ACADEMIC / INDUSTRIAL / GOVERNMENT CURRICULUM VITAE

BIOGRAPHICAL:

Surname: Spencer   **Given Names:** E. Bruce

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Marital Status: Married   **Citizenship**: Canadian

EDUCATION

1991 - Ph.D.   Computer Science (Waterloo)
                "Assimilation in Plan Recognition via Truth Maintenance with
                Reduced Redundancy", supervised by Robin Cohen.
                Accepted October 1990.
1983 - M.Math Computer Science (Waterloo)
1980 - B.Sc.   Mathematics (Dalhousie)

Areas of Specialization:
Automated reasoning, artificial intelligence, semantic web, service computing,
social network analysis, time series, machine learning, statistical modelling

EMPLOYMENT:

March 2019 – present	Senior Research Officer National Research Council of Canada
April 2018 – July 2018	Senior Research Scientist University of New Brunswick
March 2017 – March 2019	Head of Research, Eyesover Technology
July 2016 - Feb 2017	Senior Consultant to iPSNP Technology
April 2014 - Sept 2015	Lead Data Scientist and CoFounder, Fiddlehead Technology
Sept 2013 - April 2014	Senior Research Scientist and Instructor, University of New Brunswick
Feb - Aug 2013	Research and Architecture Team Lead, Introhive, Fredericton
Aug 2001-Feb 2013	Senior Research Officer, National Reseach Council Canada, Fredericton
July, 2002 - Present	Adjunct Professor UNB.
July, 2000	Promotion to Full Professor UNB
July 1996-July, 1997	Sabbatical Leave UNB
July, 1996	Tenure UNB
July, 1994	Promotion to Associate Professor UNB
Sept., 1990	Assistant Professor, Initial Appointment UNB
1988-1990	Research Assistant, University of Waterloo
1986-1988	Teaching Assistant in artificial intelligence, University of Waterloo
1983-1986	Bell-Northern Research, Computing Technology Division, Ottawa. Design and implementation of LISP and Prolog interpreters, Prolog application support.

Jan – April 1983   Lecturer in introductory programming and statistics, Dalhousie University.

1981-1982   Teaching Assistant, University of Waterloo.

May 1980 - Aug1981   Research Assistant, full time. Design and implementation of software for statistical modeling and estimation, Dalhousie University.

Highlights
- 80 peer reviewed publications, H-index 15, 8 journal and 10 conference publications in past 24 months.
- Editor for Electronic Commerce Research & Applications and for Computational Intelligence.
- Talks: 40 invited talks in Asia, North America and Europe, including keynote at 2013 IEEE ICCKE and International Conference on Big Data Analytics and Data Science 2019.
- 2013 Winner Ontology Classification Live competition, 2013 OWL Reasoner Evaluation Workshop
- 2011 Best Paper Award Canadian Artificial Intelligence Graduate Student Symposium
- 2009 Finalist for Knowledge Industry Research Award, Fredericton: SAVOIR
- 2007 Ontario Research and Innovation Optical Network (ORION) Winner of Discovery Award

Research Contracts with Industry while at UNB

1. With Martin Marietta Canada Limited Co-principal Investigators B.G. Nickerson and R.H. Cooper. Awarded July 1, 1991 ($209,000).
2. With Bell-Northern Research, Theorem-proving Techniques for Verification of Hardware and Software Systems, Principal Investigator. Awarded July 1, 1991 ($10,000), renewed July 1, 1992 ($10,000), and July 1, 1993 ($10,000).

Research Grants with Government while at UNB
1. NSERC Operating Grant OGP0106290 Improvements to automated theorem proving and truth maintenance through reduced redundancy. Awarded March 1991 for three years ($11,000 p.a.)
2. NSERC Operating Grant OGP0106290 Development and Evaluation of Automated Reasoning Systems based on Clause Trees. Awarded March 1994 for four years ($17,000 p.a.)
3. NSERC Equipment Grant, with J. D. Horton. Awarded March 1996 for the purchase of a SUN workstation and laptop computer ($19,055)

4. Study Visit Grant, Deutscher Akademischer Austauschdienst, DM 10,500 to cover expenses while visiting Germany on sabattical.
5. NSERC Operating Grant OGP0106290 Development and Evaluation of Automated Reasoning Systems based on Clause Trees. Awarded March 1998 for four years ($19,635 p.a.)
6. NSERC Discovery Grant, Internet Logic and the e-Marketplace, April 2003 to March 2010 ($10,000 p.a.).
7. NRC IRAP C2Org with Fiddlehead Technology, March 2014, $3000.
8. NRC IRAP C2Org with GoSecureAtlantic, May 2016, $3000.
9. NRC IRAP C2Org EyesOver Technology, Oct 2016, $3000

Total NSERC Grants $278,660 over 18 years.

