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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.

Publication Statistics

- Google h-index: 39 (i10 index: 176); Total citations: 6870.

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. Bhuva, "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. Bhuvra, "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.
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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.
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31. A. Saad, G. Biswas, and K. Kawamura, "Performance Evaluation of Contract Net Based Heterarchical 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.
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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.
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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.
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61. K. Blair, D. Schwartz, G. Biswas, and K. Leelawong, "Pedagogical Agents for Learning by Teaching: Teachable Agents," *Special issue of Educational Technology on "Pedagogical Agents"*, vol. 47, no. 1, pp. 56-61, January 2007.

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63. S. Narasimhan and G. Biswas, "Model-based Diagnosis of Hybrid Systems," *IEEE Trans. on Systems, Man, and Cybernetics, Part A*, vol. 37, no. 3, pp. 348–361, May 2007.
64. S.D. Pathak, D.M. Dilts, and G. Biswas, "On the Evolutionary Dynamics of Supply Network Topologies," *IEEE Transactions on Engineering Management*, vol. 54, no. 4, pp. 662-672, November 2007.
65. K. Leelawong and G. Biswas, "Designing Learning by Teaching Agents: The Betty's Brain System," *International Journal of Artificial Intelligence in Education*, vol. 18, no. 3, pp. 181–208, 2008.
66. G. Biswas and X. Koutsoukos, "Report of the Eighteenth International Workshop on Principles of Diagnosis," *Artificial Intelligence Magazine*, pp. 95-97, Spring 2008.
67. I. Roychoudhury, M. Daigle, G. Biswas, and X. Koutsoukos, "An Efficient Method for Simulating Complex Systems with Switching Behaviors Using Hybrid Bond Graphs," *Simulation News Europe*, October 2008.
68. I. Roychoudhury, G. Biswas, and X. Koutsoukos, "Designing Distributed Diagnosers for Continuous Systems," *IEEE Transactions on Automation Science and Engineering*, vol. 6, no. 2, pp. 277–290, April 2009.
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To Appear

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307. Basu, S., Dickes, A., Kinnebrew, J.S., Sengupta, P., and Biswas, G. "CTSiM: A Computational Thinking Environment for Learning Science through Simulation and Modeling," *The 5th International Conference on Computer Supported Education*, Aachen, Germany,
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309. Biswas, G., Segedy, J.R., and Kinnebrew, J.S., "Smart Open-Ended Learning Environments that Support Learners Cognitive and Metacognitive Processes," *Proceedings of the 1st IEEE International Conference on Human Factors in Computing and Informatics*, Maribor, Slovenia, 2013.
310. Dukeman, A., Caglar, F., Shekhar, S., Kinnebrew, J., Biswas, G., Fisher, D., and Gokhale, A., "Teaching Computational Thinking Skills in C3STEM with Traffic Simulation," *Proceedings of the 1st IEEE International Conference on Human Factors in Computing and Informatics*, Maribor, Slovenia, 2013.
311. Gokhale, A., Biswas, G., Sarkar, N., Sastry, S., and Branicky, M. "CPS Laboratory-as-a-Service: Enabling Technology for Readily Accessible and Scalable CPS Education," *Proceedings of the First Workshop on Cyber-Physical Systems Education (CPS-Ed 2013) at Cyber Physical Systems Week*, Philadelphia, Pennsylvania, USA, 2013.
312. Basu, S., Dickes, A., Kinnebrew, J.S., Sengupta, P., and Biswas, G. "CTSiM: A Computational Thinking Environment for Learning Science through Simulation and Modeling," *Proceedings of the 5th International Conference on Computer Supported Education*, pp. 369-378, Aachen, Germany, 2013.
313. Levin, D. T., Adams, J. A., Saylor, M. M., and Biswas, G. "A transition model for cognitions about agency," *Proceedings of the 8th ACM/IEEE international conference on Human-robot interaction*, pp. 373-380, IEEE Press, March 2013.
314. Biswas, G., Kinnebrew, J.S., and Mack, D.L.C. "How do students' learning behaviors evolve in scaffolded open-ended learning environments?" *Proceedings of the 21st International Conference on Computers in Education*, Bali, Indonesia, 2013. (**Recipient of the Best Paper Award**)
315. Biswas, G., Kinnebrew, J.S., and Segedy, J.R. "Analyzing Students' Metacognitive Strategies in Open-Ended Learning Environments," *Proceedings of the 35th annual meeting of the Cognitive Science Society*, Berlin, Germany, 2013.

