Matthew Hamilton

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Work experience

- **Systems Engineer, Avalon Holographics Inc.**
  R&D for creation of 3D light field display and associated graphics technology, including rendering, compression and processing of light field data, display simulation and optical display design. Presented at light display ecosystem workshop (SMFoLD 2017). Published papers on holographic display simulation and review of holographic display technology and applications. Filed and granted multiple patents. Scientific Research and Experimental Development (SR&ED) Tax Incentive Program claim documentation responsibilities. (April 2015-Present)
- **Senior Research Scientist, NSERC/RDC-NL Postdoctoral Industrial R&D Fellow, GRI Simulations Inc.**
  R&D for underwater remotely operated vehicle (ROV) simulation and oil and gas field development software. Developed graphics software for improving subsea simulation realism. Developed new support for integration of data and simulation visualization, including seismic, acoustic and laser imaging data and mechanical analysis simulation (soil, FEA and CFD). Published and presented two papers at OTC Arctic Technology Conference on integrated visualization and simulation environments for subsea development. Also did significant R&D planning, proposal writing and SR&ED claim documentation. (August 2012-April 2015).
- **Founder and President, Birch Scientific**
  Project management and development of software for several Alberta-based Oil and Gas start-ups developing software to enhance activities in directional drilling (September 2013-Present). Development and support of 24/7/365 web application for O&G drilling activities for IPM Magnetics Inc. Development of IP in signal processing and multiscale representation.
- **Visiting Researcher**
  Supervisor: Phil Bording, Husky Energy Research Chair, Department of Earth Science, Memorial University of Newfoundland
  Led a workshop on software development for the IBM Cell microprocessor. Supervised students on various projects from high-performance computing to scientific visualization applications (June 2007).
- **Programmer**
  Supervisor: Pierre Boulanger and Walter Bishof, Department of Computing Science, University of Alberta
  Modified/maintained a DirectX-based system (Mandala) used for psychophysical studies of spatial navigation tasks in a virtual reality environment (October 2006-February 2007).
- **Research Assistant**
  Supervisor: Todd Wareham, Department of Computer Science, Memorial University of Newfoundland
  Investigated the parameterized complexity of the frequent itemset data mining problem. (Summer 2005).
- **Programmer**
  Supervisor: Phil Bording, Husky Energy Research Chair, Department of Earth Science,

Memorial University of Newfoundland
Wrote OpenGL, C and TCL/Tk-based code for the visualization of three-dimensional seismic data. Worked with Kirk Jordan of IBM Deep Computing to port parallel MPI code in C and Fortran to the IBM Blue Gene/L system for interactive visualization of seismic elastic wave models using IBM's Deep Computing Visualization (DCV) system. (January 2005-December 2005)

◇ **Teaching Assistant/Junior Instructor**
Supervisor: Selena Delahunty, Mathematics Learning Centre, Memorial University of Newfoundland
Tutored students in foundations-level mathematics courses. (Summer 2003-December 2005)

◇ **Research Assistant**
Supervisor: Todd Wareham, Department of Computer Science, Memorial University of Newfoundland
Investigated practical algorithms for biologically-motivated common subgraph data mining problems. (Summer 2004)

◇ **Teaching Assistant**
Supervisor: Chris Callahan, Department of Mathematics and Statistics, Memorial University of Newfoundland
Marked Assignments for Math 1000: Calculus 1. (Winter 2004)

◇ **Undergraduate Student Assistant**
Department of Computer Science, Memorial University of Newfoundland
Helped walk-in students with computer science related questions. (Fall 2003, Winter 2004 and Winter 2005)

◇ **Teaching Assistant**
Supervisor: Norman Rehner, Department of Computer Science, Memorial University of Newfoundland
Marked Assignments for Discrete Structures II: Computer Science 2741. (Fall 2003)

◇ **Teaching Assistant**
Supervisor: Manrique Mata-Montero, Department of Computer Science, Memorial University of Newfoundland
Marked Assignments for Discrete Structures II: Computer Science 2741. (Winter 2003)

Education

◇ **American Society of Mechanical Engineers**

· Vortex-Induced Vibrations (June 7, 2014, San Francisco, CA)

· Fundamentals of Deepwater Riser Engineering (June 8, 2014, San Francisco, CA)

◇ **University of Alberta**

· PhD Computing Science (2006-2013)
Advisor: Pierre Boulanger
Dissertation: *Real-Time Time-Warped Multiscale Signal Processing for Scientific Visualization*

· Completed Alberta Innovates-Technology Futures course "Innovation 601 - Innovation for Researchers" (2011)

· Taught course "GPU Programming" for the University of Alberta Academic Information and Communication Technologies (AICT) Visualization Tools and Techniques Workshop August 2011.