Service to the Research Community
Committee and Board Memberships

1. Member of editorial board for Computational Intelligence since September 2003.
2. Member of Advisory Board for the International Joint Conference on Artificial Intelligence, the premier AI conference, April 2004 – April 2005.
3. President of the Canadian Society for the Computational Study of Intelligence, 2002-2005.
4. Member of the International Committee on Electronic Commerce, 2005-2007, which oversees the International Conference on Electronic Commerce.
5. Member of NSERC Discovery Grant Selection Committee 331 Sept 2006 – Sept 2009.
6. Member of the Scientific Board of Directors for the Ontario Research Network for Electronic Commerce.
7. Member of the Scientific Advisory Board for the VENUS and NEPTUNE Canada Seafloor Observatories, 2007-2011.

Service Outside the University of Scholarly or Academic Significance

1. Judged the Fredericton Area Science Fair, 1991 and 1996.
2. Elected member of Garden Creek School Parent Advisory Committee, Sept. 18, 1996 until June 1998.
3. Co-chair of Garden Creek School Community Access Centre, June 1998 until Aug. 2000.
4. Consultant for Science East Exhibit on Global Warming, May 2002.
5. Member of the Board of Directors of Science East, 2002-2005. Science East Association is a non-profit organization that built a permanent science museum in Fredericton.

PUBLICATIONS

Trademarks

Daniel Lemire, Sean McGrath, Harold Boley, Marcel Ball, Bruce Spencer, inDiscover™. A computer software program for personalized song recommendations. Trade-mark, issued in Canada, copyright number: 916517, filed: 11 Feb 2005, published: 25 May 2005.

Daniel Lemire, Sean McGrath, Harold Boley, Marcel Ball, Bruce Spencer, RACOFI Composer™ ≝ A framework for rating-based collaborative filtering and rule-based recommendation. Trade-mark, issued in Canada, copyright number: 915456, filed: 10 Sep 2004, published: 16 Feb 2005.

Journal Issues Edited

1. Edited special issue of the journal Electronic Commerce Research and Applications, 2007 7:3, best papers from the International Conference on Electronic Commerce, held in Fredericton in 2006.
2. Edited Computational Intelligence Vol. 18, No. 4, Nov 2002, including best papers from Novel E-Commerce Applications of Agents Workshop, held in May 2001.

Refereed Articles Published in a Book or Collection

1. F Al-Obeidat, N Belacel, B Spencer, Combining Machine Learning and Metaheuristics Algorithms for Classification Method PROAFTN, Combining Machine Learning and Metaheuristics Algorithms for Classification Method PROAFTN. In: Ganchev I., Garcia N., Dobre C., Mavromoustakis C., Goleva R. (eds) Enhanced Living Environments. Lecture Notes in Computer Science, vol 11369. Springer Cham.

Articles Published in Refereed Journals

1. MS Al Manir, B. Spencer, CJO Baker, Decision Support for Agricultural Consultants with Semantic Data Federation, International Journal of Agricultural and Environmental Information Systems, 2018 Vol 9-3 (IF 0.86)
2. F Al-Obeidat, B Spencer, O. Alfandi. Consistently accurate forecasts of temperature within buildings from sensor data using ridge and lasso regression, Future Generation Computer Systems, 2018. (5 yr IF 4.784)
3. F Al-Obeidat, B Spencer, E Kafeza, The Opinion Management Framework: Identifying and addressing customer concerns extracted from online product reviews, Electronic Commerce Research and Applications 27, 52-64, 2018. (5 yr IF 3.181)

4. F Al-Obeidat, B Spencer, M.. Al Taei, Identifying major tasks and minor tasks within online reviews, Future Generation Computer Systems, 2017. (5 yr Impact Factor 4.784)
5. B Spencer, F Al-Obeidat, O Alfandi, Accurately forecasting temperatures in smart buildings using fewer sensors, Personal and Ubiquitous Computing, 1-9, 2017 (Impact Factor 2.395)
6. Sandro Rama Fiorini, Julita Bermejo-Alonso, Paulo Gonçalves, Edison Pignaton de Freitas, Alberto Olivares Alarcos, Joanna Isabelle Olszewska, Edson Prestes, Craig Schlenoff, S. Veera Ragavan, Signe Redfield, Bruce Spencer, and Howard Li,
A Suite of Ontologies for Robotics and Automation, IEEE Robotics & Automation Magazine, pp 8-11, March 2017,
7. Bruce Spencer, Feras Al-Obeidat, Omar Alfandi, Short Term Forecasts of Internal Temperature with Stable Accuracy in Smart Homes, International Journal of Thermal & Environmental Engineering, Vol 13-2, pp. 81-89, 2016. DOI: 10.5383/ijtee.13.02.002.
8. Behzad Bayat, Julita Bermejo-Alonso, Joel Luis Carbonera, Tullio Facchinetti, Sandro R. Fiorini, Paulo Gonçalves, Vitor A. M. Jorge, Maki Habib, Alaa Khamis, Kamilo Melo, Bao Nguyen, Joanna Isabelle Olszewska, Liam Paull, Edson Prestes, S. Veera Ragavan, Sajad Saeedi, Ricardo Sanz, Mae Seto, Bruce Spencer, Michael Trentini, Amirkhosro Vosughi, and Howard Li, "Requirements for Building an Ontology for Autonomous Robots", Industrial Robot, 2016.
9. Harzallah, Y.; Horton, Joseph D.; Spencer, B., "Assigning Routes and Wavelengths for Collaboration over Optical Networks". *Photonic Network Communications*, November 2010, pp 1-12. (Impact Factor 0.793)
10. Buffett, S., Spencer, B. "A Bayesian Classifier for Learning Opponents' Preferences in Multi-Object Automated Negotiation," Electronic Commerce Research and Applications Journal. Volume 6, Number 3. 2007. pp. 274-284. (5-year Impact Factor 2.34)
11. Wang, Y., Zang, H., Spencer, B., Yan, Y. "A Text Categorization Approach for Match-Making in Online Business Tendering," Journal of Business and Technology. Volume 1, Number 1. October 2005.
12. Liu, S., Spencer, B., Adsett, C., Bernardi, A. "Realizing Agile Workflow with DeFleX to Support Adaptive Business Processes," Journal of Business and Technology. Atlantic Academic Press. ISSN 1712-1116. October 2005.
13. Scott Buffett, Keping Jia, Sandy Liu, Bruce Spencer, Fang Wang, 2004, "Negotiating Exchanges of P3P-labeled Information for Compensation", Computational Intelligence, 20:4, 663-677. (Impact Factor 0.673)
14. Scott Buffet and Bruce Spencer, 2004 "A Decision Procedure for Bundle Purchasing with Incomplete Information on Future Prices" International Journal of Electronic Commerce, 8:4, 131-144. (Impact Factor 1.872)
15. Bruce Spencer and J. D. Horton, 2000, "Efficient algorithms to detect and restore *minimality*: an extension of the regular restriction of resolution" Journal of Automated Reasoning, 25:1-34. (Impact Factor 0.881)

