

## CURRICULUM VITAE

Lawrence B. Holder, Ph.D.

Professor

School of Electrical Engineering and Computer Science

Washington State University

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### Research Interests

Artificial Intelligence, Machine Learning, Data Mining, Graph Theory, Algorithms, Security and Bioinformatics.

### Academic Degrees

- Doctor of Philosophy (1991) in Computer Science with emphasis in Artificial Intelligence, University of Illinois at Urbana-Champaign. Thesis entitled “Maintaining the Utility of Learned Knowledge Using Model-Based Adaptive Control.” Thesis advisor: Larry Rendell.
- Master of Science (1988) in Computer Science, University of Illinois at Urbana-Champaign. Thesis entitled “Discovering Substructure in Examples.” Thesis advisor: Robert E. Stepp.
- Bachelor of Science with Honors (1986) in Computer Engineering, University of Illinois at Urbana-Champaign.

### Professional Experience

- 2016-present: Owner and Founder, Adaptelligence LLC.
- 2013-present: Director, Smart Environments Research Center, Washington State University.
- 2006–present: Professor in the School of Electrical Engineering and Computer Science, Washington State University.
- 2004–2006: Professor in the Department of Computer Science and Engineering, University of Texas at Arlington.
- 1997–2004: Associate Professor in the Department of Computer Science and Engineering, University of Texas at Arlington.
- 1999–2000: Associate Chair in the Department of Computer Science and Engineering, University of Texas at Arlington.
- 1991–1997: Assistant Professor in the Department of Computer Science and Engineering, University of Texas at Arlington.
- 1989–1991: Research Assistant on the Construction Management Team, U.S. Army Construction Engineering Research Lab, Champaign, Illinois. Design and development of an intelligent natural language interface to an Army construction database.
- 1988–1989: Teaching Assistant for *Pattern Recognition and Machine Learning*, *Computer Inference and Knowledge Acquisition*, and *Introduction to Artificial Intelligence* courses, Department of Computer Science, University of Illinois at Urbana–Champaign.

- 1986–1988: Research Assistant for Dr. Robert E. Stepp in the area of artificial intelligence and machine learning, Department of Computer Science, University of Illinois at Urbana–Champaign.
- 1984–1988: Programming Consultant for Computing Services Office, University of Illinois at Urbana–Champaign.

### **Teaching (Washington State University)**

- Artificial Intelligence
- Machine Learning (designed course)
- Advanced Data Structures
- Gerontechnology
- Mobile Application Development (designed course)

### **Teaching (UT Arlington)**

- Intelligent Environments (designed course)
- Computer System Design Project I and II
- Machine Learning (designed course)
- Artificial Intelligence I
- Artificial Intelligence II
- Algorithms and Data Structures
- Design and Analysis of Algorithms
- Short Course: Intermediate UNIX (designed course)

### **Professional Service**

#### Conference Chairs/Co-Chairs:

- Co-Chair, Florida Artificial Intelligence Research Society Conference, 2005.

#### Workshop Chairs/Co-Chairs:

- Co-Chair with Maleq Khan and Christine Klymko, SIAM Data Mining Conference, Workshop on Mining Networks and Graphs, 2015 and 2016.
- Co-Chair with Sumi Helal, IEEE PerCom Workshop on Smart Environments, 2015.
- Co-Chair with Xifeng Yan, IEEE International Conference on Data Mining, Workshop on Mining Graphs and Complex Structures, 2007.
- Co-Chair with Mohan Kumar and Raffaele Bruno, Mobile Ad-hoc Sensors and Systems (MASS) Workshop on MASS for Global and Homeland Security, 2007.
- Co-Chair with Zdravko Markov, Florida Artificial Intelligence Research Society Conference, Special Track on Machine Learning, 2004-2008.

#### Contest Chairs/Co-Chairs:

- Co-Chair with Ashok Srivastava, IEEE International Conference on Data Mining Contest, 2011.

#### Journal Editorial Boards:

- *Knowledge and Information Systems (KAIS)*, Springer, since 2017.

- *IEEE Transactions on Knowledge and Data Engineering (TKDE)*, since 2014.
- *Computing*, Springer, since 2013
- *International Journal of Social Network Mining*, InderScience Publishers, since 2010.
- *Intelligent Data Analysis*, IOS Press, since 2005.

Member:

- Association for the Advancement of Artificial Intelligence (AAAI), since 1990
- Association for Computing Machinery (ACM), *Senior Member* since 2008
- Institute of Electrical and Electronic Engineers (IEEE) Computer Society, *Senior Member* since 2009

Program committee member for numerous conferences; reviewer for numerous journals and funding agencies.

**Awards**

- *Douglas D. Dankel II Award for service to the Florida AI Research Society*, 2016.
- *Research Excellence Award*, Univ. of Texas at Arlington, 2005, 2006.
- *Outstanding Research Achievement*, Univ. of Texas at Arlington, 2005.
- *Academy of Distinguished Teachers*, Univ. of Texas at Arlington, 2002.
- Algorithms and Data Structures course website, Lightspan's StudyWeb One of the Best Educational Resources on the Web, 2001.
- *Chancellor's Council Award for Excellence in Teaching*, Univ. Texas at Arlington, 2000.
- *Outstanding Young Faculty Award*, Univ. Texas Arlington, College of Engineering, 2000.
- *Teaching Excellence Award*, Univ. of Texas at Arlington, College of Engineering, 1999.

**University Service (Washington State University)**

School of EECS

- Director, Smart Environments Research Center (2014-present)
- Teaching Excellence Committee (Chair, 2007-2015)
- Graduate Studies Committee (2009-present)
- Computer Science Curriculum Committee (2006-present)
- Faculty Advisor, ACM Student Chapter (2006-present)

University

- Economic Development Council (2017-present)
- Faculty Senate (2008-2015)
- High-Performance Computing Committee (2011-2015)

**University Service (UT Arlington)**

CSE Department Administration: Associate Chair (1999-2000)

CSE Department Committees

- Undergraduate Studies Committee (1992 - 2006, Chair 1999 - 2006)

- Faculty Recruiting Committee (1999 - 2006, Chair 1999 - 2000)
- Tenure and Promotion Committee (1997 - 2006)
- Graduate Studies Committee (1991 - 2006)

#### CSE Department Faculty Advisor

- UTA Student Programming Team (1995 - 2000)
- ACM and IEEE Computer Society Student Chapter (1994 - 2000)
- Undergraduate Honors Program in Parallel Processing (1995 - 1999)

#### College of Engineering Committees

- Undergraduate Curriculum Committee (1999 - 2006)
- Various awards, scholarships and grade dispute committees

#### UTA University Committees

- Committee on Research Integrity (2005 - 2006)
- University Teaching Awards Committee (2002 - 2006, Chair 2004 - 2006)

## Publications (227)

H-Index [Google Scholar, 2/3/2018]: 33

Lifetime citation count [Google Scholar, 2/3/2018]: 4,957

Total citations for 2017 [Google Scholar, 2/3/2018]: 353

## Books (2)

1. D. Cook and L. Holder (Editors), *Mining Graph Data*, John Wiley & Sons, December 2006.
2. S. Bandyopadhyay, U. Maulik, L. Holder and D. Cook (Editors), *Advanced Methods for Knowledge Discovery from Complex Data*, Springer, September 2005.

## Book Chapters (11)

1. D. Cook and L. Holder, "Sensor Selection to Support Practical Use of Health-Monitoring Smart Environments," In *Ambient Intelligence and Smart Environments*, IOS Press, 2012.
2. C. You, L. Holder and D. Cook, "Substructure Analysis of Metabolic Pathways by Graph-based Relational Learning," In A. Sidhu and T. Dillon (Editors) *Biomedical Data and Applications*, Springer, September 2009.
3. W. Eberle, L. Holder and D. Cook, "Identifying Threats Using Graph-Based Anomaly Detection," in J. Tsai and P. Yu (Editors), *Machine Learning in Cyber Trust*, Springer, May 2009.
4. L. Holder and D. Cook, "Graph-based Data Mining." In J. Wang (ed.) *Encyclopedia of Data Warehousing and Mining, Second Edition*, Idea Group Publishing, 2009. Also appears in 2006 first edition.
5. J. Potts, D. Cook, and L. Holder, "Learning from Supervised Graphs," *Applied Graph Theory in Computer Vision and Pattern Recognition* (M. Last, A. Kandel, and H. Bunke, editors), Wiley, 2007.
6. D. Cook, L. Holder and N. Ketkar, "Unsupervised and Supervised Pattern Learning in Graph Data," in D. Cook and L. Holder (Editors), *Mining Graph Data*, John Wiley & Sons, December 2006.
7. D. Cook, L. Holder, J. Coble and J. Potts, "Graph-based Mining of Complex Data," in S. Bandyopadhyay, U. Maulik, L. Holder and D. Cook (Editors), *Advanced Methods for Knowledge Discovery from Complex Data*, Springer, September 2005.
8. L. Holder, D. Cook, J. Coble and M. Mukherjee, "Graph-based Relational Learning with Application to Security," in T. Washio, L. De Raedt, and J. Kok (eds.) *Advances in Mining Graphs, Trees and Sequences*, IOS Press, 2005.
9. L. Holder, D. Cook, J. Gonzalez and I. Jonyer, "Structural Pattern Recognition in Graphs." In D. Chen and X. Cheng (eds.) *Pattern Recognition and String Matching*, Kluwer Academic Publishers, November 2003.
10. D. J. Cook, G. Galal and L. B. Holder, "Discovering Concepts in Structural Data." In J. T. L. Wang, B. A. Shapiro and D. Shasha (eds.) *Pattern Discovery in Biomolecular Data: Tools, Techniques and Applications*, Oxford University Press, 1999.
11. D. J. Cook, P. Gmytrasiewicz and L. B. Holder, "Decision-Theoretic Multi-Agent Sensor Planning." In O. Firschein and T. Strat (eds.) *Reconnaissance, Surveillance, and Target Acquisition for the Unmanned Ground Vehicle*, pages 413-428, 1997.

