference on Hybrid Systems: Computational and Control*, Pisa, Italy, to appear April 2007.

Invited Talks

- Tutorial on "The Design, Implementation and Use of Expert Systems," *Fourth Annual Conference on Intelligent Systems and Machines*, Oakland University, MI, April 1986.
- "Artificial Intelligence in Production Planning and Control," *1987 Southeast Decision Sciences Institute Conference*, Feb. 18-20, Richmond, VA.
- Panel on "What expert systems can/can't do ?" at the First Annual Meeting of the AI Society of Mid-Atlantic States," (Jim Hendler, moderator) Blacksburg, VA, March 1987.
- "Knowledge Based Systems Research in the Computer Science Department at the University of South Carolina," *1987 Meeting of the South Carolina Academy of Sciences*, April 1987.
- "XX (eXpert eXplorer): An Analogical Reasoning System for Hydrocarbon Play Analysis," *Mobil Research Labs., Dallas, Exxon Research, Houston, Shell Research, Houston, Standard Oil Company, Austin, Tenneco, Houston, Sun Oil Company, Dallas, Philips Oil, Bartlesville, OK, Boeing High Tech Research Center, Seattle.*, August-September 1987.
Arco Research Labs, Mobil Research Labs, Dallas, TX, November 1987.
- "Reasoning with Uncertainty in Knowledge Based Systems," *Advanced Computational Methods Center*, University of Georgia, Athens, May 1987.
- "Reasoning with Uncertainty in Knowledge Based Systems," *Center for Machine Intelligence, College of Engineering, USC*, November 1987.

- “XX (eXpert eXplorer): A Workstation Toolbox for the Explorationist,” *Amoco Exploration, Houston, TX, Conoco Research, Houston, TX*, February 1988.
- “An Intelligent Interface to a Facies Log Analysis System,” *Amoco Research Laboratories, Tulsa, OK*, August 1988.
- “Belief Functions and the Dempster-Shafer Theory: Applications to AI Reasoning,” *Departments of Computer Science and Statistics Seminar Series, Univ. of South Carolina, Columbia, S.C.*, April 1989.
- “Classification using Non Numeric Data in the Basin Catalog,” *Amoco Exploration, Houston, TX*, May 1989.
- “Thoughts Experiments and Qualitative Reasoning,” *Department of Computer Science, Michigan State University, E. Lansing, MI*, August 17, 1989.
- “Artificial Intelligence: Second Generation Business Applications,” *Seminar at the IT Forum, London, England*, sponsored by BEALL Ltd., Nov. 3, 1989.
- “Thoughts Experiments and Qualitative Reasoning,” *IBM Thomas J. Watson Research Center, Yorktown Heights, NY*, November 13, 1989.
- “Thoughts Experiments and Qualitative Reasoning,” *Phillips Laboratories, Briarcliff Manor, NY*, November 15, 1989.
- “Thoughts Experiments and Qualitative Reasoning,” *Computer Science and Engineering Seminar, Univ. of Louisville, Louisville, KY*, Dec. 1, 1989.
- “Applying Non Numeric Data to Classification and Risk Analysis,” *Amoco Research Center, Tulsa, OK*, June 1990.
- “Second Generation Expert Systems: Model-Based Reasoning and its Applications,” *Silver Jubilee Session of the Computer Society of India, Calcutta, India*, Nov. 2, 1990.
- “Knowledge-Based Systems: Second Generation Business Applications,” *Two-day intensive course, IBC Technical Services, Nov. 21-22, 1990, London, UK*.
- “Applying Non Numeric Data to Classification and Risk Analysis,” *Amoco Research Labs, Tulsa, OK*, May 1991.
- “Knowledge-Based Systems: Second Generation Business Applications,” *Invited Speaker, Data Processing Managers Association, Nashville, TN*, December 1991.
- “Modeling for Diagnosis of Complex Continuous-valued Systems,” *Stanford University, Stanford, CA*, March 1992.
- “PLAYMAKER: A Knowledge-based Approach to Characterizing Hydrocarbon Plays,” *Institute for Petroleum in Colombia (ICP), Bucaramanga, Colombia*, June 1992.
- “Model-based Reasoning and its Applications,” *University of Los Andes, Bogota, Colombia*, June 1992.
- Panel on “Role of Uncertainty in Expert Systems for Exploration Activities,” *Conference on Artificial Intelligence in Petroleum Exploration and Production, Houston, TX*, July 1992.