16. J. D. Horton and Bruce Spencer, 1997 "Clause Trees: A Tool for Understanding and Implementing Resolution in Automated Reasoning", Artificial Intelligence, 92:25-89. (Impact Factor 3.371)
17. B. Spencer, 1994, "Avoiding Duplicate Proofs with the Foothold Refinement", Annals of Mathematics and Artificial Intelligence, 12:117-140. (Impact Factor 0.691)
18. Robin Cohen, Fei Song, Bruce Spencer and Peter van Beek, 1991, "Exploiting Temporal and Novel Information from the User in Plan Recognition", *User Modeling and User-Adapted Interaction*, Kluwer Academic Publishers, 1:125-148. (Impact Factor 0.037)
19. Robin Cohen, Marlene Jones, Bruce Spencer, Amar Sanmugasunderam, and Lisa Dent, 1989, "Providing Responses Specific to a User's Goals and Background", *International Journal of Expert Systems: Research and Applications*, 2:135-162.

Articles Published in Refereed Conferences

20. B Spencer, O Alfandi, F Al-Obeidat, Forecasting Temperature in a Smart Home with Segmented Linear Regression, (SEIT 2019), Halifax, Canada, Procedia Computer Science, Volume 155, 2019, Pages 511-518, ISSN 1877-0509,
21. B Spencer, O Alfandi, F Al-Obeidat A Refinement of Lasso Regression Applied to Temperature Forecasting, 8th International Conference on Sustainable Energy Information Technology (SEIT 2018), 2018, Porto, Portugal.
22. Joanna Isabelle Olszewska, Marcos Barreto, Julita Bermejo-Alonso, Joel Carbonera, Abdelghani Chibani, Sandro Fiorini, Paulo Goncalves, Maki Habib, Alaa Khamis, Alberto Olivares, Edison Pignaton de Freitas, Edson Prestes, S. Veera Ragavan, Signe Redfield, Ricardo Sanz, Bruce Spencer, and Howard Li
Ontology for Autonomous Robotics, 26th IEEE International Symposium on Robot and Human Interactive Communication, Lisbon, Portugal.
23. Feras Al-Obeidat, Bruce Spencer, Identifying Major Tasks from On-line Reviews, The 8th International Conference on Emerging Ubiquitous Systems and Pervasive Networks (EUSPN), September 18-20, 2017, Lund, Sweden.
24. Fera Al-Obeidat, Eleanna Kafeza, Bruce. Spencer, Opinions Sandbox: Turning Emotions on Topics into Actionable Analytics, in: The 1st EAI International Conference on Emerging Technologies for Developing Countries, Springer, March 27–28, 2017, Marrakech, Morocco.
25. Mohammad Sadnan Al Manir, Bruce Spencer and Christopher Baker, Decision Support for Agricultural Consultants with Semantic Data Federation, IN-OVIVE 2017 – the International Workshop On Sources And Data Integration In Agriculture, Food And Environment Using Ontologies, July 2nd-6th, Montpellier, France.
26. Bruce Spencer, Feras Al-Obeidat, Omar Alfandi, Selecting Sensors when Forecasting Temperature in Smart Buildings, 7th International Conference on Sustainable Energy Information Technology (SEIT 2017), May 16-19, 2017, Madeira, Portugal.

27. Bruce Spencer and Feras Al-Obeidat, "Temperature Forecasts with Stable Accuracy in a Smart Home", International Conference on Sustainable Energy Information Technology, Madrid, May 2016.