## Journal Special Issue Editorships (6)

1. A. Bagula, L. Bravo, U. Gasser, L. Holder, K. Suglyama and D. Zeng (Editors), *The Impact of Artificial Intelligence on Communication Networks and Services*, ITU Journal: ICT Discoveries, Issue 1, March 2018.
2. N. Roy, P. Rashidi, L. Holder, L. Chen (Editors), *Pervasive and Mobile Computing Journal, Special Issue on Data Mining in Pervasive Environments*, Elsevier Publishing, Volume 15, December 2014.
3. L. Holder, M. Kumar and R. Bruno (Editors), *Pervasive and Mobile Computing Journal, Special Issue on Homeland and Global Security*, Elsevier Publishing, Volume 5, Number 2, April 2009.
4. Z. Markov, L. Holder, I. Jonyer and D. Bisant (Editors), *International Journal on Artificial Intelligence Tools, Special Issue on Machine Learning, Data Mining and Neural Networks*, World Scientific Publishing, Volume 17, Number 3, June 2008.
5. I. Russell, Z. Markov and L. Holder (Editors), *International Journal on Artificial Intelligence Tools, Special Issue on Knowledge Acquisition and Representation*, World Scientific Publishing, Volume 15, Number 6, December 2006.
6. I. Russell, Z. Markov, A. Pipe, B. Carse and L. Holder (Editors), *International Journal on Pattern Recognition and Artificial Intelligence, Special Issue on Feature Selection and Extraction for Classification Problems*, World Scientific Publishing, Volume 19, Number 2, March 2005.

## Journal Articles (58)

1. A. Ray, L. Holder and A. Bifet, "Efficient Frequent Subgraph Mining on Large Streaming Graphs," *Intelligent Data Analysis*, Volume 23, Issue 1, 2019 (to appear).
2. Y. Hou and L. Holder, "On Graph Mining with Deep Learning: Introducing Model R for Link Weight Prediction," *Journal of Artificial Intelligence and Soft Computing Research*, Issue 1, 2019 (to appear).
3. J. Helkey and L. Holder, "Sensor Network Configuration Learning for Maximizing Application Performance," *Sensors*, 2018 (to appear).
4. L. Holder, M. Haque, and M. Skinner, "Machine Learning for Epigenetics and Future Medical Applications," *Epigenetics*, Volume 12, Issue 7, 2017.
5. L. Holder, M. Khan, C. Klymko, R. Caceres, N. Chawla, T. Eliassi-Rad, D. Gleich, R. Kumar, A. Prakash, J. Riedy and Y. Wu, "Current and Future Challenges in Mining Large Networks: Report on the Second SDM Workshop on Mining Networks and Graphs," *SIGKDD Explorations*, 18(1):39-45, 2016.
6. M. Haque, E. Nilsson, L. Holder and M. Skinner, "Genomic Clustering of differential DNA methylated regions (epimutations) associated with the epigenetic transgenerational inheritance of disease and phenotypic variation," *BMC Genomics*, 17:418, 2016.
7. J. Helkey, L. Holder and B. Shirazi, "Comparison of simulators for assessing the ability to sustain wireless sensor networks using dynamic network reconfiguration," *Sustainable Computing: Informatics and Systems*, Volume 9, pp. 1-7, 2016.
8. Y. Yao and L. Holder, "Incremental SVM-based Classification in Dynamic Streaming Networks," *Intelligent Data Analysis*, 20(5), 2016.
9. M. Haque, L. Holder and M. Skinner, "Genome-Wide Locations of Potential Epimutations Associated with Environmentally Induced Epigenetic Transgenerational Inheritance of

- Disease Using a Sequential Machine Learning Prediction Approach,” *PLOS ONE*, November 2015.
10. W. Eberle and L. Holder, “Scalable Anomaly Detection in Graphs,” *Intelligent Data Analysis*, Volume 19, pp. 57-74, 2015.
  11. N. Dong and L. Holder, “Natural Language Generation from Graphs,” *International Journal of Semantic Computing*, 8(3):335-384, September 2014.
  12. M. Haque, M. Skinner and L. Holder, “Imbalanced Class Learning in Epigenetics,” *Journal of Computational Biology*, 21(7):492-507, July 2014. *Featured article*.
  13. M. Haque, L. Holder, M. Skinner and D. Cook, “Generalized Query Based Active Learning to Identify Differentially Methylated Regions in DNA,” *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 10(3):632-644, 2013.
  14. L. Holder and D. Cook, “Automated Activity-Aware Prompting for Activity Initiation,” *Gerontechnology*, 11(4):534-544, 2013.
  15. S. Long and L. Holder, “Graph-Based Shape Analysis for MRI Classification,” *International Journal of Knowledge Discovery in Bioinformatics*, 2(2):19-33, 2011.
  16. D. Cook, M. Schmitter-Edgecombe and L. Holder, “Gerontechnology Education: Beyond the Barriers,” *IEEE Pervasive Computing*, 10(4):59-63, October-December 2011.
  17. D. Cook and L. Holder, “Sensor Selection to Support Practical Use of Health-Monitoring Smart Environments,” *Data Mining and Knowledge Discovery*, Volume 1, Issue 4, July/August 2011.
  18. P. Rashidi, D. Cook, L. Holder and M. Schmitter-Edgecombe, “Discovering Activities to Recognize and Track in a Smart Environment,” *IEEE Transactions on Knowledge and Data Engineering*, Volume 23, Issue 4, April 2011.
  19. W. Eberle, L. Holder and J. Graves, “Insider Threat Detection Using a Graph-based Approach,” *Journal of Applied Security Research*, Volume 6, Issue 1, January 2011.
  20. D. Cook, L. Holder, S. Thompson, P. Whitney and L. Chilton, “Graph-based Analysis of Nuclear Smuggling Data,” *Journal of Applied Security Research*, Volume 4, Issue 4, October 2009.
  21. L. Holder, M. Kumar and R. Bruno, “Introduction to the special issue on homeland and global security,” *Pervasive and Mobile Computing Journal, Special Issue on Homeland and Global Security*, Elsevier Publishing, Volume 5, Number 2, April 2009.
  22. J. Kukluk, L. Holder and D. Cook, “Inference of Edge Replacement Graph Grammars,” *International Journal on Artificial Intelligence Tools*, 17(3):539-554, June 2008.
  23. J. Kukluk, L. Holder and D. Cook, “Inferring Graph Grammars by Detecting Overlap in Frequent Subgraphs,” *International Journal of Applied Mathematics and Computer Science*, Volume 18, Number 2, 2008.
  24. L. Holder and X. Yan, “Report on the First International Workshop on Mining Graphs and Complex Structures (MGCS’07),” *SIGMOD Record*, Volume 37, Number 1, March 2008.
  25. M. Hudelson, N. Ketkar, L. Holder, T. Carlson, C. Peng, B. Waldher, and J. Jones. High Confidence Predictions of Drug-Drug Interactions: Predicting Affinities for Cytochrome P450 2C9 with Multiple Computational Methods. *Journal of Medicinal Chemistry*, 51(3):648-654, January 2008.
  26. W. Eberle and L. Holder, “Anomaly Detection in Data Represented as Graphs,” *Intelligent Data Analysis*, 11(6):663-690, December 2007.
  27. D. Cook, L. Holder and G. M. Youngblood, “Graph-based Analysis of Human Transfer Learning Using a Game Testbed,” *IEEE Transactions on Knowledge and Data Engineering*, 19(11):1465-1478, November 2007.