316. Biswas, G., Segedy, J.R., and Kinnebrew, J.S. "Smart Open-Ended Learning Environments that Support Learners' Cognitive and Metacognitive Processes," *Proceedings of the 1st IEEE International Conference on Human Factors in Computing and Informatics*, Maribor, Slovenia, 2013.
317. Dickes, A., Sengupta, P., Krishnan, G., and Basu, S. "Thinking Like a Butterfly: Leveraging Students' Embodied Intuitions in Elementary Ecology Classrooms," *Annual Conference of the National Association of Research on Science Teaching (NARST 2013)*, Rio Grande, Puerto Rico, 2013.
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319. Gokhale, A., Biswas, G., Sarkar, N., Sastry, S., and Branicky, M. "CPS Laboratory-as-a-Service: Enabling Technology for Readily Accessible and Scalable CPS Education," *Proceedings of the First Workshop on Cyber-Physical Systems Education*, (CPS-Ed 2013) at Cyber Physical Systems Week. Philadelphia, Pennsylvania, USA, 2013.
320. Kinnebrew, J.S., Mack, D.L.C., and Biswas, G. "Mining Temporally-Interesting Learning Behavior Patterns," *Proceedings of the 6th International Conference on Educational Data Mining*, Memphis, TN, USA, 2013.
321. Mendiburo, M., Williams, L., Segedy, J.R., and Hasselbring, T. "Towards Automated Support for Small-Group Instruction: Using Data from an ITS to Automatically Group Students," *Proceedings of the Fall 2013 Conference of the Society for Research on Educational Effectiveness*, Washington, D.C., 2013.
322. Mendiburo, M., Williams, L., Segedy, J.R., Wright, M., Biswas, G., and Hasselbring, T. "An Investigation of the Effect of Competition on the Way Students Engage in Game-Based Deliberate Practice," *Proceedings of the 13th IEEE International Conference on Advanced Learning Technologies*, pp. 102-106, Beijing, China, 2013.
323. Segedy, J.R., Biswas, G., Blackstock, E.F., and Jenkins, A. "Guided Skill Practice as an Adaptive Scaffolding Strategy in Open-Ended Learning Environments," *Proceedings of the 16th International Conference on Artificial Intelligence in Education*, Memphis, TN, USA, 2013.
324. Segedy, J.R., Loretz, K.M., and Biswas, G. "Model-Driven Assessment of Learners in an Open-Ended Learning Environment," *Proceedings of the Third International Conference on Learning Analytics and Knowledge*, pp. 200-204, New York, NY: ACM, 2013.
325. Segedy, J.R., Loretz, K.M., and Biswas, G. "Suggest-Assert-Modify: A Taxonomy of Adaptive Scaffolds in Computer-Based Learning Environments," *Proceedings of the Workshop on Scaffolding in Open-Ended Learning Environments*, held at the 16th International Conference on Artificial Intelligence in Education. Memphis, TN, 2013.
326. Dong, Y. and G. Biswas, "Comparison of Sensor Placement Algorithms," *24th International Workshop on Principles of Diagnosis*, A. Feldman, M. Kalech, and G. Provan, eds., Jerusalem, Israel, pp. 53-58, October 2013.