- “Database Mining,” *Conference on AI in Petroleum Exploration and Production (CAIPEP-93)*, Dallas, TX, May 1993.
- “An Efficient Scheme for Diagnosis of Complex, Continuous Systems,” (i) *The University of Tokyo, Tokyo, Japan to a consortium of Japanese industry, June 1993*, (ii) *Hitachi Advanced Research Labs, Tokyo, Japan, June 1993*, (iii) *Toshiba SSEL, Kawasaki City, Japan, June 1993*, (iv) *Mitsubishi Research Institute, Tokyo, Japan, June 1993*.
- “Conceptual Clustering and Knowledge Discovery in Databases,” (i) *Teijin Labs, Kawasaki City, Japan, June 1993*, (ii) *Fujitsu Research Labs, Japan, June 1993*.
- “Second Generation Expert Systems,” *Teijin Labs, Kawasaki City, Japan, June 1993*.
- “Intelligent Manufacturing Systems: State of the Art in U.S. and Japan,” *U.S.-Japan Program, Vanderbilt University of Public Policy Studies, Nashville, TN, November 1993*.
- “Applications of AI to the Oil Industry,” *National Center for Software Technology, Bombay, India, December 1993*.
- “Intelligent Manufacturing Systems: State of the Art,” *National Center for Software Technology, Bombay, India, December 1993*.
- “Intelligent Manufacturing and Environmentally Conscious Manufacturing,” *CAD Center, Indian Institute of Technology, Bombay, December 1993*.
- “Scientific Discovery in Geological Databases,” *Arco Research Labs, Plano, TX, May 1994*.
- “Intelligent and Environmentally Conscious Manufacturing,” *School of Engineering, Tennessee State Univ., February 1995*.
- “Intelligent Scheduling and Planning for Holonic Systems,” *Toshiba Corp., Kawasaki City, Japan, May 1995*.
- “Modeling Hybrid Systems for Diagnosis,” *Mitsubishi Research Inst., Tokyo, Japan, May 1995*.
- “Workshop on LCA Methodology and ECMM Analysis,” *Intl. Conf. on Industrial Waste Minimization, Taipei, Taiwan, Nov. 1995*.
- “Intelligent Learning Environments: The Next Generation,” *National Central University, Taiwan, Nov. 1995*.
- “Planning under Uncertainty by Spreading Activation Through an Adaptive Planning Network,” *Tokyo-Denki Univ., Saitama, Dec. 1996*.
- “Monitoring, Prediction and Fault Isolation in Dynamic Physical Systems,” *PNC, Mito, Japan, Dec. 1996*.
- “Macrocontexts plus Microworlds: The Jasper Project and AdventurePlayer,” *Univ. of Electro-Communications, Chofu, Tokyo, Japan, Dec. 1996*.
- “Planning and Distributed Scheduling for Intelligent Manufacturing,” *Toshiba Manufacturing Engineering Research Center., Yokohama, Japan, Dec. 1996*.
- “Assessment of Domain Learnability (ADL) in the Context of AC and DC Circuit Problem Solving,” *NPRDC, San Diego, CA, July 1997*.