28. J. Kukluk, L. Holder and D. Cook, "Inference of Node Replacement Graph Grammars," *Intelligent Data Analysis*, 11(4):377-400, September 2007.
29. L. Holder, Z. Markov and I. Russell, "Advances in Knowledge Acquisition and Representation," *International Journal on Artificial Intelligence Tools, Special Issue on Knowledge Acquisition and Representation*, 15(6):867-874, December 2006.
30. J. Coble, D. Cook and L. Holder, "Structure Discovery in Sequentially-Connected Data Streams," *International Journal on Artificial Intelligence Tools*, 15(6):917-944, December 2006.
31. I. Russell, Z. Markov, L. Holder and D. Cook, "The 2005 International Florida Artificial Intelligence Research Society Conference (FLAIRS-05): A Report," *AI Magazine*, Volume 27, Number 1, Spring 2006.
32. N. Ketkar, L. Holder and D. Cook, "Comparison of Graph-based and Logic-based MRDM," *ACM SIGKDD Explorations Special Issue on Link Mining*, Volume 7, Issue 2, December 2005.
33. G. M. Youngblood, D. Cook and L. Holder, "Managing Adaptive Versatile Environments," *Journal of Pervasive and Mobile Computing*, 1(4):373-403, December 2005.
34. L. Holder, I. Russell, Z. Markov, A. Pipe and B. Carse, "Current and Future Trends in Feature Selection and Extraction for Classification Problems," *International Journal on Pattern Recognition and Artificial Intelligence, Special Issue on Feature Selection and Extraction for Classification Problems*, 19(2):133-142, March 2005.
35. L. Holder, D. Cook, J. Coble and M. Mukherjee, "Graph-based Relational Learning with Application to Security," *Fundamenta Informaticae Special Issue on Mining Graphs, Trees and Sequences*, 66(1-2):83-101, March 2005.
36. J. Coble, R. Rathi, D. Cook and L. Holder, "Iterative Structure Discovery in Graph-Based Data," *International Journal on Artificial Intelligence Tools*, Volume 14, Number 1-2, February-March, 2005.
37. J. Kukluk, L. Holder and D. Cook, "Algorithm and Experiments in Testing Planar Graphs for Isomorphism," *Journal of Graph Algorithms and Applications*, Volume 8, Number 3, 2004.
38. I. Jonyer, L. Holder and D. Cook, "MDL-Based Context-Free Graph Grammar Induction and Applications," *International Journal on Artificial Intelligence Tools*, 13(1):65-79, March 2004.
39. A. Rakhshan, L. Holder and D. Cook, "Structural Web Search Engine," *International Journal on Artificial Intelligence Tools*, 13(1):27-44, March 2004.
40. D. Cook, M. Huber, R. Yerraballi and L. Holder, "Enhancing Computer Science Education with a Wireless Intelligent Simulation Environment," *Journal of Computing in Higher Education*, 16(1):106-127, Fall 2004.
41. L. Holder and D. Cook, "Graph-Based Relational Learning: Current and Future Directions," *ACM SIGKDD Explorations*, Volume 5, Issue 1, July 2003.
42. D. Cook, N. Manocha and L. Holder, "Using a Graph-Based Data Mining System to Perform Web Search," *International Journal of Pattern Recognition and Artificial Intelligence*, Volume 17, Number 5, pages 705-720, July 2003.
43. I. Jonyer, D. J. Cook and L. B. Holder, "Graph-Based Hierarchical Conceptual Clustering," *Journal of Machine Learning Research*, Volume 2, pages 19-43, October 2001.
44. D. J. Cook, L. B. Holder, S. Su, R. Maglothin and I. Jonyer, "Structural Mining of Molecular Biology Data," *IEEE Engineering in Medicine and Biology, Special Issue on Genomics and Bioinformatics*, Volume 20, Number 4, pages 67-74, July/August 2001.



45. D. J. Cook, L. B. Holder, G. Galal and R. K. Maglothin, "Approaches to Parallel Graph-Based Knowledge Discovery," *Journal of Parallel and Distributed Computing*, Volume 61, Number 3, pages 427–446, March 2001.
46. N. Manocha, D. J. Cook and L. B. Holder, "Structural Web Search Using a Graph-Based Discovery System," *ACM Intelligence Magazine*, Volume 12, Number 1, pages 20–29, March 2001.
47. I. Jonyer, L. B. Holder, and D. J. Cook, "Graph-Based Hierarchical Conceptual Clustering," *International Journal on Artificial Intelligence Tools*, Volume 10, Number 1-2, pages 107–135, March 2001.
48. L. B. Holder and D. J. Cook, "A Client-Server Computational Tool for Integrated Artificial Intelligence Curriculum," *Journal of Computing in Higher Education*, Volume 12, Number 2, March 2001.
49. D. J. Cook and L. B. Holder, "Graph-Based Data Mining," *IEEE Intelligent Systems*, Volume 15, Number 2, pages 32–41, March/April 2000.
50. S. Su, D. J. Cook, and L. B. Holder, "Knowledge Discovery in Molecular Biology: Identifying Structural Regularities in Proteins," *Intelligent Data Analysis*, Volume 3, pages 413–436, 1999.
51. K. S. Tae, D. J. Cook and L. B. Holder, "Experimentation-Driven Knowledge Acquisition for Planning," *Computational Intelligence*, Volume 15, Number 3, pages 252–279, 1999.
52. G. Galal, D. J. Cook and L. B. Holder, "Exploiting Parallelism in a Structural Scientific Discovery System to Improve Scalability," *Journal of the American Society for Information Science and Technology*, Volume 50, Number 1, pages 65–73, 1999.
53. S. Djoko, D. J. Cook, and L. B. Holder, "An Empirical Study of Domain Knowledge and Its Benefits to Substructure Discovery," *IEEE Transactions on Knowledge and Data Engineering*, Volume 9, Number 4, pages 575–586, 1997.
54. D. J. Cook, P. Gmytrasiewicz and L. B. Holder, "Decision-Theoretic Cooperative Sensor Planning," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Volume 18, Number 10, pages 1013–1023, 1996.
55. D. J. Cook, L. B. Holder, and S. Djoko, "Scalable Discovery of Informative Structural Concepts Using Domain Knowledge," *IEEE Expert*, Volume 11, Number 5, pages 59–68, 1996.
56. D. J. Cook, L. B. Holder, and S. Djoko, "Knowledge Discovery from Structural Data," *Journal of Intelligent Information Systems*, Volume 5, Number 3, pages 229–245, 1995.
57. D. J. Cook and L. B. Holder, "Substructure Discovery Using Minimum Description Length and Background Knowledge," *Journal of Artificial Intelligence Research*, Volume 1, pages 231–255, 1994.
58. L. B. Holder and D. J. Cook, "Discovery of Inexact Concepts from Structural Data," *IEEE Transactions on Knowledge and Data Engineering*, Volume 5, Number 6, pages 992–994, 1993.

#### Journal Abstracts (1)

1. M. Schmitter-Edgecombe, P. Rashidi, D. Cook and L. Holder (2010). Discovering and Tracking Activities of Daily Living Using Smart Environment Technologies (Abstract). *American Journal of Geriatric Psychiatry*.

#### Conference/Workshop Papers (138)

1. C. Pereyda and L. Holder. Toward a General-Purpose Artificial Intelligence Test by Combining Diverse Tests. *International Conference on Artificial Intelligence (ICAI)*, July 2018.
2. R. Paudel, W. Eberle and L. Holder. Anomaly Detection of Elderly Patient Activities in Smart Homes using a Graph-Based Approach. *International Conference on Data Science (ICDATA)*, July 2018.
3. S. Akter, L. Holder and D. Cook. Activity Recognition using Graphical Features from Smart Phone Sensor Data. *International Conference on Internet of Things (ICIOT)*, June 2018.
4. S. Choudhury, S. Purohit, P. Lin, Y. Wu, L. Holder, and K. Agarwal. Percolator: Scalable Pattern Discovery in Dynamic Graphs. *International Conference on Web Search and Data Mining (WSDM)*, February 2018.
5. S. Purohit, S. Choudhury, and L. Holder. Application-Specific Graph Sampling for Frequent Subgraph Mining and Community Detection. *IEEE International Conference on BigData*, December 2017.
6. S. Aminikhanghahi, R. Fallahzadeh, D. Cook, and L. Holder. Thyme: Improving smartphone prompt timing through activity awareness. *IEEE International Conference on Machine Learning and Applications (ICMLA)*, December 2017.
7. C. Packer\* and L. Holder, "GraphZip: Mining Graph Streams using Dictionary-based Compression," *KDD Workshop on Mining and Learning with Graphs (MLG)*, August 2017.
8. S. Akter and L. Holder, "Using Graphical Features To Improve Demographic Prediction From Smart Phone Data," *SIGMOD Workshop on Network Data Analytics*, May 2017.
9. Y. Hou and L. Holder, "Deep Learning Approach to Link Weight Prediction," *International Joint Conference on Neural Networks (IJCNN)*, May 2017.
10. Y. Yao and L. Holder, "Classification in Dynamic Streaming Networks," *International Conference on Advances in Social Network Analysis and Mining (ASONAM)*, August 2016.
11. Y. Yao and L. Holder, "Detecting Concept Drift in Classification Over Streaming Graphs," *KDD Workshop on Mining and Learning in Graphs (MLG)*, August 2016.
12. W. Eberle and L. Holder, "Identifying Anomalies in Graph Streams Using Change Detection," *KDD Workshop on Mining and Learning in Graphs (MLG)*, August 2016.
13. K. Bouchard, L. Holder and D. Cook, "Extracting Generalizable Spatial Features from Smart Phones Datasets," *AAAI Workshop on Artificial Intelligence Applied to Assistive Technologies and Smart Environments*, February 2016.
14. Y. Yao and L. Holder, "Scalable Classification for Large Dynamic Networks," *IEEE International Conference on Big Data*, October 2015.
15. A. Vishnu, J. Narasimhan, L. Holder, D. Kerbyson and A. Hoisie, "Fast and Accurate Support Vector Machines on Large Scale Systems," *IEEE Cluster*, September 2015.
16. L. Mookiah, W. Eberle, and L. Holder, "Discovering Suspicious Behavior Using a Graph-Based Approach," *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2015.
17. S. Choudhury, L. Holder, G. Chin, K. Agarwal and J. Feo, "A Selectivity based approach to Continuous Pattern Detection in Streaming Graphs," *International Conference on Extending Database Technology (EDBT)*, March 2015.
18. Y. Yao and L. Holder, "Scalable SVM-based Classification in Dynamic Graphs," *IEEE International Conference on Data Mining (ICDM)*, December 2014.
19. S. Akter and L. Holder, "Activity Recognition using Graphical Features," *International*

