Curriculum Vitae
Michael Buro
October 15, 2014

Short Biography and Current Research

Michael Buro is a full professor in the computing science department at the University of Alberta in Edmonton, Canada. He received his Ph.D. in 1994 for his work on Logistello — an Othello playing program that later defeated the reigning human World champion 6-0 in 1997 — while he worked as a research scientist at NEC Research Institute in Princeton, NJ. Michael's research is focused on heuristic search, machine learning, and applied game theory. In his current work, he is developing algorithms for adversarial planning, state/action inference and abstraction, and opponent modelling for complex real-time decision domains. Recent research highlights include the construction of the World's strongest Skat playing program (based on recursive Monte Carlo for imperfect information games) and one of the strongest StarCraft programs based on automated build-order planning and heuristic search applied to small-combat scenarios. The best human players are still stronger than machines in trick-based card games like Skat and real-time strategy video games such as StarCraft. Michael's research goal is to close the gap in these and similar domains by combining machine strengths such as fast search and vast infallible memory with effective human problem solving abilities such as abstraction, feature generation, and hierarchical decomposition.

Personal Information

Date of Birth:	Apr. 5, 1965
Place of Birth:	Cologne, Germany
Citizenship:	Germany
Current occupation:	Professor

Education

M.Sc. in Computer Science	Technical University of Aachen (Germany), 1990
Ph.D. in Computer Science	University of Paderborn (Germany), 1994

Academic Experience

Research and teaching assistant	1990–1994	University of Paderborn, Germany
Research Scientist	1995–2002	NEC Research Institute, Princeton NJ, USA
Associate Professor	2002–2013	University of Alberta, Edmonton, Canada
Tenure	2005	University of Alberta, Edmonton, Canada
Full Professor	2013–	University of Alberta, Edmonton, Canada

Research Grants

Year	Agency	Title	Type	Amount/Year
2001–2002	NECI	Reinforcement Learning Applied to Real-Time C&C Problems	individual	US$100,000
2002-2005	University of Alberta	Start-up Grant	individual	CA$19,000
2003-2007	NSERC	Solving Real-Time Decision Problems Learning and Planning	individual	CA$26,000
2004-2006	NSERC	Strategic Grant: AI for Commercial Games	joint	CA$31833
2007-2012	NSERC	Planning and State Evaluation in Real-Time Decision Problems.	individual	CA$24,000
2012-2017	NSERC	Search, Opponent Modelling, Cooperation, and State Inference in Complex Imperfect Information Domains in Real-Time Decision Problems.	individual	CA$17,000
2009-2014	NCE	Monte-Carlo Search in Games	joint	CA$16,300

Honors and Awards

- 10th Anniversary NECI Achievement Award (1999): Logistello among the best five NECI Computer Science projects.

- The 1996 ICCA Journal Award for the article: ProbCut: An Effective Selective Extension of the Alpha-Beta Algorithm, ICCA Journal 18(2) 1995, pp. 71–76

- Logistello invited to participate in the "Hall of Champions" event at the AAAI conference, Providence 1997

Invited Presentations

- "The Inner Workings of Kermit, a World Champion Caliber Skat Program", Drexel University, 7/2014 (1.5h)

- "Challenging Human Supremacy in Skat", University of Denver, 2/2013 (1h)

- "How Machines Learned to Play Othello", University of Denver, 2/2013 (2h)

- "Math meets AI in Games", Grant McEwan University, Edmonton, 4/2010 (1.5h)

- "Advances and challenges in AI for trick-based card games", Navy Research Laboratory, Washington DC, 4/2010 (1.5h)

- Three AI Tutorials at Madrid University 2009 (4.5h)

- Pathfinding Tutorial at AAAI 2008, Chicago (1h)

- "Planning in Real-Time Strategy Games", Workshop on Planning in Games at ICAPS, Providence, September 2007 (1hr)

- "Planning and Machine Learning in RTS Games", (with M. Lanctot) at NIPS, December 2007 (1hr)

- "Game AI Trends and Challenges", keynote presentation IEEE CIG, Honolulu, USA, June 2007 (1 hr)

- "The 2nd ORTS Game AI Competition", AIIDE, Stanford, USA, June 2007 (0.5 hrs)

- "Generalized Amazons is PSPACE-Complete" (with T. Furtak, M. Kyomi, T. Uno), BIRS Workshop on Combinatorial Game Theory, Banff 2005