327. Khorasgani, H., Kulkarni, C., Biswas, G., Celaya, J.R., and Goebel, K., "Degradation Modeling and Remaining Useful Life Prediction of Electrolytic Capacitors under Thermal Overstress Condition Using Particle Filters," *Annual Conference of the Prognostics and Health Management Society*, New Orleans, LA, October 2013.
328. Carl, J. D., Lattmann, Z., and Biswas, G. "Modeling and Simulation Semantics for Building Large-Scale Multi-Domain Embedded Systems," *27th European Conference on Modelling and Simulation*, (ECMS 2013), Aalesund, Norway. May 2013.
329. Roychoudhury, I., Daigle, M., Bregon, A., and Pulido, B. "A structural model decomposition framework for systems health management," *IEEE Aerospace Conference*, (pp. 1-12). Big Sky, MT. March 2013.
330. Alonso, N. M., Bregon, A., Alonso-Gonzalez, C. J., and Pulido, B. "A Common Framework for Fault Diagnosis of Parametric and Discrete Faults Using Possible Conflicts," *Advances in Artificial Intelligence*, (pp. 239-249). Springer Berlin Heidelberg, 2013.
331. Basu, S., Kinnebrew, J., and Biswas, G. "Assessing student performance in a computational-thinking based science learning environment," *Proceedings of the 12th International Conference on Intelligent Tutoring Systems*, pp. 476-481, Honolulu, HI, USA: Springer International Publishing, June 2014.
332. Biswas, G., Kinnebrew, J.S., and Segedy, J.R., "Using a Cognitive/Metacognitive Task Model to analyze Students Learning Behaviors," *Proceedings of the 16th International Conference on Human-Computer Interaction*, Creta Maris, Heraklion, Crete, Greece, June 2014.
333. Basu, S., Dukeman, A., Kinnebrew, J., Biswas, G., and Sengupta, P. "Investigating student generated computational models of science," *Proceedings of the 11th International Conference of the Learning Sciences*, pp. 1097-1101, Boulder, CO, USA, July 2014.
334. Dukeman, A., Shekhar, S., Caglar, F., Gokhale, A., Biswas, G., and Kinnebrew, J.S. "Analyzing Students Computational Models as they Learn in STEM Disciplines," *121st American Society for Engineering Education Annual Conference and Exposition*, Indianapolis, IN, 2014.
335. Shekhar, S., Caglar, F., Dukeman, A., Hou, L., Gokhale, A., Kinnebrew, J.S., and Biswas, G. "A Collaborative K-12 STEM Education Framework Using Traffic Flow as a Real-world Challenge Problem," *121st American Society for Engineering Education Annual Conference and Exposition*, Indianapolis, IN, 2014.
336. Khorasgani, H., D. Eriksson, G. Biswas, E. Frisk, and M. Krysander. "Off-line Robust Residual Selection Using Sensitivity Analysis," *25th International Workshop on Principles of Diagnosis, DX-2014*, Graz, Austria, 2014.
337. Carl, J. D., Biswas, G., Neema, S., and Bapty, T. "An Approach to Parallelizing the Simulation of Complicated Modelica Models," *2014 Summer Computer Simulation Conference (SCSC 14)*, Monterey, CA, July 2014.
338. G. Zhou, W. Feng, G. Biswas, W. Zhang, and X. Guan, "A Comparison of State Estimation Algorithms for Hybrid Systems," *29th European Conference on Modelling and Simulation (ECMS)*, pp. 312-319, Albena (Varna), Bulgaria, May 2015.

339. Basu, S., Kinnebrew, J.S., Shekhar, S., Calgar, F., Rafi, T.H., Biswas, G., and Gokhale, A. "Collaborative Problem Solving using a Cloud-based Infrastructure to Support High school STEM Education," *Proceedings of the 122nd ASEE Annual Conference and Exposition*, Seattle, WA, USA, June 2015.
340. Segedy, J. R., Kinnebrew, J. S., Goldberg, B. S., Sottolare, R. A., and Biswas, G., "Using GIFT to Model and Support Students Metacognition in the UrbanSim Open-Ended Learning Environment, In *Generalized Intelligent Framework for Tutoring (GIFT) Users Symposium (GIFTSym3)* (pp. 13), June 2015.
341. Kinnebrew, J.S., Gauch, B., Segedy, J.R., and Biswas, G. "Studying Student use of Self-Regulated Learning Tools in an Open-Ended Learning Environment," *Proceedings of the 17th International Conference on Artificial Intelligence in Education*, Madrid, Spain, Lecture Notes in Computer Science Volume 9112, 2015, pp. 185-194, June 2015.
342. Segedy, J.R., Kinnebrew, J.S., and Biswas, G. "Coherence Over Time: Understanding Day-to-Day Changes in Students' Open-Ended Problem Solving Behaviors," *Proceedings of the 17th International Conference on Artificial Intelligence in Education*, Madrid, Spain. Lecture Notes in Computer Science Volume 9112, 2015, pp 449-458, June 2015.
343. Ye, C., Kinnebrew, J.S., Segedy, J.R., and Biswas, G. "Learning Behavior Characterization with Multi-Feature, Hierarchical Activity Sequences," *Proceedings of the 8th International Conference of Educational Data Mining*, Madrid, Spain, June 2015.
344. Segedy, J. R., Kinnebrew, J. S., and Biswas, G., "Using GIFT to Support Students Understanding of the UrbanSim Counter Insurgency Simulation," *Workshop on Developing a Generalized Intelligent Framework for Tutoring (GIFT): Informing Design through a Community of Practice*, (pp. 54), June 2015.
345. Segedy, J. R., Kinnebrew, J. S., Goldberg, B. S., Sottolare, R. A., and Biswas, G. "Designing Representations and Support for Metacognition," *Generalized Intelligent Framework for Tutoring*. In Foundations of Augmented Cognition, *Proceedings of the 17th International Conference on Human-Computer Interaction*, pp. 663-674, Los Angeles, CA, USA, August 2015.
346. G. Zhou, G. Biswas, W. Feng, and X. Guan, "A Bayesian Framework for Fault diagnosis of Hybrid Linear Systems," *Proceedings of the 26th International Workshop on Principles of Diagnosis (DX-2015)*, pp. 27-34, Paris, France, September 2015.
347. H. Khorasgani, G. Biswas, and D. Jung, "Minimal Structurally Overdetermined Sets Selection for Distributed Fault Detection," *Proceedings of the 26th International Workshop on Principles of Diagnosis (DX-2015)*, pp. 75-82, Paris, France, September 2015.
348. O. Niggemann, G. Biswas, J. Kinnebrew, H. Khorasgani, S. Volgmann, and A. Bunte, "Data-Driven Monitoring of Cyber-Physical Systems Leveraging on Big Data and the Internet-of-Things for Diagnosis and Control," *Proceedings of the 26th International Workshop on Principles of Diagnosis (DX-2015)*, pp. 185-192, Paris, France, September 2015.
349. G. Zhou, G. Biswas, and W. Feng, "A Comprehensive Diagnosis of Hybrid Systems for Discrete and Parametric Faults Using Hybrid I/O Automata," *Proceedings of the 9th IFAC Symposium on Fault Detection Supervision and Safety of Technical Processes (IFAC Safeprocess)*, 48(21): pp. 143-149, Paris, France, September 2015.