28. Bruce Spencer and Omar Alfandi, "Forecasting Internal Temperature in a Home with a Sensor Network", International Workshop on Machine Learning and Data Mining for Sensor Networks, Madrid, May 2016.

29. Weihong Song, Bruce Spencer, Weichang Du, "Complete Classification of Complex ALCHO Ontologies Using a Hybrid Reasoning Approach", Description Logics 2013, 942-961.

30. Weihong Song, Bruce Spencer, Weichang Du, "A Transformation Approach for Classifying ALCHI(D) Ontologies with a Consequence-based ALCH Reasoner", ORE 2013, 39-45.

31. Bruce Spencer and Scott Bufffett, "Simulating Social Commerce Applied to Buyer Group Pricing, Recommendation Incentives, and Bundling", Proceeedings of the International Conference on Electronic Commerce, August 6-8, 2012, Singapore, 95-98.

32. Weihong Song, Bruce Spencer and Weichang Du: "WSReasoner: A Prototype Hybrid Reasoner for ALCHOI Ontology Classification using a Weakening and Strengthening Approach", OWL Reasoner Evaluation Workshop, Collocated with the 6th International Joint Conference on Automated Reasoning, Manchester England, July 1, 2012, 6:1-13.

33. Yuanyuan Guo, Huajie Zhang, Bruce Spencer, "Cost-Sensitive Self-training", Proceedings of the Canadian Artificial Intelligence Conference, Toronto, Canada, May 28-30, 2012: 61-73. *Nominated for Best Paper.*

34. Xiping Hu, Weichang Du, Bruce Spencer, "A Multi-Agent Framework for Ambient Systems Development", International Conference on Ambient Systems, Networks and Technologies, September 19-21, 2011, Niagara Falls, Ontario, Canada.

35. Weihong Song, Bruce Spencer, Weichang Du, "Hybrid Reasoning for Ontology Classification" Canadian Artificial Intelligence Conference Graduate Student Symposium, pp 372-376, May 24, 2011, Saint John's, Canada. *Best Paper Award Winner.*

36. Rachel Ellaway, Jeremy Cooperstock, Bruce Spencer. "Simulation Integration for Healthcare Education, Training and Assessment" International Conference in Digital Information Management, July 2010, Thunderbay Ontario.

37. Bruce Spencer, Bryan Copeland, Yosri Harzallah, Justin Hickey and Sandy Liu, "Health Training with SAVOIR and the RSM," Fifth International Conference on Semantics, Knowledge and Grid, ZuHai, China, Oct 10-12, 2009.

38. Sandy Liu, Bruce Spencer: SAVOIR: Coordination of Collaboration as a Service" Proceedings of ACM Conference on Computer Supported Cooperative Work 2010. Savannah, Georgia. February 6-10, 2010.

39. Harzallah, Y, Horton, J and Spencer B, "Collaboration over a Service-Oriented Fibre Optic Networking Platform", IEEE International Conference on Digital Ecosystems and Technologies, Istanbul, Turkey, 31 May-3 June 2009.

40. Spencer, B and Sandy Liu "Modeling and Managing Collaborative Sessions for a Virtual Organization", Fourth International Conference on Semantics, Knowledge and Grid, Beijing, China, Dec 3-5, 2008.

41. Spencer, B and Sandy Liu "Modeling the Sharing of Resource across Collaborative Sessions", Asian Pacific Service Computing Conference, Yilan, Taiwan, December 9-12, 2008.

42. Bin Wang, Bruce Spencer, Charles X. Ling, Harry Zhang: "Semi-supervised Self-training for Sentence Subjectivity Classification" Canadian Conference on AI 2008, Windsor, Ontario, May 28-30, 2008: 344-355.

43. Spencer, B. "Assimilating Ontological Additions in Convergent Negotiation Protocols," The 9th International Conference on Electronic Commerce (ICEC'07). Minneapolis, Minnesota, USA. August 19-22, 2007.

44. Liu, S., Spencer, B., Liang, Y., Xu, B., Zhang, L., Brooks, M.F. "Towards an Agile Infrastructure to provision Devices, Applications and Networks: A Service-Oriented Approach," The First IEEE International Workshop on Requirements Engineering for Services (REFS'07)The 31st Annual IEEE International Computer Software and Applications Conference. Beijing, China. July 23-27, 2007.

45. Sandy Liu, Yong Liang, Bo Xu, Libo Zhang, Bruce Spencer, Martin Brooks, "On Demand Network and Application Provisioning Through Web Services," The Proceedings of the IEEE International Conference on Web Services (ICWS 2007). Salt Lake City, Utah, USA. July 9-13, 2007.

46. Michael Jemtrud, Philam Nguyen, Bruce Spencer, Martin Brooks, Sandy Liu, Yong Liang, Bo Xu, and Libo Zhang, "Eucalyptus: Intelligent Infrastructure Enabled Participatory Design Studio", WinterSIM 2006 (Winter Simulation Conference), Dec 3-6, 2006/Monterey, California.