◇ **Memorial University of Newfoundland**

· B.Sc (Honors) Pure Mathematics/Computer Science (2005).
Advisor: Todd Wareham
Dissertation: *The Parameterized Complexity of Enumerating Frequent Itemsets*

- Participated in joint MUN/IUG IT/Computer Science program at Memorial's Harlow, England Campus, Fall 2004.

◇ **Scholarships and Fellowships**

- NSERC/RDC-NL Postdoctoral Industrial R&D Fellowship (2013-2015)
- iCore PhD Graduate Scholarship in ICT (2008-2011)
- Alberta Advanced Education Graduate Student Scholarship (2008)
- NSERC Post-Graduate Scholarship Extension (PGS-M) (2007)
- Walter H. Johns Graduate Fellowship (2007)
- iCore Graduate Student Award (2007)
- Walter H. Johns Graduate Fellowship (2006)
- University of Alberta Faculty of Science Graduate Scholarship (2006)
- iCore Graduate Student Award (2006)
- NSERC Canada Graduate Scholarship (CGS M) (2006)
- WJ Blundon Scholarship (2002-2003)
- M.O. Morgan Scholarship (2002-2003)
- Centenary of Responsible Government Scholarship (2001-2002)
- Electoral District Scholarship (2001)
- Memorial University Entrance Scholarship (2001)

◇ **Awards and Honors**

- NSERC Undergraduate Student Research Award, Summer 2005.
- NSERC Undergraduate Student Research Award, Summer 2004.
- 2nd Place in Memorial University Computer Science Department's 25th Anniversary Programming Competition.
- Memorial University Dean of Science Book Prize 2004-2005.
- Named to Memorial University Faculty of Science Dean's List 2001-2002, 2002-2003, and 2003-2004.
- Advanced Placement (AP) Scholar Award (2001)
- Honourable Mention in 2001 WJ Blundon Mathematics Competition

PATENTS

Haas, W. Campbell-Correa, J. Hamilton, M. Hill, S. Peckham, J. Rumbolt, C. "Directional pixel for multiple view display"' U.S. Patent US10,244,230 B2

Hamilton, M. Rumbolt, C. Benoit, D. Troke, M. Lockyer, R. "Layered Scene Decomposition CODEC System and Methods"' U.S Patent Application No. 5/683,992, Publication No. 20190068973A1
2 additional patents pending.

PUBLICATIONS

Hamilton, M. Butyn, T. Baker, R. (2018) "Holographic Displays: Emerging Technologies and Use Cases in Defense Applications" NATO MSG-159 2018 Annual M&S Conference.

Hamilton, M., Rumbolt, C. Butyn, T. Benoit, D. Lockyer, R. Troke, M. (2018) "Light Field Display Simulator for Experience and Quality Evaluation"'. Display Week SID Symposium Digest of Technical Papers, Vol. 29, 1523-1526.

Hamilton, M., Rumbolt C., Baker, R. (2017) "Codec Requirements for Dense Light Field Displays, ISO/IEC JTC1/SC 29/WG 11 m41773, Macau, CN – October 2017

Hamilton, M., Rumbolt C. (2017) "Dense Light Field Displays and the Need for HNSS, ISO/IEC JTC1/SC 29/WG 11 m41772, Macau, CN – October 2017

Hamilton, M. Maynard, A., Jujuly, M., Adeoti, I., Rahman, A., Adey, M. (2016) "Integrated Design and Analysis for Virtual Arctic Simulation Environment." Proceedings of the OTC Arctic Technology Conference, St. John's, Canada.

Hamiton, M., Dodd, S. (2015) "Virtual Arctic Simulation Environment." Proceedings of the OTC Arctic Technology Conference, Copenhangen, Denmark.

Hamilton, M. (2013) "Real-Time Time-Warped Multiscale Signal Processing for Scientific Visualization." Advisor: Pierre Boulanger. PhD dissertation, Department of Computing Science, University of Alberta.

Ridgway, D., Broderick, G., Lopez-Campistrous, A., Ru'aini, M., Winter, P., Hamilton, M., Boulanger, P., Kovalenko, A., Ellison, M.J. (2008) "Coarse-grained molecular simulation of diffusion and reaction kinetics in a crowded virtual cytoplasm", Biophysical Journal 2008, May 15;94(10):3748-59.

Hamilton, M., Zhan, L., Maynard, A., Bording, P.R. (2007) "Three Dimensional Cache-Coherency for Multicore Volume Rendering." Proceedings of the Seventeenth Annual IEEE Newfoundland Electrical and Computer Engineering Conference (NECEC 2007).