- “IMA and Spreading Activation for Flexible Robotics Systems,” *Tokyo-Denki Univ.*, Saitama, Aug. 1997.
- “Fault Isolation from Transients in Dynamic Physical Systems,” *Univ. of Osaka ISIR*, Osaka, Japan, Aug. 1997.
- “Formal Specifications of Hybrid Dynamic System Models,” *Univ. of Osaka ISIR*, Osaka, Japan, Aug. 1997.
- “Distributed Scheduling for Holonic Manufacturing Systems,” *Toshiba Corp., SSEL Division*, Kawasaki City, Japan, Aug. 1997.
- “EcoDS: A Decision Support System for Streamlined LCA,” *Japan LCA Forum*, Tokyo, Japan, Aug. 1997.
- “What every DXer should know about Systems Theory,” *Eighth Intl. Workshop on Principles of Diagnosis (DX-97)*, with M.J. Chantler, Mont. St. Michel, France, Sept. 1997.
- “Monitoring, Prediction, and Fault Isolation in Complex Physical Systems,” *Univ. of Paris-Nord (XIII)*, Villetaneuse, France, Sept. 1997.
- “Formal Specifications of Hybrid Dynamic System Models,” *Knowledge Systems Laboratory, Dept. of Computer Science, Stanford Univ.*, Palo Alto, CA, Dec. 1997.
- “Formal Specifications of Hybrid Dynamic System Models,” *Xerox PARC*, Palo Alto, CA, Dec. 1997.
- “Fault Isolation from Transients in Dynamic Physical Systems,” *HP Labs*, Palo Alto, CA, Dec. 1997.
- “A Comprehensive Framework for Model-based Monitoring and Diagnosis,” *NASA Ames Research Center*, Mountain View, CA, Sept. 1998.
- “Modeling and Analysis of Hybrid Dynamic System,” *KSL Seminar Series*, Stanford University, CA, Oct. 1998.
- “A Comprehensive Framework for Model-based Monitoring and Diagnosis,” *Nobots Seminar Series*, Stanford University, CA, Oct. 1998.
- “A Comprehensive Framework for Model-based Monitoring and Diagnosis,” *AI Seminar Series*, SRI International, Menlo Park, CA, Nov. 1998.
- “Knowledge Representation and Reasoning for Multidisciplinary Design,” *DARPA RaDeo Meeting*, Seattle, WA, February 1999.
- “A Model-based approach to Fault Detection and Isolation for Complex Physical Systems,” *IRISA*, Rennes, France, March 2000.
- “Applying the Hidden Markov Methodology to Unsupervised Learning of Temporal Data,” Keynote Lecture, *CIMA 2001: Computational Intelligence: Methods and Applications*, Bangor, Wales, UK, June 19-22, 2001.
- “An Integrated Approach to Fault Detection and Isolation in Complex Hybrid Systems,” *NASA Ames Research Center*, Mountain View, CA, July 2002.

- “Fault Diagnosis and Fault-Adaptive Control in Embedded Systems,” *NASA Johnson Space Center*, Houston, TX, October 2002.
- “Teachable Agents and Student Learning,” *Learning Federation Workshop on Gaming and Simulation*, Orlando, FL, December 2002.
- “Learning by Teaching: A New Agent Paradigm for Educational Software,” *Workshop on Educational Agents: More than virtual tutors*, Vienna, Austria, June 2002.
- “Towards Long-term Autonomy in Embedded Systems: Hybrid Modeling, FDI, Fault-Adaptive Control, and IVHM,” *NASA Ames Research Center*, Mountain View, CA, July 2003.
- “Evaluating Teachable Agents: Educational Software that implements the Learning by Teaching Paradigm,” *Dagstuhl Seminar on Embodied Conversational Agents*, Dagstuhl, Germany, March 2004.
- “Qualitative Modeling and Cognitive Science,” *Symposium Presentation at the 26th Annual Cognitive Science Conference*, Chicago, IL, August 2004.
- Three lectures: (i) “Model-based Diagnosis of Continuous Systems,” (ii) “Model-based Diagnosis of Hybrid Systems,” and (iii) “Hierarchical, Limited Look Ahead Control,” *Spanish Summer School on Fault Detection and Diagnosis of Complex Systems*, Penaranda de Duero, Burgos, Spain, June 2006.
- “A New Approach to Designing Intelligent Learning Environments Exploring the value of Learning by Teaching,” *University of Arkansas at Little Rock*, October 13, 2006.

Research Proposals

Funded Research

Summary

Total External Funded Research (PI or co-PI):	\$15.7 million
Total of External Funding as PI:	\$3.65 million
Current grants: Total (as PI or co-PI):	\$8.32 million
Current grants (as PI):	\$2.33 million

List of Funded Proposals

Currently funded proposals in bold font.

1. “Three Dimensional Image Reconstruction,” Sponsored Programs and Research Grant, Univ. of South Carolina, PI, 1984, \$1000.
2. “An Active Learning Assistant Interface,” co-PI with M.M. Matthews, NCR Corporation, Columbia, 1985, \$161,000.
3. “XX (eXpert eXplorer) An Expert Database System of ‘Electronic Case Histories of Oilfields’ which assists in the Identification of Potential Hydrocarbon Plays and Prospects,” 1986 (current sponsors: Amoco, British Petroleum, Japan National Oil Corporation, Mobil, Union Oil of California), co-PI with C. Kendall, J. Bezdek, and R. Cannon, January 1987 - September 1992, \$380,000.