- "Using RTS Games as RL Benchmarks and Bake-offs," Invited talk at the NIPS workshop on reinforcement learning benchmarks and bake-offs, Whistler 2004

- "RTS Games as Test-Bed for Real-Time Research" (with T. Furtak), Proceedings of the JCIS Workshop on Game AI, Cary 2003, pp. 481–484

- "Machine Learning in Games," BNMI Workshop on Artificial Intelligence, Banff 2002

- "How Machines have Learned to Play Othello," Invited talk at the Game Programming Workshop, Hakone 1997

- "Logistello - A Strong Learning Othello Program," Invited lecture at Nihon University, Tokyo 1997

Refereed Journal Publications

- D. Gomboc, M. Buro, T.A. Marsland, Tuning Evaluation Functions by Maximizing Concordance, Theoretical Computer Science Journal, Volume 349, Issue 2, pp. 202–229, 2005

- M. Buro, Improving Heuristic Mini-Max Search by Supervised Learning, Artificial Intelligence, Vol. 134 (1-2) 2002, pp. 85–99

- M. Buro, Efficient Approximation of Backgammon Race Equities, ICCA Journal 22(3) 1999, pp. 133–142

- M. Buro, Toward Opening Book Learning, ICCA Journal 22(2), 1999, pp. 98–102

- M. Buro and H. Kleine Büning, On Resolution with Short Clauses, Annals of Mathematics and Artificial Intelligence 18 2–4, 1996, pp. 243–260

- M. Buro, Statistical Feature Combination for the Evaluation of Game Positions, JAIR 3, 1995, pp. 373–382

- M. Buro, ProbCut: An Effective Selective Extension of the Alpha-Beta Algorithm, ICCA Journal 18(2) 1995, 71-76

- M. Buro, On the Maximum Length of Huffman Codes, Information Processing Letters 45, 1993, pp. 219–223

Refereed Conference Publications

- N. Barriga, M. Stanescu, and M. Buro, Parallel UCT Search on GPUs. IEEE Symposium on Computational Intelligence and Games (CIG), 2013

- M. Stanescu, N. Barriga, and M. Buro, Hierarchical Adversarial Search Applied to Real-Time Strategy Games. Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE), 2014

- M. Stanescu, N. Barriga, and M. Buro. Introducing Hierarchical Adversarial Search, a Scalable Search Procedure for Real-Time Strategy Games (poster), European Conference on AI (ECAI), 2014

- G. Erickson and M. Buro, Global State Evaluation in StarCraft. Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE), 2014

- T. Furtak, and M. Buro, Recursive Monte Carlo Search for Imperfect Information Games, IEEE Conference on Computational Intelligence in Games (CIG), 2013

- D. Churchill and M. Buro. Portfolio Greedy Search and Simulation for Large-Scale Combat in StarCraft, IEEE Conference on Computational Intelligence in Games (CIG), 2013

- A. Saffidine, H. Finnsson, and M. Buro, Alpha-Beta Pruning for Games with Simultaneous Moves, AAAI, Toronto, 2012, pp. 556-562

- D. Churchill, A. Saffidine, and M. Buro, Fast Heuristic Search for RTS Game Combat Scenarios, AIIDE, Stanford, 2012, pp. 112-117

- D. Churchill and M. Buro, Build Order Optimization in StarCraft, AIIDE 2011, pp. 14-19

- T. Furtak and M. Buro, Using Payoff-Similarity to Speed Up Search, IJCAI 2011, pp. 534-539

- J. Long and M. Buro, Real-Time Opponent Modeling in Trick-Taking Card Games, IJCAI 2011, pp. 617-622

- T. Furtak and M. Buro, On the Complexity of Two-Player Attrition Games Played on Graphs, AIIDE 2010

- J.R. Long, N.R. Sturtevant, M. Buro, and T. Furtak, Understanding the Success of Perfect Information Monte Carlo Sampling in Game Tree Search, AAAI, 2010, pp. 134-140

- M. Buro, J.R. Long, T. Furtak, and N.R. Sturtevant, Improving State Evaluation, Inference, and Search in Trick-Based Card Games, IJCAI, Pasadena USA, 2009, pp. 1407-1413

- T. Furtak and M. Buro, Minimum Proof Graphs and Fastest-Cut-First Search Heuristics, IJCAI, Pasadena USA, 2009, pp. 492-498