- Conference on Machine Learning and Applications (ICMLA)*, December 2014.
20. W. Eberle and L. Holder, "A Partitioning Approach to Scaling Anomaly Detection in Graph Streams," *First International Workshop on High Performance Big Graph Data Management, Analysis, and Mining (BigGraphs)*, *IEEE BigData Conference*, October 2014.
  21. L. Mookiah, W. Eberle, and L. Holder, "Detecting Suspicious Behavior Using a Graph-Based Approach," *IEEE Symposium on Visual Analytics Science and Technology (VAST)*, November 2014.
  22. A. Ray, L. Holder and S. Choudhury, "Frequent Subgraph Discovery in Large Attributed Streaming Graphs," *KDD Workshop on Big Data, Streams and Heterogeneous Source Mining: Algorithms, Systems, Programming Models and Applications (BigMine)*, August 2014.
  23. J. Narasimhan and L. Holder, "Feature Engineering for Supervised Link Prediction on Dynamic Social Networks," *International Conference on Data Mining (DMIN)*, July 2014.
  24. Z. Wemlinger and L. Holder, "Improving Activity Recognition in Smart Environments with Ontological Modeling," *International Conference on Smart Homes and Health Telematics (ICOST)*, LNCS 8456, pp. 129-137, June 2014.
  25. G. Chin, S. Choudhury, J. Feo and L. Holder, "Predicting and Detecting Emerging Cyberattack Patterns Using StreamWorks," *Cyber and Information Security Research Conference (CISRC)*, April 2014.
  26. W. Eberle and L. Holder, "Incremental Anomaly Detection in Graphs," *IEEE ICDM Workshop on Incremental Clustering, Concept Drift and Novelty Detection (IclNov)*, December 2013.
  27. S. Long and L. Holder, "Discovery of Discriminating Neural Regions for MRI Classification," *Workshop on Expanding the Boundaries of Health Informatics Using AI (HIAI)*, *Conference on Artificial Intelligence (AAAI)*, July 2013.
  28. S. Choudhury, L. Holder, G. Chin and J. Feo, "Fast Search for Dynamic Multi-Relational Graphs," *SIGMOD Workshop on Dynamic Networks Management and Mining (DyNetMM)*, June 2013.
  29. S. Choudhury, L. Holder, G. Chin, A. Ray, S. Beus and J. Feo, "StreamWorks – A System for Dynamic Graph Search," *ACM SIGMOD Conference Demo Track*, June 2013.
  30. M. Halappanavar, S. Choudhury, E. Hogan, P. Hui, J. Johnson, I. Ray and L. Holder, "Towards a Network-of-Networks Framework for Cyber Security," *IEEE International Conference on Intelligence and Security Informatics*, June 2013.
  31. D. Haglin and L. Holder, "Combining Structure and Property Values is Essential for Graph-based Learning," *IPDPS Workshop on Parallel and Distributed Computing for Machine Learning and Inference Problems*, May 2013.
  32. S. Long and L. Holder, "Graph-Based MRI Brain Scan Classification and Correlation Discovery," *IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB)*, May 2012.
  33. W. Eberle, L. Holder and B. Massengill, "Graph-Based Anomaly Detection Applied to Homeland Security Cargo Screening," *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2012.
  34. A. Ray and L. Holder, "Efficiency Improvements for Parallel Subgraph Miners," *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2012.
  35. B. Das, A. Seelye, B. Thomas, D. Cook, L. Holder and M. Schmitter-Edgecombe, "Using

- Smart Phones for Context-Aware Prompting in Smart Environments,” *Workshop on Consumer eHealth Platforms, Services and Applications (CeHPSA) at the Consumer Communications and Networking Conference (CCNC)*, January 2012.
36. S. Long and L. Holder, “Graph Based Classification of MRI Data Based on the Ventricular System,” *Workshop on Biological Data Mining and its Applications in Healthcare (BioDM) at the IEEE International Conference on Data Mining (ICDM)*, December 2011.
  37. S. Choudhury, L. Holder, G. Chin and J. Feo, “Large-Scale Continuous Subgraph Queries on Streams,” *Workshop on High-Performance Computing meets Databases, Co-located with Supercomputing 2011*, Seattle, WA, November 2011.
  38. C. Josyln, S. al-Saffar, D. Haglin and L. Holder, “Combinatorial Information Theoretical Measurement of the Semantic Significance of Semantic Graph Motifs,” *Conference on Knowledge Discovery and Data Mining (KDD) Workshop on Mining Data Semantics (MDS)*, August 2011.
  39. W. Eberle and L. Holder, “Compression versus Frequency for Mining Patterns and Anomalies in Graphs,” *Conference on Knowledge Discovery and Data Mining (KDD) Workshop on Mining and Learning with Graphs (MLG)*, August 2011.
  40. O. Romero, J. Gonzalez and L. Holder, “Handling of Numeric Ranges for Graph-Based Knowledge Discovery,” *International Conference on Data Mining (DMIN)*, July 2011.
  41. S. Long and L. Holder, “Using Graphs to Improve Activity Prediction in Smart Environments based on Motion Sensor Data,” *International Conference on Smart Homes and Health Telematics (ICOST)*, June 2011.
  42. Z. Wemlinger and L. Holder, “The COSE Ontology: Bringing the Semantic Web to Smart Environments,” *International Conference on Smart Homes and Health Telematics (ICOST)*, June 2011.
  43. W. Eberle and L. Holder, “Graph-based Knowledge Discovery: Compression vs. Frequency,” *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2011.
  44. O. Romero, J. Gonzalez and L. Holder, “Handling of Numeric Ranges with the SUBDUE System,” *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2011.
  45. W. Eberle and L. Holder, “Detecting Insider Threats Using a Graph-based Approach,” *Proceedings of the Center of Academic Excellence in Information Assurance Workshop on Insider Threat (CAEWIT) Workshop*, November 2010.
  46. E. Nazerfard, D. Cook and L. Holder, “Conditional Random Fields for Activity Recognition in Smart Environments,” *ACM International Health Informatics Symposium*, November 2010.
  47. R. Zou and L. Holder, “Frequent subgraph mining on a single large graph using sampling techniques,” *Proceedings of the Eighth Workshop on Mining and Learning with Graphs (MLG)*, pp. 171-178, July 2010.
  48. W. Eberle, L. Holder and J. Graves, “Using a Graph-Based Approach for Discovering Cybercrime,” *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2010.
  49. O. Romero, J. Gonzalez and L. Holder, “Handling of Numeric Ranges for Graph-Based Knowledge Discovery,” *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2010.
  50. N. Ketkar, L. Holder and D. Cook, “gRegress: Extracting Features from Graph Transactions for Regression,” *International Joint Conference on Artificial Intelligence (IJCAI)*, July

- 2009.
51. C. You, L. Holder and D. Cook, "Learning Patterns in the Dynamics of Biological Networks," *ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, June 2009.
  52. W. Eberle and L. Holder, "Applying Graph-based Anomaly Detection Approaches to the Discovery of Insider Threats," *IEEE International Conference on Intelligence and Security Informatics (ISI)*, June 2009.
  53. W. Eberle and L. Holder, "Discovering Anomalies to Multiple Normative Patterns in Structural and Numeric Data," *International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)*, May 2009. **Best Paper Award**.
  54. W. Eberle and L. Holder, "Graph-Based Approaches to Insider Threat Detection," Extended Abstract, *Cyber Security and Information Intelligence Research Workshop*, April 2009.
  55. N. Ketkar, L. Holder and D. Cook, "Faster Computation of the Direct Product Kernel for Graph Classification," *IEEE Workshop on Computational Intelligence and Data Mining*, March 2009.
  56. N. Ketkar, L. Holder and D. Cook, "Empirical Comparison of Graph Classification Algorithms," *IEEE Workshop on Computational Intelligence and Data Mining*, March 2009.
  57. W. Eberle and L. Holder, "Mining for Insider Threats in Business Transactions and Processes," *IEEE Workshop on Computational Intelligence and Data Mining*, March 2009.
  58. W. Eberle and L. Holder, "Insider Threat Detection Using Graph-Based Approaches," *Cybersecurity Applications and Technologies Conference for Homeland Security (CATCH)*, March 2009.
  59. C. You, L. Holder and D. Cook, "Graph-based Data Mining in Dynamic Networks: Empirical Comparison of Compression-based and Frequency-based Subgraph Mining," *IEEE International Conference on Data Mining (ICDM) Workshop on Analysis of Dynamic Networks*, December 2008.
  60. A. Singh and L. Holder, "Strategic Path Planning on the Basis of Risk vs. Time," *International Conference on Entertainment Computing*, September 2008.
  61. A. Christiansen, D. Johnson and L. Holder, "Game-based Simulation for the Evaluation of Threat Detection in a Seaport Environment," *International Conference on Entertainment Computing*, September 2008.
  62. C. You, L. Holder and D. Cook, "Graph-based Temporal Mining of Metabolic Pathways with Microarray Data," *ACM SIGKDD Workshop on Data Mining in Bioinformatics (BIOKDD)*, August 2008.
  63. C. You, L. Holder and D. Cook, "Temporal and Structural Analysis of Biological Networks in Combination with Microarray Data," *IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology*, September 2008.
  64. C. You, L. Holder and D. Cook, "Dynamic Graph-based Relational Learning of Temporal Patterns in Biological Networks Changing over Time," *International Conference on Bioinformatics and Computational Biology (BIOCOMP)*, July 2008.
  65. W. Eberle and L. Holder, "Discovering Structural Anomalies in Graph-based Data," *IEEE International Conference on Data Mining Workshop on Mining Graphs and Complex Structures*, October 2007.
  66. J. Kukluk, L. Holder and D. Cook, "Inference of Node and Edge Replacement Graph Grammars," *International Conference on Machine Learning (ICML) Workshop on*