4. "Qualitative Physics for Complex Regular Systems," Vanderbilt University Research Council Summer Award, PI, 1988, \$5500.
5. "Qualitative Modeling for Advanced Medical Reasoning and Instruction," Vanderbilt University Research Council Summer Award, PI, 1989, \$3000.
6. "Design and Development of Fault Isolation and Maintenance Training Systems for the AMIX Project," Federal Express Corporation, PI, Sept. 1990-May 1991, \$58,500.
7. "Geological Basin Characterization, Classification and Analysis using Artificial Intelligence Techniques," Amoco Research Labs., PI, June 1989 - May 1993, \$117,000.
8. "Assessing Competence in Electronic Troubleshooting," Office of Naval Research, Co-PI with S. Goldman, July 1991 - June 1993, \$250,000.
9. "Assessing Competence in Electronic Troubleshooting – AASERT Fellowship," Office of Naval Research, Co-PI with S. Goldman, August 1992 - July 1995, \$80,000.
10. "SMART Assessments: Scientific Mathematical Arenas for Refining Thinking," Investigator, J. Pellegrino and N. Vye (Co-PI's), July 1992 - June 1997, \$1,944,380.
11. "A Knowledge-Based System for Risk Analysis of Hydrocarbon Prospects," Ecopetrol, Colombia, PI, September 1992-August 1993, \$33,000.
12. "Model-based Diagnosis of Continuous-valued Systems," McDonnell Douglas Corporation, February 1993-September 1993, \$19,900.
13. "Developing Conceptual Clustering Methods for Knowledge Discovery Tasks," Arco Exploration and Production, May 1993-Dec. 1994, \$56,000.
14. "U.S.-Japan Industry and Technology Management Program," AFOSR, Investigator, K. Kawamura (PI), 1994-97, \$2,208,299.
15. "High Precision Robotic Manufacturing System," co-PI with K. Kawamura, Tech Gem Diamond Tools, Inc., Feb. 1995-Jan. 1996, \$75,900.
16. "Data Mining Project," Rockwell Science Center, Palo Alto, CA, PI, 1995-96, \$10,000.
17. "Developing Knowledge Discovery Methods for the Management Discovery Tool," AT&T Global Information Systems, 1996-97, \$27,807 (1 year).
18. "Developing Knowledge Discovery Methods for the Management Discovery Tool," NCR HITC, Atlanta, 1997-98, \$26,000 (1 year).
19. "Assessing Qualitative Reasoning Skills in Understanding and Troubleshooting Alternating Current Circuits," Office of Naval Research (ONR), PI, with B. Bhuvra, D. Schwartz, and J. Bransford, 1996-98, \$276,379 (2 years), \$313,680, 1999-2001.
20. "A Systematic Integrated Methodology for Prediction, Monitoring, and Diagnosis of Complex, Dynamic Systems," Mitsubishi Research Institute, Tokyo, Japan, PI, 1996-98, \$101,828 (2 years).
21. "Hybrid Modeling, Monitoring, Prediction, and Diagnosis of Complex Physical Systems," Hewlett Packard Labs, Palo Alto, CA, PI, 1997-98, \$40K + \$15K (equipment), 1998-99, \$50K + \$5K (equipment), 1999-00, \$50K + \$10K (equipment).