- M. Buro and A. Kovarsky, Concurrent Action Execution with Shared Fluents, AAAI, Vancouver Canada, 2007, pp. 950-955

- M.R. Jansen and M. Buro, HPA* Enhancements, AIIDE, Stanford USA, 2007, pp. 2-5

- F. Sailer, M. Buro, and M. Lanctot, Adversarial Planning Through Strategy Simulation, CIG, Hawaii USA, 2007, pp. 80-87

- D. Demyen and M. Buro, Efficient Triangulation-Based Pathfinding. Proceedings of the AAAI conference, Boston 2006, pp. 942-947

- N.R. Sturtevant and M. Buro, Improving Collaborative Pathfinding Using Map Abstraction, Proceedings of the AIIDE conference, Marina del Rey 2006, pp. 45-50

- M. Buro, J. Bergsma, D. Deutscher, T. Furtak, F. Sailer, D. Tom, and N. Wiebe, AI System Designs for the First RTS-Game AI Competition, Proceedings of the GameOn Conference, Braunschweig Germany, 2006, pp. 13-17

- A. Kovarsky and M. Buro, A First Look at Build-Order Optimization in Real-Time Strategy Games, Proceedings of the GameOn Conference, Braunschweig Germany, 2006, pp. 18-22

- N.R. Sturtevant and M. Buro, Partial Pathfinding Using Map Abstraction and Refinement, AAAI, Pittsburgh, 2005, pp. 1392-1397

- M. Buro and T. Furtak, On the Development of a Free RTS Game Engine, Proceedings GameOn'NA Conference, Montreal, 2005, pp. 47-51

- T. Furtak, M. Kiyomi, T. Uno, and M. Buro, Generalized Amazons is PSPACE-Complete, IJCAI, Edinburgh, 2005, pp. 132-137

- A. Kovarsky and M. Buro, Heuristic Search Applied to Abstract Combat Games, Proceedings of the Eighteenth Canadian Conference on Artificial Intelligence, Victoria 2005, pp. 66–78

- M. Chung, M. Buro, and J. Schaeffer, Monte Carlo Planning in Real-Time Strategy Games, Proceedings of the Computational Intelligence in Games Conference, Colchester 2005, pp. 117–124

- M. Buro and T. Furtak, RTS Games and Real-Time AI Research, Proceedings of the Behavior Representation in Modeling and Simulation Conference (BRIMS), Arlington VA 2004, pp. 63–70

- T. Hauk, M. Buro, and J. Schaeffer, Rediscovering *-MiniMax Search, Computers and Games Conference, Ramat-Gan 2004, pp. 35-50

- T. Hauk, M. Buro, and J. Schaeffer, *-MiniMax Performance in Backgammon, Computers and Games Conference, Ramat-Gan 2004, pp. 51-65

- D. Gomboc, T.A. Marsland, and M. Buro, Evaluation Function Tuning via Ordinal Correlation, Proceedings of the Advances in Computer Games Conference 10, Graz 2003, pp. 1–18

- A.X. Jiang and M. Buro, First Experimental Results of ProbCut Applied to Chess, Proceedings of the Advances in Computer Games Conference 10, Graz 2003, pp. 75–103

- M. Buro, Solving the Oshi-Zumo Game, Proceedings of the Advances in Computer Games Conference 10, Graz 2003, pp. 223–239

- M. Buro, Real-Time Strategy Games: A New AI Research Challenge, Proceedings of the International Joint Conference on AI, Acapulco 2003, pp. 1534–1535

- M. Buro, ORTS: A Hack-Free RTS Game Environment, Proceedings of the International Computers and Games Conference, Edmonton 2002, pp. 280–291

- M. Buro, Simple Amazons Endgames and their Connection to Hamilton Circuits in Cubic Subgrid Graphs, Proceedings of the Second International Conference on Computers and Games, Hamamatsu 2000, pp. 250–261

- M. Buro, From Simple Features to Sophisticated Evaluation Functions, Proceedings of the First International Conference on Computers and Games (LNCS volume 1558), Tsukuba 1998, pp. 126–145

- M. Buro, Logistello: A Strong Learning Othello Program, Proceedings of the 19th Annual Conference Gesellschaft für Klassifikation e.V., Basel 1995, pp. 37–38