- Challenges and Applications of Grammar Induction*, June 2007.
67. W. Eberle and L. Holder, "Mining for Structural Anomalies in Graph-Based Data," *International Conference on Data Mining (DMIN-07)*, June 2007.
  68. J. Kukluk, C. You, L. Holder and D. Cook, "Learning Node Replacement Graph Grammars in Metabolic Pathways," *International Conference on Bioinformatics and Computational Biology (BIOCOMP-07)*, June 2007.
  69. J. Kukluk, L. Holder and D. Cook, "Inference of Edge Replacement Graph Grammars," *Proceedings of the Twentieth International Conference of the Florida AI Research Society (FLAIRS)*, May 2007.
  70. C. You, L. Holder and D. Cook, "Application of Graph-based Data Mining to Metabolic Pathways," *Workshop on Data Mining in Bioinformatics, IEEE International Conference on Data Mining*, December 2006.
  71. K. Ates, J. Kukluk, L. Holder, D. Cook and K. Zhang, "Graph Grammar Induction on Structural Data for Visual Programming," *Proceedings of the 18th IEEE International Conference on Tools with Artificial Intelligence*, November 2006.
  72. N. Ketkar, L. Holder and D. Cook, "Mining in the Proximity of Subgraphs," *Proceedings of the ACM KDD Workshop on Link Analysis*, August 2006.
  73. J. Kukluk, C. You, L. Holder and D. Cook, "Discovering Recursive Patterns in Biological Networks (Abstract)," *Dallas Area Bioinformatics and Computational Biology Workshop*, August 2006.
  74. G. M. Youngblood, B. Nolen, M. Ross, and L. Holder, "Building Test Beds for AI with the Q3 Mod Base," *Proceedings of the Annual Artificial Intelligence for Interactive Digital Entertainment Conference*, June 2006.
  75. A. Singh and L. Holder, "Classification of Threats via a Multi-sensor Security Portal," *Proceedings of the IEEE Intelligence and Security Informatics Conference*, May 2006.
  76. W. Eberle and L. Holder, "Detecting Anomalies in Cargo Shipments Using Graph Properties," *Proceedings of the IEEE Intelligence and Security Informatics Conference*, May 2006.
  77. J. Kukluk, L. Holder and D. Cook, "Inference of Node Replacement Recursive Graph Grammars," *Proceedings of the SIAM Conference on Data Mining*, April 2006.
  78. C. Corley, D. Cook, L. Holder, and K. Singh, "Graph-based Data Mining in Epidemia and Terrorism Data," *Proceedings of the Conference on Quantitative Methods and Statistical Applications in Defense and National Security*, February 2006.
  79. G. M. Youngblood, D. Cook and L. Holder, "Seamlessly Engineering a Smart Environment," *Proceedings of the International Conference on Systems, Man and Cybernetics*, October 2005.
  80. N. Ketkar, L. Holder and D. Cook, "Qualitative Comparison of Graph-based and Logic-based Multi-Relational Data Mining: A Case Study," *Proceedings of the ACM KDD Workshop on Multi-Relational Data Mining*, August 2005.
  81. N. Ketkar, L. Holder, D. Cook, R. Shah and J. Coble, "Subdue: Compression-based Frequent Pattern Discovery in Graph Data," *Proceedings of the ACM KDD Workshop on Open-Source Data Mining*, August 2005.
  82. G. M. Youngblood, D. Cook, L. Holder and E. Heierman, "Automation Intelligence for the Smart Environment," *Proceedings of the International Joint Conference on Artificial Intelligence*, August 2005.
  83. B. Kondeti, M. Nallacharu, G. M. Youngblood and L. Holder, "Interfacing the D'Artagnan Cognitive Architecture to the Urban Terror First-Person Shooter Game," *Proceedings of*

- the *International Joint Conference on Artificial Intelligence Workshop on Reasoning, Representation and Learning in Computer Games*, August 2005.
84. G. M. Youngblood, L. Holder and D. Cook, "A Learning Architecture for Automating the Intelligent Environment," *Proceedings of the Conference on Innovative Applications of Artificial Intelligence (IAAI)*, July 2005.
  85. J. Coble, D. Cook and L. Holder, "Structure Discovery in Sequentially Connected Data," *Proceedings of the Eighteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2005. **Best Paper Award.**
  86. R. Rathi, D. Cook and L. Holder, "A Serial Partitioning Approach to Scaling Graph-Based Knowledge Discovery," *Proceedings of the Eighteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2005.
  87. J. Potts, D. Cook and L. Holder, "Learning from Examples in a Single Graph," *Proceedings of the Eighteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2005.
  88. G. M. Youngblood, E. Heierman, L. Holder and D. Cook, "Automated HPOMDP Construction through Data-mining Techniques in the Intelligent Environment Domain," *Proceedings of the Eighteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2005.
  89. J. Potts, L. Holder, D. Cook and J. Coble, "Learning Concepts from Intelligence Data Embedded in a Supervised Graph," *Proceedings of the International Conference on Intelligence Analysis*, May 2005.
  90. G. M. Youngblood, L. Holder and D. Cook, "Managing Adaptive Versatile Environments," *Proceedings of the Third IEEE International Conference on Pervasive Computing and Communications (PerCom)*, March 2005.
  91. M. Mukherjee and L. Holder, "Graph-based Data Mining for Social Network Analysis," *Proceedings of the ACM KDD Workshop on Link Analysis and Group Detection*, August 2004.
  92. I. Jonyer, L. Holder and D. Cook, "Attribute Value Selection Based on the Minimum Description Length," *Proceedings of the International Conference on Artificial Intelligence*, June 2004.
  93. J. Coble, D. Cook, L. Holder and R. Rathi, "Structure Discovery from Sequential Data," *Proceedings of the Seventeenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2004.
  94. G. M. Youngblood and L. Holder, "Agent-Based Players for a First-Person Entertainment-Based Real-Time Artificial Environment," *Proceedings of the Seventeenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2004.
  95. I. Jonyer, L. Holder and D. Cook, "MDL-Based Context-Free Graph Grammar Induction," *Proceedings of the Sixteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2003. *Second Place, Best Paper Award Competition.*
  96. A. Rakhshan, L. Holder and D. Cook, "Structural Web Search Engine," *Proceedings of the Sixteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2003.
  97. G. M. Youngblood and L. Holder, "Evaluating Human-Consistent Behavior in a Real-time First-person Entertainment-based Artificial Environment," *Proceedings of the Sixteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2003.
  98. R. Mehta, D. Cook and L. Holder, "Identifying Inhabitants of an Intelligent Environment Using a Graph-Based Data Mining System," *Proceedings of the Sixteenth International*