47. Michael Jemtrud, Martin Brooks, Bobby Ho, Sandy Liu, Philam Nguyen, John Spence, Bruce Spencer, "Eucalyptus: Intelligent Infrastructure Enabled Participatory Design Studio", Centre for the Study of Architecture in the Arab Region(CSAAR) Nov 14-16, 2006, Rabat, Morocco.

48. Michael Jemtrud, Martin Brooks, Bobby Ho, Sandy Liu, Philam Nguyen, John Spence, Bruce Spencer, "Eucalyptus: User Controlled Lightpath Enabled Participatory Design Studio", Work in progress session of The Association for Computer-Aided Design in Architecture (ACADIA), Oct 12-15, 2006, Louisville, Kentucky.

49. Sandy Liu, Bruce Spencer, Martin Brooks, Michael Jemtrud, Konstantin Privalov, John Spence, Michel Savoie, Bobby Ho. "Towards a Service-oriented Participatory Design Studio Supported by UCLP." Proceedings of the IEEE International Conference on Services Computing (SCC'06). Sep 18 2006. Chicago. IEEE Computer Society.

50. Michael Jemtrud, Martin Brooks, Bobby Ho, Sandy Liu, Philam Nguyen, John Spence, Bruce Spencer, "Eucalyptus: Collaborating at the speed of light" Conference: eCAADE (Education and Research in Computer Aided Architectural Design in Europe) Sept 6-9, 2006/Volos, Greece.

51. Scott Buffett, Bruce Spencer, Luc Comeau, Michael Fleming. "Detecting Opponent Concessions in Multi-Issue Automated Negotiation," The 8th

International Conference on Electronic Commerce (ICEC'06). Fredericton, New Brunswick, Canada. August 14, 2006. NRC 48552.

52. Scott Buffett, Luc Comeau, Michael W. Fleming, Bruce Spencer, "MONOLOGUE: A Tool for Negotiating Exchanges of Private Information in E-Commerce", Proceedings of Second Annual Conference on Privacy, Security and Trust (PST 2005), October 12-14, 2005, pp 79-88.

53. Ball, M., Boley, H., Hirtle, D., Mei, J., Spencer, B. "The OO jDREW Reference Implementation of RuleML," Proceedings of the International Conference on Rules and Rule Markup Languages for the Semantic Web (RuleML 2005). Galway, Ireland. Springer LNCS 3791. November 10-12, 2005. pp. 218-223. NRC 48284.

54. Buffett, S., Spencer, B. "Learning Opponents' Preferences in Multi-Object Automated Negotiation," Seventh International Conference on Electronic Commerce (ICEC'05). Xi'an, China. August 15-17, 2005. NRC 48260.

55. Bruce Spencer and Sandy Liu, "Inferring Data Transformation Rules to Integrate Semantic Web Services" In Proceedings of the International Semantic Web Conference, ISWC 2004, Hiroshima, Japan, November 2004, Lecture Notes in Computer Science 3298 Springer, pp 456-470.

56. Scott Buffett, Nathan Scott, Bruce Spencer, Michael Richter and Michael Fleming, "Determining Internet Users' Values for Private Information", Proceedings of Second Annual Conference on Privacy, Security and Trust (PST 04), October 13-15, 2004, pp 79-88.

57. Yue Wang, Huajie Zhang, Bruce Spencer and Yuhong Yan, "Text Categorization for an Online Tendering System", In Proceedings of the Business Agents and Semantic Web Workshop (BASeWEB 04), London, Canada, May 2004, pp 55-71.

58. Connie Adsett, Ansgar Bernardi, Sandy Liu and Bruce Spencer, "Realizing Weak Workflow with Declarative Flexible XML Routing in SOAP", In Proceedings of the Business Agents and Semantic Web Workshop (BASeWEB 04), London, Canada, May 2004, pp 31-44.

59. Bruce Spencer and Sandy Liu, "Inference Queues for Communicating and Monitoring Declarative Information among Web Services", In Proceedings of Rules and Rule Markup Languages for the Semantic Web, (RuleML03), Sanibel Island, FL, USA, October 2003, pp 121-135.

60. Scott Buffett and Bruce Spencer, "Efficient Monte Carlo Decision Tree Solution in Dynamic Purchasing Environments" International Conference on Electronic Commerce (ICEC'03), Pittsburgh, PA, October 2003, pp. 31-39.

61. Fang Wang and Bruce Spencer, "A Proposal and Evaluation Engine for Adding Negation to P3P / APPEL" In Proceedings of the Business Agents and Semantic Web Workshop (BASeWEB 03), Halifax, Canada, June 2003, pp 35-41.

62. Scott Buffett, Keping Jia, Sandy Liu, Bruce Spencer, Fang Wang, "Negotiating Exchanges of P3P-labeled Information for Measureable Benefits". In Proceedings of the Business Agents and Semantic Web Workshop (BASeWEB 03), Halifax, Canada, June 2003, pp 25-34.