Refereed Workshop Publications

- D. Churchill and M. Buro, Incorporating Search Algorithms into RTS Game Agents, AIIDE Workshop on Artificial Intelligence in Adversarial Real-Time Games, Stanford, 2012, pp. 2–7

- N.R. Sturtevant, V. Bulitko, M. Buro, Automatic State Abstraction for Pathfinding in Real-Time Video Games, Research Abstract, SARA 2005, Lecture Notes in Computer Science, Volume 3607, 2005, pp. 362–364

- M. Buro, Call for AI Research in RTS Games, Proceedings of the AAAI-04 workshop on AI in Games, San Jose 2004, pp. 139–141

- M. Buro and I. Durdanovic, An Overview of NECI's Generic Game Server, Proceedings of the 6th Computer Games Olympiad Workshop, Maastricht 2001, pp. 23–28

- M. Buro, Experiments with Multi-ProbCut and a New High-Quality Evaluation Function for Othello, Proceedings of the Workshop on Computer Games, NECI Princeton, 1997 (`www.cs.ualberta.ca/~mburo/publications.html`)

- M. Buro, Toward Opening Book Learning, Proceedings of the IJCAI Workshop on Computer Games, Nagoya 1997, pp. 43–48

Refereed Book Chapter Publications

- P.I. Cowling, M. Buro, M. Bida, A. Botea, B. Bouzy, M.V. Butz, P. Hingston, H. Muoz-Avila, D. Nau, and M. Sipper, Search in Real-Time Video Games. In: Artificial and Computational Intelligence in Games, a follow-up to Dagstuhl Seminar 12191, Eds: S.M. Lucas, M. Mateas, M. Preuss, P. Spronck, J. Togelius, pp. 1-19, 2013

- A. Botea, B. Bouzy, M. Buro, C .Bauckhage, and D. Nau. Pathfinding in Games. In: Artificial and Computational Intelligence in Games, a follow-up to Dagstuhl Seminar 12191, Eds: S.M. Lucas, M. Mateas, M. Preuss, P. Spronck, J. Togelius, pp. 21-31, 2013

- M. Buro and D. Demyen, Fast Pathfinding Based on Triangulation Abstractions Doug Demyen (BioWare Corp.), AI Game Programming Wisdom 4, 2008, pp. 143–158

- F. Sailer, M. Lanctot, and M. Buro, Simulation-Based Planning in RTS Games, AI Game Programming Wisdom 4, 2008, pp. 405-418

- M. Buro, The Evolution of Strong Othello Programs, in: Entertainment Computing – Technology and Applications, R. Nakatsu and J. Hoshino (ed.), Kluwer 2003, pp. 81–88

- M. Buro, Experiments with Multi-ProbCut and a New High-Quality Evaluation Function for Othello, In: Games in AI Research, H.J. van den Herik, H. Iida (ed.), 2000, pp. 77–96

- M. Buro, Toward Opening Book Learning, In: Machines that Learn to Play Games, J. Fürnkranz and M. Kubat, Nova Science Publishers, Inc., 1998, pp. 81–89

Other Publications

- J. Schaeffer, V. Bulitko, M. Buro, Bots Get Smart, IEEE Spectrum, 2008, pp. 44-49

- M. Buro and M. Lanctot, and S. Orsten, The Second Annual Real-Time Strategy AI Competition, Proceedings of the 3rd Annual North-American GAME-ON Conference 2007, pp. 77–81

- M. Buro, How Machines have Learned to Play Othello, IEEE Intelligent Systems J. 14(6), 1999, pp. 12–14

- M. Buro, The Othello Match of the Year: Takeshi Murakami vs. Logistello, ICCA Journal 20(3), 1997, pp. 189–193

- M. Buro (Editor), Papers of the Workshop on Computer Games, NECI, Princeton 1997 (`www.cs.ualberta.ca/~mburo/publications.html`)

- M. Buro, An Overview of Logistello, 1997 (`www.cs.ualberta.ca/~mburo/publications.html`)

- M. Buro (Editor), The Fourth International Paderborn Computer Othello Tournament, 1996 (`www.cs.ualberta.ca/~mburo/publications.html`)

- M. Buro, L'apprentissage des ouvertures chez Logistello, Magazine de la Fèdèration Française d'Othello FFORUM 37, 1995, pp. 18–20

- M. Buro (Editor), The Third International Paderborn Computer Othello Tournament, 1995 (`www.cs.ualberta.ca/~mburo/publications.html`)