- Conference of the Florida AI Research Society (FLAIRS)*, May 2003.
99. I. Jonyer, L. Holder and D. Cook, "Concept Formation Using Graph Grammars," *Proceedings of the KDD Workshop on Multi-Relational Data Mining*, July 2002.
  100. J. Gonzalez, L. Holder and D. Cook, "Graph-Based Relational Concept Learning," *Proceedings of the Nineteenth International Conference on Machine Learning*, July 2002.
  101. J. Gonzalez, L. Holder and D. Cook, "Experimental Comparison of Graph-Based Relational Concept Learning with Inductive Logic Programming Systems," *Proceedings of the Twelfth International Conference on Inductive Logic Programming*, July 2002.
  102. S. Bandyopadhyay, U. Maulik, D. J. Cook, L. B. Holder and Y. Ajmerwala, "Enhancing Structure Discovery for Data Mining in Graphical Databases Using Evolutionary Programming," *Proceedings of the Fifteenth International Conference of the Florida AI Research Society (FLAIRS)*, May 2002.
  103. J. Gonzalez, L. B. Holder and D. J. Cook, "Application of Graph-Based Concept Learning to the Predictive Toxicology Domain," *Proceedings of the Predictive Toxicology Workshop at the Fifth European Conference on Principles and Practice of Knowledge Discovery in Databases*, September 2001.
  104. J. Gonzalez, L. B. Holder and D. J. Cook, "Graph-Based Concept Learning," *Proceedings of the Fourteenth International Florida AI Research Society Conference*, pages 377-381, May 2001.
  105. N. Manocha, D. J. Cook and L. B. Holder, "Structural Web Search Using a Graph-Based Discovery System," *Proceedings of the Fourteenth International Florida AI Research Society Conference*, pages 133-137, May 2001.
  106. D. J. Cook and L. B. Holder, "A Client-Server Interactive Tool for Integrated Artificial Intelligence Curriculum," *Proceedings of the Fourteenth International Florida AI Research Society Conference*, pages 206-210, May 2001.
  107. J. Gonzalez, L. B. Holder, and D. J. Cook, "Graph-Based Concept Learning," *Proceedings of the National Conference on Artificial Intelligence*, page 1072, July 2000.
  108. I. Jonyer, L. B. Holder, and D. J. Cook, "Graph-Based Hierarchical Conceptual Clustering in Structural Data," *Proceedings of the National Conference on Artificial Intelligence*, page 1073, July 2000.
  109. J. Gonzalez, I. Jonyer, L. B. Holder and D. J. Cook, "Efficient Mining of Graph-Based Data," *AAAI Workshop on Learning Statistical Models from Relational Data*, pages 21-28, July 2000.
  110. G. M. Youngblood, L. B. Holder, and D. J. Cook, "A Framework for Autonomous Mobile Robot Exploration and Mapping Through the Use of Place-Centric Occupancy Grids," *Proceedings of the Machine Learning Workshop on Learning from Spatial Information*, June 2000.
  111. I. Jonyer, L. B. Holder and D. J. Cook. "Graph-Based Hierarchical Conceptual Clustering," *Proceedings of the Thirteenth International Florida AI Research Society Conference*, pages 91-95, May 2000.
  112. J. Gonzalez, L. B. Holder and D. J. Cook, "Structural Knowledge Discovery Used to Analyze Earthquake Activity," *Proceedings of the Thirteenth International Florida AI Research Society Conference*, pages 86-90, May 2000.
  113. R. Chittimoori, L. B. Holder and D. J. Cook, "Applying the Subdue Discovery System to the Chemical Toxicity Domain," *Proceedings of the Twelfth International Florida AI Research Society Conference*, pages 90-94, 1999.
  114. R. Chittimoori, L. B. Holder and D. J. Cook, "Applying Subdue to Chemical



- Toxicity Data,” *AAAI Spring Symposium on Predictive Toxicology*, 1999.
115. R. Chittimoori, J. Gonzalez and L. B. Holder, “Structural Knowledge Discovery in Chemical and Spatio-Temporal Domains,” *Proceedings of the Sixteenth National Conference on Artificial Intelligence*, 1999.
  116. S. Su, D. J. Cook and L. B. Holder, “Applications of Knowledge Discovery to Molecular Biology: Identifying Structural Regularities in Proteins,” *Proceedings of the Pacific Symposium on Biocomputing*, pages 190–201, 1999.
  117. L. B. Holder and D. J. Cook, “Coupling Two Complimentary Knowledge Discovery Systems,” *Proceedings of the Eleventh International Florida Artificial Intelligence Research Society Conference*, pages 183–187, 1998.
  118. D. J. Cook, G. Galal and L. B. Holder, “Exploiting Parallelism in Knowledge Discovery Systems to Improve Scalability,” *Proceedings of the Thirty-First Hawaii International Conference on System Sciences*, 1998.
  119. G. Galal, D. J. Cook and L. B. Holder, “Improving Scalability in a Knowledge Discovery System by Exploiting Parallelism,” *Proceedings of the Third International Conference on Knowledge Discovery and Data Mining*, pages 171–174, 1997.
  120. T. Duell and L. B. Holder, “A Study of Overfit in Decision-Tree Induction,” *Proceedings of the Tenth International Florida Artificial Intelligence Research Society Conference*, pages 342–346, 1997.
  121. D. J. Cook, P. Gmytrasiewicz and L. B. Holder, “Multi-Agent Cooperative Sensor Planning,” *Proceedings of the Image Understanding Workshop*, pages 1321–1332, 1996.
  122. P. Hsia, C. T. Hsu, D. C. Kung and L. B. Holder, “User-Centered System Decomposition: Z-Based Requirements Clustering,” *Proceedings of the Second International Conference on Requirements Engineering*, pages 126–135, 1996.
  123. L. B. Holder, “Intermediate Decision Trees,” *Proceedings of the 14th International Joint Conference on Artificial Intelligence*, pages 1056–1062, 1995.
  124. S. Djoko, D. J. Cook and L. B. Holder, “Analyzing the Benefits of Domain Knowledge in Substructure Discovery,” *Proceedings of the First International Conference on Knowledge Discovery and Data Mining*, pages 75–80, 1995.
  125. L. B. Holder, D. J. Cook and S. Djoko, “Substructure Discovery in the SUBDUE System,” *Proceedings of the AAAI Workshop on Knowledge Discovery in Databases*, pages 169–180, 1994.
  126. D. J. Cook and L. B. Holder, “Sensor Planning and Coordination in Multi-Agent Systems,” *Proceedings of the Image Understanding Workshop*, 1994.
  127. A. Chaudhry and L. B. Holder, “An Empirical Approach to Solving the General Utility Problem in Speedup Learning,” *Seventh International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems*, pages 149–158, 1994.
  128. L. B. Holder and A. Chaudhry, “Simple Selection of Utile Control Rules in Speedup Learning,” *Proceedings of the Third International Workshop on Knowledge Compilation and Speedup Learning*, pages 77–82, 1993.
  129. L. B. Holder, “Empirical Analysis of the General Utility Problem in Machine Learning,” *Proceedings of the Tenth National Conference on Artificial Intelligence*, pages 249–254, 1992.
  130. L. B. Holder, D. J. Cook and H. Bunke, “Fuzzy Substructure Discovery,” *Proceedings of the Ninth International Conference on Machine Learning*, pages 218–223, 1992.

131. L. B. Holder, "Unifying Empirical and Explanation-Based Learning by Modeling the Utility of Learned Knowledge," *Proceedings of the ML92 Workshop on Knowledge Compilation and Speedup Learning*, 1992.
132. L. B. Holder, "Selection of Learning Methods Using an Adaptive Model of Knowledge Utility," *Proceedings of the International Workshop on Multistrategy Learning*, pages 247–254, 1991.
133. L. B. Holder, "The General Utility Problem in Machine Learning," *Proceedings of the Seventh International Conference on Machine Learning*, pages 402–410, 1990.
134. L. B. Holder, "Application of Machine Learning to the Maintenance of Knowledge Base Performance," *Proceedings of the 3rd International Conference on Industrial & Engineering Applications of AI & Expert Systems*, pages 1005–1012, 1990.
135. L. B. Holder, "Performance-Driven Knowledge Transformation," *Proceedings of the Third Florida Artificial Intelligence Research Symposium*, pages 149–153, 1990.
136. D. J. Cook and L. B. Holder, "Accelerated Learning on the Connection Machine," *Proceedings of the Second IEEE Symposium on Parallel and Distributed Processing*, pages 448–454, 1990.
137. L. B. Holder, "Empirical Substructure Discovery," *Proceedings of the Sixth International Workshop on Machine Learning*, pages 133–136, 1989.
138. R. E. Stepp, B. L. Whitehall and L. B. Holder, "Towards Intelligent Machine Learning Algorithms," *Proceedings of the Eighth European Conference on Artificial Intelligence*, pages 333–338, 1988.

#### Conference Posters/Abstracts (4)

1. S. Purohit, L. Holder and G. Chin. Synthetic Temporal Graph Generation. Poster and Abstract. SIAM Workshop on Network Science, July 2018.
2. J. Fairey and L. Holder. StarIso: Graph Isomorphism Through Lossy Compression. Poster and Abstract. Data Compression Conference, April 2016.
3. A. Gain\* and L. Holder. Network of Spiking Neurons Driven by Compression. Poster and Abstract. Data Compression Conference, April 2016.
4. L. P. Behmer, J. Fairey, L. Holder and L. R. Fournier. Using EEG and Machine Learning to Predict Action Goals from Data in the Human Mirror System. Poster and abstract. 20<sup>th</sup> Annual Meeting of the Cognitive Neuroscience Society, April 2013.

#### Technical Reports (7)

1. R. Shah and L. B. Holder, "Subdue Web Interface and GUI," Technical Report CSE-2004-9, Department of Computer Science and Engineering, University of Texas at Arlington, November 2004.
2. D. J. Cook, L. B. Holder and S. Djoko, "Knowledge Discovery from Structural Data," Technical Report TR-95-149, NASA Center of Excellence in Space Data and Information Sciences, 1995.
3. L. B. Holder, "Maintaining the Utility of Learned Knowledge Using Model-Based Adaptive Control," Ph.D. Thesis, Department of Computer Science, University of Illinois, Urbana, IL, October 1991.
4. S. F. Kappes, A. B. Baskin, R. E. Reinke and L. B. Holder, "A Knowledge-Based Natural Language Database Interface," Technical Report P-91/15, U.S. Army Corps of Engineers

- Construction Engineering Research Laboratory, Champaign, IL, May 1991.
5. L. B. Holder, "Substructure Discovery in Subdue," Technical Report UILU-ENG-88-2220, Department of Computer Science, University of Illinois, Urbana, IL, May 1988.
  6. L. B. Holder, "Discovering Substructure in Examples," Masters Thesis, Department of Computer Science, University of Illinois, Urbana, IL, May 1988. (Available as Technical Report UILU-ENG-88-2223).
  7. R. E. Stepp, B. L. Whitehall and L. B. Holder, "Toward Intelligent Machine Learning Algorithms," Technical Report UILU-ENG-88-2221, Department of Computer Science, University of Illinois, Urbana, IL, May 1988.