63. Keping Jia and Bruce Spencer,"Negotiating Exchanges of Private Information for Web Service Eligibility", In Proceedings of the 16th Conference of the Canadian Society for the Computational Study of Intelligence (AI 03), Halifax, Canada, June 2003, pp 252-267.

64. Bruce Spencer, "The Design of j-DREW: A Deductive Reasoning Engine for the Web" The International Workshop/Symposium on Logic-Based Program Synthesia and Transformation. CBD ITCLS 2002, First CologNET Workshop on Component-Based Software Development and Implementation Technology for Computational Logic Systems. Madrid, Spain. September 20, 2002. pp. 155-166.

65. Charlie Obimbo and Bruce Spencer, "T-Priority Resolution: A Resolution Strategy for Deductive Databases", In Proceedings of IC-AI'2000 The 2000 International Conference on Artificial Intelligence, Monte Carlo Resort, Las Vegas, Nevada, USA, June 25, 2000, pages 1550-1556.

66. Bruce Spencer and J. D. Horton, "Support Ordered Resolution", Prodeedings of 17th International Conference on Automated Deduction, Pittsburgh, PA, USA, June 2000 LNAI 1831, pp 385-400.

67. Peter Baumgartner, J. D. Horton and Bruce Spencer, "Merge Path Improvements for Minimal Model Hypertableaux", Proceedings of Tableaux '99, Albany, New York, pages 51-65, Springer-Verlag LNAI 1617, June 8, 1999.

68. J.D. Horton and Bruce Spencer, "Rank/Activity: A Canonical Form for Binary Resolution", Proceedings of 15th International Conference on Automated Deduction, Lindau, Germany, pages 412-426, Springer-Verlag LNAI 1421, July 1998.

69. Bruce Spencer and J.D. Horton, "Extending the Regular Restriction of Resolution to Non-Linear Sub Deductions", Proceedings of the Fourteenth National Conference on Artificial Intelligence, July 1997, Providence, Rhode Island, USA.

70. Charlie F. Obimbo and Bruce Spencer "Access Clause Trees in Disjunctive Deductive Databases", Proceedings of the workshop DDLP '96 on Deductive Databases and Logic Programming, in conjunction with the Joint International Conference on Logic Programming, Bonn, Germany, pages 15-28, GMD – For Shungszentrum Informations technik, GMBH, Sept. 1996

71. J.D. Horton and Bruce Spencer "A Top Down Algorithm to Find Only Minimal Clause Trees", 1995, Proceedings of CPL 95, held in conjunction with KI-95, Bielefeld, Germany, Sept. 11-13, pp. 77-78.

72. Robin Cohen, Bruce Spencer and Pay Hoyt, "Designing a Tool to Allow Updates During Plan Recognition – Challenges and Applications", Proceedings of the IEEE Conference on Tools with Artificial Intelligence, Nov. 1994, New Orleans, Louisiana, pp. 63-70.

73. Bruce Spencer and Robin Cohen, "A Non-Horn ATMS which Allows Flexible Specification of Required Completeness", Proceedings of the Tenth Canadian Conference on Artificial Intelligence, May 1994, Banff, Alberta, pp. 233-240.

74. Bruce Spencer, "The Ordered Clause Restriction of Model Elimination and SLI", International Symposium of Logic Programming, Oct. 1993, Vancouver,

B.C. This is a poster session paper and appears on p. 678 of the Proceedings.

75. Robin Cohen and Bruce Spencer, "Specifying and Updating Plan Libraries for Plan Recognition Tasks", IEEE Conference on Artificial Intelligence Applications, March 1-5, 1993, Orlando, Florida, pp. 27-33

76. Bruce Spencer, "Linear Resolution With Ordered Clauses", 4th UNB Artificial Intelligence Symposium, September 20-21, 1991, pp. 223-233. This also appears in Proceedings of the Workshop on Disjunctive Logic Programming, held in conjunction with the International Logic Programming Symposium, San Diego, California, Nov. 1, 1991.

77. Robin Cohen, Bruce Spencer and Peter van Beek, "In Search of Practical Specifications", AAAI Spring Symposium Series on Implemented Knowledge Representation and Reasoning Systems, March 26-28, 1991, Stanford University, pp. 313-316.

78. Bruce Spencer, "Avoiding Duplicate Proofs", Proceedings of the North American Conference on Logic Programming, October 29 – November 1, 1990, Austin, Texas, pp. 569-584.

79. Robin Cohen and Bruce Spencer, "Research Interests in Plan Recognition: Assimilating Novel Plans", Proceedings of the 2nd AAAI Workshop on Plan Recognition, International Joint Conference on Artificial Intelligence, August 21, 1989.

80. Bruce Spencer and Peter van Beek, "Applying Truth Maintenance to a Network of Constraints", Proceedings of the Workshop on Constraint Processing Algorithms and Their Applications, International Joint Conference on Artificial Intelligence, August 20, 1989.

81. Bruce Spencer, "Combining Dependency Directed Backtracking with the ATMS", In Experiments in the Theorist Paradigm: A collection of student papers in the Theorist Project, David Poole (ed.), Department of Computer Science, University of Waterloo Research Report CS-87-30, May 1987.