- M. Buro and H. Kleine Büning, Report on a SAT Competition, Bulletin of the EATCS 49, 1993, pp. 72–80

Theses

- M. Buro, "Methods for the evaluation of game positions by means of examples," Ph.D. thesis in German, University of Paderborn, 1994

- M. Buro, "A contribution to the determination of Rado's Sigma(5) – or – How to catch busy beavers?," Diploma thesis in German, Technical University of Aachen, 1990

Industrial Work Experience

I worked at the NEC Research Institute in Princeton from 1995 until 2002 starting off as a programmer, which explains the small number of publications between 1996 and 1998. While working on multi-agent learning and e-commerce applications, I also had the opportunity to further enhance the selective search and machine learning algorithms I pioneered in my Ph.D. thesis. The result of this research was the strong Othello program Logistello which defeated the World-champion in 1997. After this successful event I wrote server/client software to connect Logistello to NEC's Internet portal Biglobe in Japan, where it from 1998 until 2001 played $\approx$ 20,000 games each month. As part of NEC's effort to improve its Internet visibility, I also co-developed a generic game service, which is discussed in more detail below.

Software Applications

- **Logistello (1992–2000)** was the World's strongest Othello playing program at the time. It defeated human World champion Takeshi Murakami 6-0 in 1997. Logistello's source code is available here: `www.cs.ualberta.ca/~mburo/log.html`.

- **Generic Game Server (GGS) (1999–2002)** [Joint work with I. Durdanovic, NEC-Labs, Princeton]

  GGS is a generic game server that supports a range of boardgames such as Othello, Amazons, Chess, Checkers, and Go, and allows human players and connected programs to compete. Servers like GGS are useful for driving AI research by providing game transcripts which can be used for tuning search algorithms and learning strategies and opponent models. The project's URL is `www.cs.ualberta.ca/~mburo/ggs`.

- **ORTS (2001–2009)** [Team effort at the University of Alberta]

  ORTS (Open Real-Time Strategy) is a free software RTS game engine that was developed in the GAMES group at the University of Alberta. Its purpose is to give the AI research community access to a state-of-the-art RTS game environment for conducting real-time AI experiments. ORTS consists of $\approx 137,000$ lines of C++ and script code, and lots of 3d graphics artwork. ORTS has been used successfully in my undergraduate advanced game programming course and as experimental platform in several studies. It was also the platform for four international RTS game AI competitions. The project's URL is `www.cs.ualberta.ca/~mburo/orts`.

- **International Skat Server (2007–2009)** [Team effort at the University of Alberta]

  To promote research in the area of card game AI I have developed ISS — the International Skat Server — which is the only meeting place for Skat players and programs. Users can play against each other and our programs for free. ISS is also a learning tool for human Skat players who can practice to play against strong opponents. Our Skat programs are evaluated by monitoring how well they play against skat experts on ISS. ISS client software is free software that can be downloaded from `http://skatgame.net/iss`.

- **Kermit (2008–present)** [Team effort at the University of Alberta]

  Kermit is the first Skat playing program that has reached expert human playing level. Kermit's playing strength is based on aggressive bidding, card inference, and Perfect Information Monte Carlo (PIMC) search. Hand evaluation and card inference parameters have been estimated from a large set of games played by humans on an online Skat server. Recently we have increased Kermit's speed 30-fold and added an opponent modeling module that is able to exploit weaker players and loses less against stronger opponents. The speed increase enabled us to test our new recursive Monte Carlo search algorithm for imperfect information games

- **UAlbertaBot (2009-present)** [Team effort at the University of Alberta]

  UAlbertaBot is an AI system capable of playing StarCraft — a popular real-time strategy video game — competitively. Unlike other bots that mostly follow scripted policies, our program uses heuristic search to optimize build-orders and bases attack/retreat decisions on the outcome of combat simulations. In recent years UalbertaBot finished three times among the best 3 entries in the annual StarCraft AI competition, and won the event in 2013. The UAlbertaBot code can be downloaded from `https://code.google.com/p/ualbertabot`.