350. H. Khorasgani, D. Jung, and G. Biswas, "Structural Approach for Distributed Fault Detection and Isolation," *Proceedings of the 9th IFAC Symposium on Fault Detection Supervision and Safety of Technical Processes (IFAC Safeprocess)*, 48(21), pp. 72-77, September 2015.
351. D. Jung, H. Khorasgani, E. Frisk, M. Krysander, and G. Biswas, "Analysis of fault isolation assumptions when comparing model-based design approaches of diagnosis systems," *Proceedings of the 9th IFAC Symposium on Fault Detection Supervision and Safety of Technical Processes (IFAC Safeprocess)*, 48(21): pp. 1289-1296, September 2015.
352. G. Zhou, G. Biswas, W. Feng, and X. Guan, "Online Monitoring and Fault Diagnosis of Hybrid Systems Using Switched Dynamic Bayesian Networks," *Proceedings of the Annual Conference of the Prognostics and Health Management Society (Annual PHM)*, pp. 186-196, Coronado Island, CA, October 2015.
353. Basu, S., Biswas, G., Kinnebrew, J., and Rafi, T. "Relations between modeling behavior and learning in a Computational Thinking based science learning environment," *Proceedings of the 23rd International Conference on Computers in Education (In Ogata, H. et al. (Ed.),)*, pp. 184-189. China: Asia-Pacific Society for Computers in Education, December 2015.

Recent Awards

- NASA 2011 Aeronautics Research Mission Directorate Technology and Innovation Group Award for Vehicle Level Reasoning System and Data Mining methods to improve aircraft diagnostic and prognostic systems
Awarded to Honeywell and Vanderbilt researchers (Biswas, Koutsoukos, and Mack) for their project on VIPR: Vehicle Integrated Prognostics Reasoner.
- IEEE Fellow, 2014

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.
- “Teachable Agents and the Role of Metacognitive Support in Learning by Teaching Environments,” *University of Memphis Cognitive Science Seminar Series*, March 2007.
- “Issues in Efficient Simulation of Component-Oriented Hybrid System Models,” *2007 Summer Simulation Conference; Special Track on Computational Modeling and Simulation of Embedded Systems*, San Diego, CA, July 2007.
- “Building Students’ Metacognitive Skills through Interactions with Computer-based Teachable Agents,” *2008 IES Research Conference*, Washington, D.C., June 11, 2008.
- “A Learning by Teaching Approach to Help Students Develop Self-Regulatory Learning Skills in Middle School Science Classrooms,” *Enhancing Learning Using Adaptive Computerized Tutoring in K-12 Settings symposium*, 30th Annual Meeting of the Cognitive Science Society, Washington, D.C., July 2008.
- “Model-based Diagnosis of Hybrid Systems,” *Tutorial Presented at International Conference on Prognostics and Health Management*, Denver, Colorado, October 2008.
- “Towards Intelligent Embedded Systems: Hybrid Modeling, Diagnosis, and Fault-Adaptive Control,” *Ecole Polytechnic*, Lille, France, June 18, 2009.
- “Robust Distributed Diagnosis of Complex Systems using Dynamic Bayes Nets,” *University of Valladolid*, Spain, June 28 2009.