Refereed by Editor
- "Case studies in IoT Big Data: Forecasting Building Temperature and Equipment Breakdown" Bruce Spencer, International Conference on Big Data Analytics and Data Science, Theme : Building the Data-Driven Future of Big Data, November 11-13, 2019, Las Vegas, USA. This paper was promoted into an invited talk.
- "What does Software Engineering Practice offer to Semantic Web Service Composition?" Bruce Spencer, Sandy Liu, Semantic Web Services Workshop in conjunction with the 3rd International Semantic Web Conference (ISWC2004). Hiroshima, Japan. November 7-11, 2004. NRC 48057.
- "Minimal Binary Resolution Trees" Bruce Spencer and J.D. Horton, Proceedings of workshop Deduction Internal Report WV-96-09 Technical University of Dresden, held in conjuction with Kunstliche Intelligenz Sept. 1996, Dresden, Germany. This is a one page abstract appearing on page 5.
- "A Security Policy Model From a NIAM Representation of Access Control", Bruce Spencer, William Stewart, Rod Cooper, Brad Nickerson, Kirby Ward,

Elton Ashby and Don Cumming, Proceedings of the 4th Canadian Computer Security Symposium, Ottawa, May 12-15, 1992, pp. 329-344.
- "Model Elimination with Labels", S. Shi and B. Spencer, Proceedings of the APICS Computing Science Conference, October 26, 1991, Halifax, NS, pp. 84-90.

Invited Talks (Career)
1. "Parallelism, Prolog and the ATMS", Bell Northern Research, Ottawa, September, 1987.
2. "AND Parallelism and the ATMS", University of Waterloo ICR Student Presentations, May 31, 1988.
3. "Assimilation in Plan Recognition", Bell Northern Research, Ottawa, May 5, 1989.
4. "Plan Recognition with an Oracle", University of Toronto, July 13, 1989.
5. "Avoiding Duplicate Proofs", NRC IIT Ottawa, Bell Northern Research Ottawa, May 1991
6. "Extended Truth Maintenance Systems", Université de Moncton, April 23, 1992.
7. "Completeness and Non-Horn Truth Maintenance", University of Saskatchewan, May, 1992.
8. "The Ordered Clause Restriction of Resolution", University of Waterloo, ICR Colloquium, June 9, 1993,
9. – Bell Northern Research, Ottawa, June 7, 1993.
10. "Avoiding Redundancy in a Compiler for Automated Theorem Proving", University of Guelph, June 11, 1993.
11. "Clause Trees", Workshop on Logic Programming with Incomplete Information, held in conjunction with ILPS 1993, Vancouver, British Columbia, October 30, 1993.
12. J.D. Horton and Bruce Spencer, "Clause Trees - A Tool for Doing and Understanding Automated Theorem Proving", UNB Faculty of Computer Science Seminar, Sept. 1994
13. – UNB Dept. of Mathematics and Statistics Departmental Seminar, Nov. 1, 1994.
14. "Clause Trees - A Tool for Automated Reasoning", AIDA Forum, T.H. Darmstadt, Germany, Sept 6, 1995 and
15. – Computer Science Department Seminar, University of Koblenz, Germany, Sept 8, 1995.
16. "Minimal Binary Resolution Trees", University of Kaiserslautern, July 2, 1996
17. – AIDA Forum, T.H. Darmstadt, Germany, July 9, 1996 and
18. – University of Koblenz, September 20, 1996 Artificial Intelligence Seminar and
19. – Computer Science Department Seminar, U. Saarbruecken, October 15, 1996.
20. "Winning at Proving Theorems with Computers" St. Francis Xavier University, March 2000
21. – University of Saskatchewan, April 2000.

22. "The Design of j-DREW: a Deductive Reasoning Engine for the Semantic Web" Dagstuhl-Seminar 02061, Rule Markup Techniques, 3-8 Feb 2002, Schloss Dagstuhl, Germany.
23. "Why Automated Reasoning is Absolutely Essential for Building Web Applications" at CASCON 2003 workshop "Automated Reasoning and its Applications" held October 9, 2003.
24. Semantic Web Interest Group Panel: The Semantic Web: When, Where and How Will It Have Impact, Université de Quebec à Montreal, 19 November 2004.
25. "Software Engineering for Semantic Web Service Composition" Kitamura Laboratory, Kwansei Gakuen University, Sanda, Japan, Nov 4, 2004;
26. –   Institute for Computing Technology, Chinese Academy of Sciences, Beijing, China, Nov 15, 2004;
27. –   Recherche Appliquée en Linguistique Informatique, Université de Montreal, Nov 18, 2004;
28. –   Simon Fraser University, Burnaby, B.C., March 15, 2005;
29. –   McDonald Detweiler and Associates, Richmond, BC, March 16, 2005;
30. –   Acadia University Feb 17, 2006.
31. "Eucalptus: A Middleware for the NEP" Canarie Network-Enabled Platforms Workshop, June 26, 2007.
32. "SAVOIR: Coordination of Collaboration" April 9, 2008 at Computer Science Departmental Colloquium, Concordia University, Montreal.
33. "Services in Support of Collaborative Virtual Organizations" Computer Science Faculty Colloquium, University of New Brunswick, Fredericton, Nov 5, 2008.
34. –   Research Institute of Southeast University SuZhou, China, Nov 28, 2008.
35. –   International Workshop on Collaboration, Health and Knowledge Grid Beijing, China, Institute for Computing Technology, Chinese Academy of Sciences, Dec 2, 2008.
36. "SAVOIR: Coordination of Collaboration" April 9, 2008 at Departmental Colloquium, Concordia University, Montreal.
37. Building the Health Services Virtual Organization: Lessons and Opportunities" Jodrey School of Computer Science, Acadia University, February 4, 2011.
38. _ Text Analysis and Machine Learning Group Seminar, U of Ottawa, March 31, 2011.
39. "The REM Project", Medical Imaging Informatics Teleradiology Conference, Toronto, Ontario, May 14, 2011.
40. "Mashing up Collaboration with Federated Modeling and Simulation" IEEE-NB Seminar, University of New Brunswick, Fredericton, March 28, 2012.
41. Keynote Address : "Shallow and Deep Semantics : Semantic Search Engines and Beyond", 3rd IEEE International eConference on Computer and Knowledge Engineering, Ferdowsi University of Mashhad, Iran, Oct 31, 2013.
42. Invited : "Competing at Semantic Search", UNB Faculty of Computer Science Research Expo, April 2014.