22. "Hybrid Modeling for Smart Systems Design," University Research Council, Vanderbilt Univ., Summer 1997, \$5290.
23. "Development of an Intelligent Learning Environment for Training of Clinical Audiology Students," Dept. of Education, 1997-2000, with co-PI with A.M. Tharpe, D. Schwartz, and J. Bransford, \$398,178.
24. "Learning and Intelligent Systems: Center for Intelligent Learning Technologies," National Science Foundation, 1997-2002, with J. Bransford (PI) and others, \$1,172,285.
25. "Teachable Agents: Computer Environments for Supporting High Achievement in Science and Mathematics," co-PI with John Bransford and Dan Schwartz, National Science Foundation (KDI grant), \$800,000.
26. "Fault-Adaptive Control Technology," DARPA, 1999-2003, with G. Karsai (PI), \$1,287,960.
27. "Hybrid Modeling and Diagnosis," Xerox Palo Alto, Research Center, \$41,000, 1999-2001.
28. "Robust Methods for Autonomous Fault-Adaptive Control of Complex Systems," (G. Biswas, PI, K. Frampton and G. Karsai, co-PI's), NASA Research on Intelligent Systems, \$672,591, April 2001–March 2004.
29. "Dynamic Modeling, Analysis, and Synthesis of Embedded Hybrid Systems," (G. Biswas, PI, G. Karsai, and S. Abdelwahed, co-PIs), NSF Embedded and Hybrid Systems, \$272,000, Oct. 2002–Sept. 2005.
30. "Distributed Monitoring and Control of Complex Dynamic Systems," (G. Biswas, PI, S. Abdelwahed, co-PI) NASA Advanced Human Support Technology Program, \$471,933, Jan. 2003–Dec. 2005.
31. **"Foundations of Hybrid and Embedded Software Systems," S. Sastry (UC Berkeley) and J. Sztipanovits (Vanderbilt), PI's, G. Karsai, G. Biswas, and K. Frampton, co-PI's (Vanderbilt), NSF Large ITR Grant, \$4.7 million (Vanderbilt), 2003-2007.**
32. "Collaborative Research: Exploring the Value of Learning by Teaching," N. Vye (Vanderbilt) and D. Schwartz (Stanford), PI's, G. Biswas and J. Bransford (Vanderbilt), co-PI's, NSF Program on Learning and Education, \$899,812, 2003-2005.
33. "SGER: Modeling, Analysis, and Diagnosis for Safety of Distributed Hybrid Systems," PI, X. Koutsoukos and S. Abdelwahed, co-PIs, NSF SGER Award, \$200,000, 2004-2005.
34. "FACT Toolsuite Integration," co-PI, G. Karsai (PI), Boeing Aerospace Company, \$100,333, 2005.
35. "Speech Recognition in Chaotic Aural Environments," PI, E. Manders (co-PI), DARPA STTR, Phase 1 (UME Voice, Principal), \$33,000, 2005.
36. "Collaborative Research: Exploring the value of Learning by Teaching (supplement)," PI, NSF Role Grant, \$44,599, 2006.
37. "Multi-Agent Architecture for Adaptive Science Operations in Satellite Formations," co-PI, D. Schmidt, PI, subcontractor to Lockheed Martin ATC, Palo Alto, NASA AIST, \$ 80,180, May 2005–December 2006.

38. “Human Centric Design Environments for Command and Control Systems: The C2 Wind Tunnel,” co-PI, J. Sztipanovits, PI, G. Karsai, T. Bapty, co-PI’s, AFOSR PRET, \$2,270,000, March 2006–November 2008.
39. “Advanced Diagnostics and Prognostics Techniques Applied to NASA Spacecraft and Testbeds,” PI, NASA Ames Research Center (USRA), \$109,014, July 2006–May 2007.
40. “A learning by teaching approach to help students develop self-regulatory learning skills in middle school science classrooms,” PI, K. Catley, D.L. Schwartz, co-PIs, Dept. of Education, Institute for Education Sciences, \$1,499,980, July 2006–June 2009.
41. “Aircraft Electrical Power System Diagnostics and Health Management,” PI, subcontract from Qualtech Systems Inc, CT (Office of Naval Research STTR Topic N064-007-0103), \$33,000, September 2006–May 2007.
42. “Collaborative Research: REESE- Assisting and Assessing Middle School Science Learning in Formal and Informal Settings,” PI, NSF REESE grant, \$467,355, January 2007–December 2009.
43. “Fault Diagnostics, Prognostics, and Self-Healing Control of Navy Electric Machinery,” PI, Subcontract from Qualtech Systems Inc, CT (Contract No. N00014-06-M-0263 from Office of Naval Research STTR Topic N06-033), \$33,000, September 2006–May 2007.
44. “Online Statistical Methods for Robust State Estimation, Anomaly Detection, and Degradation Analysis in Complex Systems,” PI, X. Koutsoukos and G. Karsai, co-PIs, NASA Aeromnautics grant, \$749,868, January 2007–December 2009.
45. “The Smart Sensor Web Architecture,” co-PI, D. Schmidt, PI, subcontract from Lockheed Martin ATC, Palo ALto, CA (NASA ROSES Program), \$467,729, January 2007–December 2009.
46. “Distributed Monitoring and Diagnosis of Embedded Systems Using Hierarchical Abstractions,” co-PI, X. Koutsoukos, PI, NSF, \$270,000, July 2006–June 2009.
47. “Distributed Multi-agent Fault Diagnosis and Reconfiguration Control,” PI, subcontract from Qualtech Systems, CT, NASA SBIR, \$30,277, February 2007–December 2007.