- “Self-Cognitive Capability for Anomaly Detection, Fault Analysis, and Prognosis,” *Center for Advanced Life Cycle Engineering, University of Maryland, College Park, MD*, November 5, 2009.
- “Promoting Self-Regulated Learning Skills through Social Interactions in Agent-Based Environments,” *Theme-Based Invited Talk (DIGITEL) at 17th Intl. Conf. on Computers in Education*, Hong Kong, China, Nov. 30-Dec. 4, 2009.
- “Choice-Adaptive Intelligent Learning Environments (CAILE),” *Renowned Researcher Talk at Interactive Event: Applications of Virtual Agents, Student Modeling, and Knowledge Engineering in Education*, 17th Intl. Conf. on Computers in Education, Hong Kong, China, Nov. 30-Dec. 4, 2009.
- “Robust Distributed Diagnosis of Complex Systems using Dynamic Bayes Nets,” *Linköping University*, Linköping, Sweden, December 16, 2009.
- “Robust and Efficient Model-based Methods for FDI in Physical Systems,” *Scania Research Labs*, Stockholm, Sweden, December 20, 2009.
- “Cross-Exchanges between Mobile and Game-Based Learning,” *Third International Conference on Digital Games and Toy-Enhanced Learning*, Kaohsiung, Taiwan, April 2010.
- “Modeling and Measuring Self-Regulated Learning Skills in Teachable Agent Environments,” *AAAI Fall Symposium FS-02 on Cognitive and Metacognitive Educational Systems (MCES)*, Arlington, VA, Nov. 2010.
- “Robust Model-based Diagnosis of Dynamic Systems,” *23rd Australasian Joint Conference on Artificial Intelligence*, Adelaide, Australia, December 2010.
- “Research Panel on Height of Graduate Students,” *18th Intl. Conf. on Computers in Education*, Putrajaya, Malaysia, November 2010.
- “Robust, Distributed Diagnosis of Complex Systems using Dynamic Bayes Nets,” *Honeywell Technical Center*, Minneapolis, MN, February 11, 2010.
- “Self-Cognitive Capability for Anomaly Detection, Fault Analysis, and Prognosis,” *Center for Advanced Life Cycle Engineering, University of Maryland, College Park, MD*, November 5, 2010.
- “Advances in PHM, Anomaly Detection, Fault Analysis and Prognosis,” *IEEE Prognostics and Health Management Conference*, Shenzhen, China, May 2011.
- “Data Mining for Diagnosis,” *Annual Conference of the Prognostics and Health Management Society - PHM 2011*, Montreal, Canada, September 2011. Invited Tutorial.
- “Educational Data Mining,” *Institute of Education Sciences (IES) Technical Working Group Meeting on Educational Data Mining*, SRI International, September 2011.
- “Data Mining for Anomaly Detection and Diagnosis: A Case Study,” *22nd Intl. Workshop on Principles of Diagnosis (DX-2011)*, Murnau, Germany, October 2011.
- “Game-Based and Toy-Enhanced Learning: Research Challenges,” *Height of Graduate Students Mini-symposium, 19th International Conference on Computers in Education*, Chiang Mai, Thailand, December 2011.