43. Invited : "Data Science Workshop in R", CyberSocial, Moncton, Canada, January 14, 2015.
44. "The OWL Reasoner Evaluation Competition and WSReasoner", Atlantic Workshop on Semantics and Services, Fredericton, December 9, 2015.
45. "WSReasoner: Strategically Using Faster Reasoners For Harder Logics" Semantic Web Meetup, Massachusetts Institute of Technology, Artificial Intelligence Lab, Sept 12, 2016.

"Case Studies in the Internet of Things", NRC Digital Technologies Lunch and Learn seminar series, Ottawa, Ontario, Jan 8, 2018.

Training of Highly Qualified Personnel
Master's Students

1. Suping SHI	Oct 1993	MCS	Avoiding Redundancy in Compilers for Automated Theorem Proving
2. Amit SARDESAI	Oct 1995	MCS	Building an Object Layer on Top of a Relational Database System: The VEDA Prototype
3. It Fung SIOW	Dec 1995	MCS	Incorporating deductive queries into relational databases
4. Baoyun SUN	Oct 1996	MCS	Program Verification Using Otter 2.0
5. Scott BUFFETT	Oct 1998	MCS	Investigating iterative deepening in top-down automated reasoning
6. Qiao Liang ZHANG	May 2001	MCS	
7. Keping JIA	Oct 2003	MCS	A business rule explanation system for Web services
8. Fang WANG	Oct 2003	MCS	Detecting and preventing rule conflicts in APPEL
9. Yue WANG	Oct 2003	MCS	Learning the ontological positions of natural language objects
10. Bo XU	Oct 2006	MCS	Slope one in collaborative filtering
11. Bin LIAO	July 2007	MCS	Using clustering methods to define social networks from ratings of music

12. Biao WANG	Nov 2007	MCS	Multi-level Online Learning
13. Yosri HARZALLAH	Jan 2009	MCS	Assigning Routes and Wavelengths for Collaboration over Optical Networks
14. Cheng LU	May 2009	MCS	Ontology Validation under the Closed-World Semantics
15. Xiping HU	May 2011	MCS	Agent Based Application Programming Network for Ad-hoc Networks
16. Pratik SHAH	May 2015	MSC	Twitter Network Analysis for Online Community Structure

PhD Students

1. Charlie OBIMBO	April 2000	PhD	Access Clause Trees in Disjunctive Deductive Databases
2. Scott BUFFETT	May 2004	PhD	Monte Carlo Algorithms for Expected Utility Estimation in Dynamic Purchasing
3. Bin WANG	July 2009	PhD	Semi-supervised learning and Opinion-oriented Information Extraction
4. Yuanyuan GUO	July 2012	PhD	Semi-supervised Bayesian Learning
5. Weihong SONG	October 2015	PhD	Efficient Classification of Complex Ontologies

Courses Taught
For the Faculty of Computer Science at UNB
Each course is at least 39 contact hours.

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CS1003 Introduction to Programming (FORTRAN)  3x
CS1013 Intermediate Programming (FORTRAN)     4x
CS1053 Introduction to Programming (Modula-2) 2x
CS1063 Intermediate Programming (Modula-2)    2x
CS1073 Introduction to Programming (Java)     2x
CS1083 Intermediate Programming (Java)        3x
CS2013 Software Engineering                   4x
CS1303 Discrete Structures                    3x
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CS3323 Data Structures	3x
CS3995 Professional Practice	1x
CS4725 Artificial Intelligence	2x
CS5015 Introduction to Logic Programming	7x
CS6905 Advanced Technologies for E-Business	2x (*)
CS6999 Semantic Web Techniques	6x (*)
CS6999 Social Network Analysis	2x (*)

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