Academic Service Activities

Refereeing Scholary Publications

Journals

- Artificial Intelligence Journal (AIJ 2002, 2005, 2010)

- Computational Intelligence (CI 2004)

- IEEE Transactions on Computational Intelligence and AI in Games (TCIAIG 2010, 2011, 2012)

- International Computer Games Association (ICGA 2000, 2002, 2003, 2004, 2006)

- Journal of Artificial Intelligence Research (JAIR 2005, 2006, 2011)

- Theoretical Computer Science (TCS 2000, 2004)

Workshops and Conferences

- Advances in Computer Games Conference (ACG 1999, 2002, 2005)

- Artificial Intelligence In Digital Entertainment (AIIDE, 2007, 2008, 2010, 2011, 2012, 2013, 2014)

- Computational Intelligence in Games Conference (CIG 2005, 2006, 2007, 2008, 2010, 2011, 2013, 2014)

- European Conference on AI (ECAI 2004)

- GameOn Conference (2006, 2008)

- ICAPS Workshop on Planning in Games (2007, 2010)

- IJCAI Workshop on Reasoning, Representation, and Learning in Computer Games (2005)

- International Joint Conference on Artificial Intelligence (IJCAI 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013)

- International Conference on Machine Learning (ICML 1999, 2006)

- International Conference on Computers and Games (CG 1998, 2002, 2004)

- International Workshop on Entertainment Computing (IWEC 2002)

- National Conference of the American Association of Artificial Intelligence (AAAI 2004, 2005, 2006, 2008, 2009, 2010, 2012, 2013, 2014)

Thesis Committees

- R. Valenzano, internal Ph.D. examiner, 9/2014

- P. Mazrooei, internal M.Sc. examiner, 9/2013

- G. van Eyck, internal M.Sc. examiner, 7/2013

- N.D. Truong (NUS), external Ph.D. examiner, 4/2013

- C. Wang (NICTA), external Ph.D. examiner 6/2012

- R. Vogt, internal Ph.D. candidacy examiner, 2/2012

- M. Johanson, internal Ph.D. candidacy examiner, 11/2011

- J. Bajpai, external Ph.D. candidacy examiner (Math), 11/2011

- S.F. Gudmundsson (University of Iceland), external Ph.D. candidacy examiner, 8/2011

- F. Yang, internal Ph.D. examiner, 12/2010

- P. Henderson, internal Ph.D. examiner, 8/2010

- D. Tom, internal M.Sc. examiner, 4/2010

- M. Kirce, internal M.Sc. examiner, 1/2010

- T.C. Tien (National University of Singapore), external Ph.D. examiner, 2/2010

- E.E. Nino, external M.Sc. examiner (Electrical Engineering), 8/2009

- M. Jansen, internal M.Sc. examiner, 9/2008

- L.Y. Jin (NUS), external Ph.D. examiner, 4/2007

- J. van Ryswyck, internal Ph.D. examiner, 8/2006

Other

- NSERC Strategic Grant reviewer (2006, 2010)

- Section Editor: International Computer Games Association (ICGA) Journal (2002–2012)

- Associate Editor: IEEE Transactions on Computational Intelligence and AI in Games (TCIAIG) (2013-2014)

Workshop and Competition Organization

- Organizer of the Workshop on RTS Game AI at AIIDE 2012, 2014

- Organizer of the Rocky Mountain Regional ICPC Programming Contest (Alberta) (2013, 2014)

- Organizer of four StarCraft AI competitions (AIIDE 2011,2012,2013,2014)

- Co-Organizer of the ICAPS Workshop on Planning in Games (2010, 2013)

- Organizer of four ORTS RTS Game Competitions (AIIDE 2006-2009)

University of Alberta Committees

- Faculty of Science Advisory Selection Committee 7/13–

- ICT Steering Committee, 7/11-6/12

- CS Graduate Committee, 7/11-6/12

- CS Server Renewal Project Committee, 9/10–6/11

- CS Undergraduate Committee, 7/05–7/08, 1/10–6/11

Contributions to the Training of Highly Qualified Personnel

Current Ph.D. Students:

- M. Stanescu, 3/13–

- N. Barriga, 3/13–

- D. Churchill, 5/10–, "Planning with Abstractions in Real-Time Game Domains"

Past Ph.D. Students:

- T. Furtak, 9/07– 8/13, "State Evaluation and Search in Imperfect Information Games'

- J.R. Long, 4/07– 8/11, "Search, Inference, and Opponent Modelling in an Expert-Calibre Skat Player"

- M. Lanctot, 4/07–10/08, "Planning and Abstraction in RTS Games" (switched supervisor)