Research Supervision

Ph.D. Theses

1. D.L. Hibler, “The Thought Experiment Method: A New Approach to Qualitative Reasoning,” January 1992.
2. X. Yu, “Multi-level Reasoning applied to Diagnosis of Complex Continuous-valued Systems,” December 1992.
3. G. Lee, “Increasing Reliability and Efficiency for Knowledge-Based Systems,” May 1994.

4. A.M. Tharpe, "A Problem-Based Curriculum in a Computerized Learning Environment for Training in the Field of Audiology," (Audiology and Speech Sciences), May 1994.
5. M. Curtin, "A Decision-making Framework for Environmentally Conscious Manufacturing," (Management of Technology, joint supervision with K. Kawamura), June 1995.
6. T. Crews, "AdventurePlayer: Macrocontexts plus Microworlds," July 1995.
7. J.B. Weinberg, "Syndromic Abstraction: A Method of Exploiting Domain Structure to Focus Abductive Reasoning in Association Based Representations," August 1996.
8. P.J. Mosterman, "Hybrid Dynamic Systems: A hybrid Bond Graph Modeling Paradigm and its Application in Diagnosis," May 1997.
9. R. Kapadia, "Model-based Support for Parametric System-Level Design Optimization," Nov. 1999.
10. C. Li, "A Bayesian Approach to Temporal Data Clustering using the Hidden Markov Model Methodology," August 2000.
11. S. Narasimhan, "Model Based Diagnosis of Hybrid Systems," July 2002.
12. E.J. Manders, "A combined statistical detection and qualitative fault isolation scheme for abrupt faults in dynamic systems," June 2003.
13. R. Dhingra, "A Streamlined LCA Approach for Conducting a Cost and Residual Risk Based Evaluation of Automobile Recycling Alternatives in the U.S., Japan, and Europe," May 2004.
14. T. Katzlberger, "Learning by Teaching Agents," December 2004.
15. K. Leelawong, "Using the Learning-by-Teaching Paradigm to Design Intelligent Learning Environments," August 2005.

M.S. Theses

1. An-chi Huang, "Segmentation of Three-dimensional Planar Surfaces from Intrinsic Images," April 1985.
2. Viddam Mohan, "Conversion and Enhancement of an Image Processing Package," May 1985.
3. V. Subramanian, "A Document Retrieval System using a Fuzzy Expert Systems Approach," August 1985.
4. Cho Hune, "Analysis of some Parallel Image Processing Algorithms," December, 1985.
5. Adithya M. Rao, "An Expert System for a Constraint Based Problem," May 1986.
6. Antang Huang, "A Knowledge Based Approach to User Assistance for the Unix Text Formatter," July 1986. (joint)
7. R. Abramczyk, "OASES: An Expert System for Operational Analysis".
8. S. Wang, "A Knowledge-based Model of an Active Assistance System for Unix," Sept. 1986. (joint)