- “Using Conversational Agents in Learning by Teaching Environments to Promote Metacognition in Middle School Science Classrooms,” *National Tainan University, Tainan, Taiwan, National Central University, Jhongli, Taiwan*, May 2012.
- “Data Mining Methods to Support Real World Diagnostics and Prognostics,” *2012 Prognostics and System Health Management Conference (PHM 2012)*, Beijing, China, May 2012.
- “A Model-Based Approach to Prognostics of Electronic Capacitors: Accelerated Experiments for Electrical and Thermal Overstress Conditions,” *GE Tech Center, Bangalore, India*, July 17, 2012.
- “Educating Our Students through Games,” *CGAMES Conference*, Louisville, KY, August-Sept. 2012.
- “Open-ended Environments That Help Middle School Students Develop Metacognitive Strategies for Learning Science,” *University of Pittsburgh Learning Research and Development Center (LRDC) 50th Anniversary Distinguished Speaker Series*, Pittsburgh, PA, April 4, 2013.
- “Metacognition and Self-Regulation,” *ARL GIFT User Meeting*, Memphis, TN, July 13, 2013.
- “Betty’s Brain: Helping Middle School Students Develop Metacognitive Strategies for Learning Science,” *American Psychological Association, Division 3 (Experimental Psychology) Symposium on Technological Innovations in Education*, Honolulu, Hawaii, August 2013.
- “Case Studies in Qualitative Modeling and Reasoning,” *QR 2013 - 27th Qualitative Reasoning Workshop*, Schloss Etelsen, Bremen, Germany, Aug. 27-30, 2013.
- “Model-based Diagnosis - Where Are We? And Where Do We Go from Here?” Panel Discussion at *International Workshop on Principles of Diagnosis*, Graz, Austria, September 2015.
- “Analyzing Students’ Learning Behaviors in Open Ended Learning Environments (OELEs),” Cognitive Science Invited Speaker Series, Department of Philosophy, The Faculties of Humanities and Theology, Lund University, Sweden. October 21, 2015.
- “CTSiM: A Computational Thinking Environment for Learning Science using Simulation and Modeling,” Sixth International Conference to review research on Science, Technology and Math Education (epiSTEME 6), Mumbai, India, December 15-18, 2015.

Research Proposals

Funded Research

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. Bhuvu, 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 2010.
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 2010.
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–September 2010.
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–February 2010.
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.
48. “Model-Based Condition Monitoring and Diagnosis of Nuclear Power Plants,” *Vanderbilt Innovations Office Grant Program*, \$4,000., November 2007 - February 2008.
49. “Postdoctoral Training: Rigorous Research Methods in the Learning Sciences,” Department of Education, Institute for Educational Sciences, co-PI, P. Cobb, PI, co-PIs B. Rittle-Johnson, T. Smith, \$732,956, June 2008 - May 2012.
50. “Integrated Ground Support System for Launch Operations,” NASA STTR Phase 2 (subcontractor to Qualtech Systems, Inc., \$179,992, Sept. 2008 - May. 2011.

51. "Assisting and Assessing Middle School Science Learning in Formal and Informal Settings," *National Science Foundation (REESE grant)*, PI, \$467,355, January 2007 - December 2010. (collaborative proposal with Daniel Schwartz, Stanford University).
52. "Avionics Diagnostics and Prognostics Using Bond Graphs," PI, *NASA Aeronautics Program*, \$175,000, February 2008 - January 2011.
53. "Vehicle Integrated Prognostics Reasoner (VIPR)," PI, co-PI: Xenofon Koutsoukos, *NASA Aeronautics Program*, (subcontractor to Honeywell Labs), \$366,804, December 2009 - November 2012.
54. "Dependability and Risks Assessment Frameworks Tool Sets(DRAFTS): Stage 2: Integrating Function and Behavior," PI, *Airbus Industries, UK*, \$70,719, June 2010 - June 2011.
55. "HCC: Medium: Collaborative Research: Formal Analysis of Choice-Adaptive Intelligent Learning Environments (FACILE) that support Future Learning," PI, *NSF HCC Program*, \$681,541, August 2009 - July 2012. (collaborative with Daniel Schwarz, Stanford University).
56. "Distributed Diagnosis, Prognosis and Recovery for Complex Systems," PI, *ONR STTR Program*, \$17,000, February 2010 - January 2011.
57. "Dynamic Physical/Data-Driven Models for System-Level Prognostics and Health Management," PI, *NASA STTR Program*, \$49,960, August 2010 - June 2011.
58. "Developing and Evaluating a Technology-Based Fractions Intervention Program for Low-Achieving and At-Risk Students," co-PI (Ted Hasselbring, PI), *Department of Education Educational technology Program*, \$1,499,862, October 2010-September 2013.
59. "CTSiM: Fostering Computational Thinking in Middle Schools through Scientific Modeling and Simulation," PI, *NSF Cyberlearning Program*, \$550,279.00, September 2011 - August 2013.
60. "SimSelf: A simulation environment designed to model and scaffold learners' self-regulatory skills to optimize complex science learning," PI, Cognition and Student Learning, Institute for Educational Science, \$1,218,424, June 2012-May 2015.
61. "C3STEM: Enabling Community-Situated, Challenge-based, Collaborative STEM Education Using Broadband Cyber Infrastructure," PI, NSF EAGER, \$297,350, October 2012-September 2014.
62. **"Extending CTSiM: An Adaptive Computational Thinking Environment for Learning Science through Modeling and Simulation in Middle School Classrooms," PI, NSF CISE Cyberlearning Program, \$1,348,412, Oct. 2014 to Sept. 2017.**
63. **"Developing a Metacognitive Tutor within the GIFT Framework," PI, Army Research Labs, Adelphi Human Research, \$473,971, May 2014 to April 2017**
64. **"Enhancing Games with Assessment and Metacognitive Emphases (EGAME)," co-PI, NSF EHR program, \$3,149,239, Sept. 2011 to May 2016.**
65. **"Beyond Fault Diagnosis and Failure Prognosis Fault Tolerant Control of Aerospace Systems," PI, Air Force SBIR Program/Global Tech Inc, Atlanta, GA, \$168,726, Oct. 2015-Sept. 2017**