(\* indicates undergraduate student author)

### Invited Talks

1. "Mining Dynamic Graphs," Pacific Northwest National Laboratory, March 2013.
2. "Graph-based Pattern Learning," DOE Summer School on Multiscale Mathematics and High Performance Computing, WSU Tri-Cities Campus, August 2008.
3. "Center for Research in CyberIntelligence," Pacific Northwest National Laboratory, January 2007.
4. "Graph-based Relational Learning," Washington State University, February 2006.
5. "Graph-based Relational Learning," Colloquia of the Computer Science and Engineering Department, University of Notre Dame, November 2005.
6. "Graph-based Data Mining in Biological Databases," Guest Lecturer, Bioinformatics Course, University of Notre Dame, November 2005.
7. "Connecting the Dots: Graph-based Discovery Informatics for Learning Patterns of Asymmetric Threats," Visionary Lecture Series in Discovery Informatics, Johns Hopkins University School of Professional Studies in Business and Education, March 2004.
8. "Extracting Knowledge from Structural Data Using Substructure Discovery," invited talk to the NASA Goddard Space Flight Center CESDIS Group, 1994.
9. "North Texas Association for Artificial Intelligence (NTAAI) Panel on Data Mining," panelist, 1994.
10. "Empirical Analysis of the General Utility Problem in Machine Learning," invited talk to the Computer Science Department at the University of Texas at Austin, 1992.
11. "Common Trends in the Performance of Symbolic and Connectionist Learning Methods," invited talk to the UTA MIND group, 1992.
12. "The Utility of Machine Learning," invited talk to the North Texas Association for Artificial Intelligence (NTAAI), 1992.
13. "Maintaining the Utility of Learned Knowledge Using Model-Based Adaptive Control," invited talk to the NASA Ames Research Center Intelligent Systems Group, 1991.
14. "Controlling the Application of Learning Methods for the Improvement and Maintenance of Knowledge Base Performance," invited talk to the Jet Propulsion Laboratory (JPL) Intelligent Systems Group, 1990.

### Support (Total funding: \$11.5M. Funding as PI: \$3.5M)

1. L. Holder, "Multi-Stream Graph Mining," NSF EAGER, 8/1/2016-7/31/2017, \$99,999.

2. L. Holder, "REU Site: Undergraduate Research in Smart Environments," NSF Research Experience for Undergraduates, 5/1/2015-4/30/2018, \$335,000.
3. L. Holder and W. Eberle, "Anomaly Detection in Graph Streams," *NSF Information Integration and Informatics*, 10/1/2013-9/30/2016, \$458,790 (\$249,796 to WSU).
4. L. Holder, "Pattern Learning in Large, Heterogeneous, Attributed Graphs," *Pacific Northwest National Laboratory*, 10/1/2010-9/30/2012, \$120,000.
5. L. Holder, "HUNTER: HUMINT Use of Networks for Tactical Exploitation and Reasoning," *DARPA GUARD-DOG Program, Subcontract to BAE Systems*, 10/1/2010-10/31/2011, \$90,000.
6. W. Eberle and L. Holder, "Detecting Anomalies in Shipping Data Using a Graph-based Approach," *Department of Homeland Security (DHS)*, 9/21/2010-12/31/2011, \$300,000.
7. D. Cook, M. Schmitter-Edgecombe, L. Holder, B. Shirazi, and S. Jayaram, "IGERT: Integrative Training in Health-Assistive Smart Environments," *NSF Integrative Graduate Education and Research Traineeship Program (IGERT)*, 7/1/2009-6/30/2014, \$2,823,126.
8. L. Holder, "Scaling Graph-based Pattern Learning for Large Graphs," *Pacific Northwest National Laboratory*, 7/14/2009-6/30/2010, \$39,392.
9. D. Cook and L. Holder, "Advanced Analysis for Proliferation Control," *Pacific Northwest National Laboratory*, 7/1/2008-12/31/2008, \$40,000.
10. L. Holder and W. Eberle, "Insider Threat Detection Using a Graph-based Approach," *DHS Cyber-Security Research and Development Program*, 3/1/2008-9/20/2010, \$327,667.
11. L. Holder, T. Pratt, D. Hindman and K. Marett, "Cybercriminology and Digital Forensics," *WSU Initiation of Collaboration*, 7/1/07-6/30/08, \$5,000.
12. L. Holder and D. Cook, "Integration of a MOUT Simulator into the General Game Playing (GGP) System for the Evaluation of Transfer Learning," *Naval Research Laboratory*, 10/01/07-9/30/08, \$137,450.
13. L. Holder, G. M. Youngblood, D. Cook and M. Huber, "Transfer Learning in Integrated Cognitive Systems," subcontract with the Institute for the Study of Learning and Expertise (ISLE), *DARPA Transfer Learning Program (BAA05-29)*, 10/1/05-9/30/07, \$600,000.
14. D. Cook and L. Holder, "Graph-based Mining of Public Health Data," *NSF Science and Engineering Informatics (SEI) Program*, 9/1/05-8/31/08, \$352,327. In collaboration with K. Singh at University of North Texas.
15. L. Holder and D. Cook, "Graph-Based Structural Pattern Learning," *NRL BAA 55-03-05r*, 4/1/05-3/31/06, \$118,622.
16. L. Holder and D. Cook, "Application of Graph-based Pattern Learning to Financial Transaction Data," *Booz-Allen-Hamilton*, 9/1/04-8/31/05, \$30,000.
17. L. Holder and G. M. Youngblood, "Integration of a Cognitive Architecture and an Urban Warfare Simulator for the Evaluation of AI Methods," *NRL BAA 55-03-02*, 9/1/04-8/31/05, \$75,500.
18. L. Holder, I. Ahmad, S. K. Das, F. Lewis and F. Lu, "Acquisition of Instrumentation for Engineering Research in Advanced Security Detection Systems," *NSF Major Research Instrumentation (MRI) Program*, 9/1/04-8/31/07, \$357,143.
19. L. Holder and D. Cook, "Graph-Based Structural Pattern Learning," *U.S. Air Force Evidence Assessment, Grouping, Linking and Evaluation (EAGLE) Program*, 1/1/04-3/15/06, \$377,516.
20. S. Das, I. Ahmad, D. Cook, L. Holder, and M. Kumar, "ITR Collaborative Research: Pervasively Secure Infrastructures (PSI): Integrating Smart Sensing, Data Mining, Pervasive Networking, and Community Computing," *NSF Information Technology*

- Research (ITR) Program, 9/1/03–8/31/08, \$1,600,000.*
21. S. Chakravarthy, J. Yu, L. Holder, S. Das and Y. Aslandogan, “Acquisition of High-Performance Distributed Computing and Storage Infrastructure at UTA,” *NSF Major Research Instrumentation (MRI) Program, 9/1/02–8/31/05, \$950,000.*
  22. L. Holder and D. Cook, “Graph-Based Structural Pattern Learning,” *DARPA Evidence Extraction and Link Discovery (EELD) Program, 9/6/01–12/5/03, \$375,000.*
  23. D. Cook, L. Holder and S. Chakravarthy, “Graph-Based Data Mining,” *NSF, 9/1/01–8/31/04, \$442,487.*
  24. D. Cook, S. Chakravarthy, S. Das, M. Huber, L. Holder, F. Kamangar and R. Yerraballi, “MavHome: An Intelligent Home Environment,” *NSF Information Technology Research (ITR) Program, 9/1/01–8/31/06, \$1,159,959.*
  25. D. Cook, L. Holder, S. Das, M. Huber and R. Yerraballi, “Instrumentation for Intelligent Agent Wireless Computing Research,” *NSF Major Research Instrumentation (MRI) Program, 9/1/01–8/31/04, \$426,284.*
  26. D. Cook, L. Holder, S. Das, F. Kamangar and R. Yerraballi, “Integrating Intelligent Agent and Wireless Computing Research into the Undergraduate Curriculum,” *NSF Educational Innovation Grant, 1/1/01–12/31/03, \$329,915.*
  27. D. Cook, L. Holder, S. Das, F. Kamangar and R. Yerraballi, “Remote Site Monitoring, Measurement, and Control,” *Automation and Robotics Research Institute, 5/1/00–8/15/00, \$20,000.*
  28. D. J. Cook and L. B. Holder, “Scalable Knowledge Discovery,” *Texas Higher Education Coordinating Board Advanced Technology Program, 1/1/98–8/31/00, \$108,346.*
  29. L. B. Holder and D. J. Cook, “Scalable Knowledge Discovery from Large Structural Databases,” *NSF, 2/15/97–8/31/00, \$304,323.*
  30. L. B. Holder and D. J. Cook, “Problem-Solving Strategies for Knowledge-Based Engineering Applied to Generative N/C Programming,” *Texas Instruments, Dallas, TX, 8/16/94–1/15/95, \$13,250.*
  31. D. J. Cook and L. B. Holder, “Parallel Knowledge Discovery from Large Complex Databases,” *NASA CESDIS HPCC Program, 7/1/93–9/30/96, \$147,000.*
  32. L. B. Holder, “Control of Machine Learning Methods,” *University of Texas at Arlington Research Initiation Grant, 9/1/91–8/31/92, \$20,000.*