9. C. Robinson, "A Language Based Editor for Novice Pascal Programmers," May 1987.
10. T.S. Anand, "A Rule Based Expert System Shell for Diagnosis," July 1987.
11. R. Nori, "SEDFIL: An Interactive Implementation of a Basinfill Simulation Program," September 1987.
12. H. Neelakandan, "An Active Assistance Interface for USCSH". (joint), September 1987.
13. C. Matthews, "An Intelligent Assistant for Vi," December 1987.
14. D. Hibler, "Qualitative Physics for Complex Regular Systems," November 1988.
15. X. Yu, "CHECKER: A System for Knowledge-Base Verification," May 1989.
16. E. Petty, "An Intelligent Tutor for Chess," May 1989.
17. W.J. Hagins, "Qualitative Models for Engineering Applications," May 1990.
18. J. Weinberg, "Qualitative Cardiac Models," August 1990.
19. C.J. Kee, "A Student Modeling System for ITCDD," August 1990. (joint with B. Bhuvu).
20. Qun Yang, "Conceptual Clustering and Exploratory Data Analysis," May 1991.
21. S. Manganaris, "Introducing Bond Graphs in Qualitative Reasoning about Physical Systems," June 1991.
22. K. Krishnamurthy, "Model-Based Structural Design," Summer 1991.
23. D. Ackerman, "A Knowledge-Based Systems Approach to Prison Sentence Management," December 1991.
24. T. Crews, "An Intelligent Tutor for Jasper Trip Planning Problems," August 1992.
25. R. Kapadia, "Model-based Diagnosis of Continuous-valued Systems," August 1993.
26. L. Frey, "Collaborative Learning Environments in the Jasper context," October 1994.
27. C. Li, "Conceptual Clustering with Mixed Numeric and Nominal Data," August 1995.
28. K. Leelawong, "Visual Programming Environment," May 1997.
29. Y. Wu, "Temporal Analysis of ICU Data," Sept. 1997.
30. Y. Wang, "Betty's Brain: A Computer Implementation of a Teachable Agent system," July 2001.
31. D. Eddleman, "A Framework for Distributed Garbage Collection in Java for the Visibroker Object Request Broker," July 2001.
32. J.W. Ramirez, "Developing tools for generating Matlab simulation models from Hybrid Bond Graphs," May 2003.
33. J. Lyons, "Distributed Monitoring, Control, and Physical System Modeling for a Laboratory Three-Tank System," May 2004.

34. J. Gandhe, "Distributed Diagnosis Algorithms for Complex Continuous Systems," May 2004.
35. S. Gupta, "Improvements to TCG-Based Algorithms for Hybrid Diagnosis," May 2004.
36. K. Viswanath, "Temporal Reasoning schemes applied to Concept Maps for the Betty's Brain system," August 2004.
37. B. Adebisi, "Implementing Self Regulation Strategies in the Betty's Brain System," May 2005.
38. R. Gupta, "Teaching about Dynamic Processes: A Teachable Agents Approach," May 2005.

Current Ph.D. Candidates

Indranil Roychoudhury	Jason Tan
Yanna Wu	John Kinnebrew
Matt Daigle	John Wagster
Ashraf Tantawy	Aparna Barve

Professional Societies

American Association for Artificial Intelligence	IEEE Computer Society
Sigma Xi Research Society	Association for Computing Machinery
Artificial Intelligence in Education (AI-ED)	Cognitive Science Society
Society for Computer Simulation	

Professional Activities (External)

• Editorships:

- Guest Editor, Special Issue on *Diagnosis of Complex Systems: Bridging the Gap between the FDI and DX communities*, M.O. Cordier, J. Lunze, L. Trave-Massuyes, and M. Staroswiecki, co-editors, IEEE Transactions on Systems, Man, and Cybernetics, Part B, Oct. 2005.
- Associate Editor, IEEE Transactions on Systems, Man, and Cybernetics.
- Associate Editor, IEEE Transactions on Knowledge and Data Engineering.
- Associate Editor, Applied Intelligence: The International Journal, Kluwer Academic.
- Guest Editor, Special Issue of the International Journal of Approximate Reasoning on *Belief Revision and Belief Maintenance*, 1992.

• Workshop Organization:

- Workshop Co-Chair, Subgroup Environmentally Conscious Manufacturing: The IMS Perspective, Workshop on Clean and Intelligent Manufacturing for the Process Industry, Nashville, TN, October 1993.
- Group Leader, Internal Workshop on Biorobotics, Intelligence Group, Tsukuba, Japan, May 1995.
- Program Co-chair, Principles of Diagnosis Workshop, val Morin, Canada, Oct. 1996.
- Workshop Organizer (Chair), 3rd Engineering Problems for Qualitative Reasoning Workshop, IJCAI-97, Nagoya, Japan, August 1997.

- Workshop Session Organizer (Chair), Ecometrics '98, session on Sustainability Metrics for the Electronics Industry, Lausanne, Switzerland, Jan. 20-21, 1998.
- Co-chair, AAAI Spring Symposium on Hybrid Systems and AI, Stanford, CA, March 1998.
- Program Co-chair, IEEE Intl. Conf. on Systems, Man, and Cybernetics, Nashville, TN, Oct. 2001.
- Program Chair, Fifteenth Intl. Workshop on Qualitative Reasoning, San Antonio, TX, May 2001.
- Program Chair, 18th International Workshop on Principles of Diagnosis, Nashville, TN, 2007.