66. “**Diagnosis-Driven Prognosis for Decision Making,**” NASA/Qualtech Systems, Rocky Hill, CT, \$189,085, June 2015 to May 2017
67. “**Infrastructure and Analytics for Data Intensive Research in Open-Ended Learning Environments (OELEs),**” PI, National Science Foundation CISE EAGER, \$299,983, Sept. 2015 to Aug. 2017
68. “**Cloud Computing and Software Defined Networking Enhancements to Support Collaborative and Interactive STEM Education,**” co-PI, National Science Foundation US Ignite Program, \$357,711, Sept. 2015 to Aug. 2017
69. “**Information Saliency,**” PI, Office of Naval Research STTR Program Phase 2/DiscernTek, \$390,000, Sept. 2015 to Aug. 2017
70. “**Prognostic Scheduling,** PI, Air Force Research Labs/Global Tech, Inc., Atlanta, GA, \$20,125, Sept. 2015 to Aug. 2016.

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.
16. I. Roychoudhury, "Distributed Diagnosis of Continuous Systems: Global Diagnosis through Local Analysis," August 2009.
17. J. Kinnebrew, "Global Sensor Web Coordination and Control Using Multi-Agent systems," August 2010.
18. C. Kulkarni, "A Physics-Based Degradation Modeling Framework for Diagnostic and Prognostic Studies in Electrolytic Capacitors," December 2012.
19. D. Mack, "Anomaly Detection from Complex Temporal Sequences in Large Data," May 2013.
20. J. Segedy, "Adaptive Scaffolds in Open-Ended Computer-Based Learning Environments," June 2014.
21. J. Carl, "High Performance Numerical Simulations to Support System Level Design," December 2015.

Current Ph.D. Candidates

Satabdi Basu
 Yi Dong
 Ningyu Zhang

Hamed Khorasgani
 Brian Gauch
 Davut Disci

Professional Societies

Association for Advancement of Artificial Intelligence	IEEE Computer Society
Sigma Xi Research Society	Association for Computing Machinery
Artificial Intelligence in Education (AI-ED)	International Society for the Learning Sciences
Society for Computer Simulation	American Society for Engineering Education
Asia Pacific Society for Computers in Education	

Professional Activities (External)

- **Editorships:**

- Guest Editor, Special Issue on *Learning Systems for Science and Technology Education*, B. Bredeweg and B. McLaren, IEEE Transactions on Learning Technologies, 2013.
- Guest Editor, Special Issue on *Model-based Diagnosis: Facing Challenges in Real-world Applications*, P. Struss, G. Provan, J. de Kleer, co-editors, IEEE Transactions on Systems, Man, and Cybernetics, Part A, June 2010.
- 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 - Systems.
- Associate Editor, IEEE Transactions on Learning Technologies.
- Associate Editor, Intl. Journal of Prognostics and Health Management
- Associate Editor, International Journal of Educational Data Mining
- Editorial Board, Educational Technology and Society Journal.
- Editorial Board, Journal of Metacognition and Learning
- Editorial Board, International Journal of Smart Learning Environments
- Associate Editor, IEEE Transactions on Knowledge and Data Engineering. (past)
- Associate Editor, Applied Intelligence: The International Journal, Kluwer Academic. (past)
- 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.