## Advising

Doctoral (15 graduated, 5 current)

1. Christopher Pereyda, “Evaluation of AI Systems,” May 2020 (expected).
2. Sumit Purohit, “Multi-Stream Graph Mining,” May 2019 (expected).
3. Joel Helkey, “Sensor Network Optimization Based on Target Application,” May 2019 (expected).
4. Jason Fairey, “Compression-Based Graph Matching,” May 2019 (expected).
5. Syeda Akter, “Graph Mining Sensor Network Data,” August 2018 (expected).
6. Zachary Wemlinger, “Methods for Integrating Ontological Models into Smart Environment Activity Recognition Algorithms,” July 2018.
7. Yuchen Hou, “Link Weight Prediction with Deep Learning,” July 2018. Currently engineer at Deliverr.
8. Yibo Yao, “Supervised Learning in Dynamic Streaming Graphs,” December 2015.

- Currently Data scientist at Turn, Inc.
9. Jeyanthi Narasimhan, "Link Prediction in Dynamic Graphs," December 2015. Currently Data Scientist at Ford Motor Credit Company.
  10. Abhik Ray, "Structural Pattern Discovery in Dynamic Graphs," December 2015. Currently Data Scientist at ESPN, Inc.
  11. Muksitul Haque, "Identification of Novel Differentially Methylated DNA Regions Using Active Learning and Imbalanced Class Learners," August 2014. Currently Data Mining Engineer at Stryker Mako.
  12. Samuel Seth Long, "Graph-Based Neural Image Analysis and Classification," August 2014. Currently Assistant Professor in the Department of Computer Science at Lewis-Clark State College.
  13. Sutanay Choudhury, "Subgraph Matching for Dynamic Graphs," May 2014. Currently researcher at the Pacific Northwest National Laboratory.
  14. Chang hun You, "Learning Patterns in Dynamic Graphs with Application to Biological Networks," August 2009. Currently Data Science Engineer at MZ.
  15. Nikhil Ketkar, "Empirical Comparison of Graph Classification and Regression Algorithms," May 2009. Currently Engineering Manager at Guavus Network Systems.
  16. William Eberle, "Information Theoretic, Probabilistic and Maximum Partial Substructure Algorithms for Discovering Graph-Based Anomalies," May 2007. Currently Professor in the Department of Computer Science at Tennessee Technological University.
  17. Jacek Kukluk, "Inference of Node and Edge Replacement Graph Grammars," May 2007. Currently a Research Associate at the Dana-Farber/Harvard Cancer Center.
  18. G. Michael Youngblood, "Automating Inhabitant Interactions in Home and Workplace Environments Through Data-Driven Generation of Hierarchical Partially-Observable Markov Decision Processes," co-advised with Dr. Diane Cook, August 2005. Currently Researcher at the Xerox Palo Alto Research Center.
  19. Istvan Jonyer, "Learning Context-Free Graph Grammars Using the Minimum Description Length Principle," August 2003. Currently VC at NexStar Partners.
  20. Jesus Gonzalez, "Empirical and Theoretical Analysis of Structural Concept Learning," August 2001. Currently Investigator in the Department of Computer Science at the National Institute of Astrophysics, Optics and Electronics in Puebla, Mexico.

#### Masters (41)

1. Jesse Waite, "Anomaly Detection in Processes Represented as a Graph," July 2018.
2. Ngan Dong, "Natural Language Generation from Graphs," May 2013.
3. Ruoyu Zou, "Frequent Subgraph Mining on a Single Large Graph Using Sampling Techniques," December 2010.
4. Damian Johnson, "Port Locale Modeling and Scenario Evaluation in 3D Virtual Environments," May 2009.
5. Allen Christiansen, "Modeling Sensors and Threats in a Three-Dimensional Real-Time Simulation of a Seaport Environment," May 2009.
6. Yan Zhang, "Improving the Efficiency of Graph-based Data Mining with Application to Public Health Data," December 2007.
7. Ashish Singh, "Improving the Survivability of Agents in a First-Person Shooter Urban Combat Simulation by Incorporating Military Skills," December 2007.
8. Janakiram Natarajan, "Simulation of Sensor Responses of Advanced Security Systems," August 2006.

9. Amar Singh, "Improving Security Detection Using Multiple Sensor Data," May 2006.
10. ChungHun You, "Application of Graph-based Data Mining to Biological Networks," December 2005.
11. Chris Gonsalves, "Comparison of Search-based and Kernel-based Methods for Graph-based Relational Learning," August 2005.
12. Bharat Kondeti, "Integration of the D'Artagnan Cognitive Architecture with Real-Time Simulated Environments," May 2005.
13. Maheshwar Nallachura, "Spatial Reasoning for Real-Time Simulated Environments," May 2005.
14. Nikhil Ketkar, "Comparison of Graph-based and Logic-based Relational Learning," December 2004.
15. Rohan Shah, "Empirical Comparison of Graph-Based Data Mining Systems Based on Minimum Description Length," December 2004.
16. Maitrayee Mukherjee, "Graph-Based Data Mining on Social Networks," August 2004.
17. Abhilash Maniam, "Graph-Based Click-Stream Mining for Categorizing Browsing Activity in the World Wide Web," August 2004.
18. Swapnil Palod, "Transformation of Relational Databases to Graphs for Data Mining," May 2004.
19. Amit Pant, "Improved Data Partitioning for Distributed Graph-Based Data Mining," December 2003.
20. Jacek Kukluk, "Algorithm and Experiments for Testing Planar Graphs for Isomorphism," December 2003.
21. Arash Rakhshan, "Structural Web Search Engine," August 2003.
22. Parag Mhashilkar, "Networking for the AMEBA Cognitive Architecture," August 2003.
23. G. Michael Youngblood, "Agent-Based Simulated Cognitive Intelligence in a Real-Time First-Person Entertainment-Based Artificial Environments," August 2002.
24. Ali Chousein, "Using Bayesian Model Averaging in Modeling Other Agents and Learning the Beliefs of Other Agents in Multi-Agent Environments," December 2001.
25. Gayathri Sampath, "Subdue Graph Visualizer," May 2001.
26. Bharath Peramur, "Development of Intelligent Process Agents for the Agent Based Manufacturing Operating System," August 2000.
27. Istvan Jonyer, "Hierarchical Conceptual Clustering Using a Graph-Based Knowledge Discovery System," May 2000.
28. Ravindra Chittimoori, "Discovering Substructures in Chemical Toxicity Domain," December 1999.
29. Kruti Mehta, "A Java-Based Client-Server Simulator for Intelligent Agent Design," December 1999.
30. Jesus Gonzalez, "Application of Structural Discovery to Real-World Datasets," May 1999.
31. Ron Maglothin, "Data Mining in DNA: Using the Subdue Knowledge Discovery System to Find Potential Gene Regulatory Sequences," May 1999.
32. Karthik Amirtharajan, "Agent-Based Manufacturing Operating System Architecture: Design and Implementation of a Generic Device Control Agent Language for Reconfigurable Automation," May 1999.
33. Thomas Duell, "A Study of Overfit in Inductive Learning," August 1998.
34. Shaobing Su, "Applications of Knowledge Discovery to Molecular Biology: Identifying Structural Regularities in Proteins," August 1998.
35. Sharon Barber, "Model-Based Object Recognition Using Invariants," May 1998.

36. Robert Duff, "EGOS: An Environment for Generalized Object-Oriented Simulation," May 1998.
37. Ramakrishna Kintada, "Detection of Closed Shapes in Images," May 1997.
38. Prasad Parthasarthy, "Subdue GUI: Interface of Graph-Based Discovery System with a Graph Visualization Tool," May 1997.
39. Stephen Poe, "Substructure Discovery in Image Data Using Subdue," August 1995.
40. Vikram Dintyala, "Object-Oriented Analysis and Graphical User Interface for the RSTA Subsystem of the Unmanned Ground Vehicle Project," May 1995.
41. Anurag Chaudhry, "Empirical Analysis of the General Utility Problem in Speedup Learning," August 1993.

#### Undergraduate Honors Theses (4)

1. Heather Chan, "Real-Time Visualization of Graph-Based Data Mining," May 2004.
2. Pravin Muthukumar, "WISE: Wireless Intelligent Simulation Environment," Aug. 2001.
3. Istvan Jonyer, "Design, Implementation and Evaluation of a Dialog-based Interactive System," May 1999.
4. G. Michael Youngblood, "Autonomous Mobile Robot Exploration and Mapping of Place-Centric Occupancy Grids," May 1999.