- A. Kovarsky, 9/04–7/07, "Build-Order Optimization in RTS Games" (left program)

Current M.Sc. Students

- J. Peters, 4/11–, "Monte Carlo Tree Search in Synthetic Game Trees"

Past M.Sc. Students

- G. Erickson, 3/13–9/14, "State Evaluation and Opponent Modelling in Real-Time Strategy Games"

- S. Orsten, 4/09-1/11, "Dynamically Learning Efficient Server/Client Network Protocols for Networked Simulations"

- A. Isaza, 4/08-8/08 (co-supervised with R. Greiner), "Cover Heuristic"

- K. Chen, 4/07-1/09, "Robust Triangulation-Based Pathfinding"

- J. Schaeffer, 1/07-9/07 "UCT Applied to Games with Imperfect Information", University of Leipzig, Germany

- T. Furtak, 4/05-9/07, "Sorting Using SIMD Registers"

- D. Demyen, 4/05–9/06, "Efficient Triangulation-Based Pathfinding"

- F. Sailer, 4/05–6/07, "Adversarial Planning in RTS Games Through Simulation"

- S. Chinthapally, 2/04–1/06, "Overfitting in Generalized Linear Evaluation Models"

- J. Yip, 3/03–03/05, "Scripting in RTS Games" (left program)

- M. Chung, 2/03–2/05, (co-supervised with J. Schaeffer) "Monte Carlo Planning in RTS Games"

- T. Hauk, 4/03–1/04, (co-supervised with J. Schaeffer) "Search in Trees with Chance Nodes"

- D. Gomboc, 4/03–1/04, (co-supervised with T. Marsland) "Evaluation Function Tuning via Ordinal Correlation"

- A. Kovarsky, 1/03–7/04, "Heuristic Search Applied to Abstract Combat Scenarios"

B.Sc. Thesis Supervision

- J. Schaefer, 1/05–9/05, "Monte Carlo Skat", University of Leipzig, Germany

Undergraduate/Highschool Student Project Supervision

- 2014: D. Schneider (NSERC), M. Redshaw (NSERC)

- 2013: S. Kewatin, E. Chui, D. Lee

- 2012: M. Beneteau, D. Lee, J. Lorenz

- 2011: R. Lagerquist, J. Lorenz

- 2010: J. Schmidek (NSERC), I. Morrison, E. Farnsworth, R. Lagerquist

- 2007: K. Mirzayans (NSERC), S. Orsten (NSERC), N. Taylor

- 2006: N. Wiebe (NSERC), K. Anderson, D. Tom, J. Bergsma, K. Mirzayans, S. Healy, N. Rossol, M. Packer

- 2005: L. Brown (NSERC), A. Schumacher (NSERC), T. Furtak, A. Hakman, J. Liske, E. Benner, M. Marshall, K. McMillan, R. Ma (WISEST)

- 2004: T. Furtak (NSERC), K. Yerex, S. Wagia-alla, T. Huang

- 2003: T. Furtak (NSERC), R. Vogt (NSERC), H. Wentland

- 2000: S. Sanbeg (Rutgers University)

Other

- Post-doctoral fellow (co-supervision with Jonathan Schaeffer): Dr. N.R. Sturtevant (2004–2010)
  Topics: Pathfinding in video games and AI for card games

- Post-doctoral fellow: Dr. S. Katajama (2001–2002)
  Topic: Reinforcement Learning Applied to Real-Time Command & Control Problems.

Teaching

Undergraduate Courses

- CMPUT 101. Introduction to Computing Science (2009)

- CMPUT 115. Programming with Data Structures (2011)

- CMPUT 201. Practical Programming Methodology (2002, 2003, 2004, 2005, 2006, 2013, 2014)

- CMPUT 204. Algorithms 1 (2006, 2007, 2010)

- CMPUT 272. Formal Systems and Logic in Computing Science (2008, 2010)

- CMPUT 325. Non-Procedural Programming Languages (2007)

- CMPUT 350/399. Advanced Game Programming (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014)

Graduate Courses

- CMPUT 605. Individual Study Course: Topics in RTS Games (2003, 2004, 2006)

- CMPUT 657. Heuristic Search (2009, 2010, 2013)

- CMPUT 670. Efficient Algorithms (2004)

- CMPUT 673. Computational Complexity Theory (2003, 2005)

- CMPUT 675: AI Search Algorithms (2007)