Hamilton, M., Muller, M., van Rooij, I., and Wareham, T. (2007) "Approximating Solution Structure." In E. Demaine, G.Z. Gutin, D. Marx, and U. Stege (eds.) Structure Theory and FPT Algorithmics for Graphs, Digraphs, and Hypergraphs. Dagstuhl Seminar Proceedings no. 07281. Internationales Begegnungs- und Forschungszentrum fur Informatik (IBFI), Schloss Dagstuhl, Germany. URL: http://drops.dagstuhl.de/portals/07281/

Hamilton, M., Muller, M., van Rooij, I., and Wareham, T. (2007) "Approximating Solution Structure." Technical Report 2007-002, Department of Computer Science, Memorial University of Newfoundland.

Hamilton, M., Chaytor, R., and Wareham, T. (2006) "The Parameterized Complexity of Enumerating Frequent Itemsets." In H. Bodlaender and M. Langston (eds.) Proceedings of the 2nd International Workshop on Parameterized and Exact Computation (IWPEC'06). Lecture Notes in Computer Science no. 4169. Springer-Verlag; Berlin. 227-238

Hamilton, M. (2005)"The Parameterized Complexity of Enumerating Frequent Itemsets." Advisor: Todd Wareham. Honors dissertation, Department of Computer Science, Memorial University of Newfoundland, December 2005.

Hamilton, M., Churchill D., Bording, P.R., Jordan, K. (2005) "A System for Real-time Parallel Scientific Computation and Visualization using the IBM Blue Gene/L Supercomputer." Proceedings of the Fifteenth Annual IEEE Newfoundland Electrical and Computer Engineering Conference (NECEC 2005).

Churchill, D., Gillard, P., Hamilton, M., and Wareham, T. (2004) "Prototyping Parallel Sequence Edit-Distance Algorithms in FPGA Hardware." Proceedings of the Fourteenth Annual IEEE Newfoundland Electrical and Computer Engineering Conference (NECEC 2004).

Press Articles

"Simulated Environment, Real Gains in Arctic", by Louise S. Durham, American Association for Petroleum Geoscientists (AAPG) Explore, February 2015.

"Computer Science partners with software company to develop simulation technology", by Kelly Foss at http://www.mun.ca/science/news.php?id=2598

"Deep Research with IBM," by Michelle Osmond appeared on today.mun.ca, October 18, 2005 featuring work appearing in Hamilton, Churchill *et. al* above.

Posters

Hamilton, M., Rumbolt, C. Butyn, T. Benoit, D. Lockyer, R. Troke, M. (2018) "Light Field Display Simulator for Experience and Quality Evaluation" Display Week 2018 Poster Session.

Hamilton, M. Bouglanger, P. (2011) "High Performance Time-Warped Multiscale Signal Processing for Visualization"' Alberta Innovates Tech Futures Summit 2011 Student Poster Session.

Ridgway, D., Broderick G., Hamilton, M., Boulanger P., Ellison, M. (2008) "Spatial Systems Biology: Particle-Based Models of Crowded Protein Reaction Kinetics." Omics and Systems Biology, Canadian Proteome Society Regional Meeting, 2008.

Presentations

Light Field Displays: From Current Developments to the Next Generation at 2017 Streaming Media Field of Light Display (SMFoLD) Workshop, Sterling, U.S.A.

Integrated Design and Analysis for Virtual Arctic Simulation Environment OTC Arctic Technology Conference 2016, St. John's, Canada.

Virtual Arctic Simulation Environment; presented at OTC Arctic Technology Conference 2015, Copenhagen, Denmark.

Real-Time Time-Warped Multiscale Signal Processing for Scientific Visualization (Invited Talk); Department of Computer Science, Memorial University, St. John's, NL, Canada, December 5, 2013.

Innovation in Core-Sampling For Deep Sea Mining Operations; co-presented with Rick Phipps and Matthew Adey at Deep Sea Mining Summit in 2013, London, UK.

High-Performance Time-Warped Multiscale Signal Reconstruction; at International Conference on Applied Harmonic Analysis and Multiscale Computing, 2011, Edmonton Alberta.

Parameterized Complexity for Microarray Analysis; University of Alberta Digital Biology Network Meeting, May 26, 2008.

Perceptually-Motivated Visualization for Biomolecular Cell Simulation (Invited talk); Department of Computer Science, Memorial University, St. John's, NL, Canada, June 28, 2007.

The Parameterized Complexity of Enumerating Frequent Itemsets; presented at the 2nd International Workshop on Parameterized and Exact Computation (IWPEC'06), Zurich, Switzerland.

A System for Real-time Parallel Scientific Computation and Visualization using the IBM Blue Gene/L Supercomputer; presented at the Fifteenth Annual Newfoundland Electrical and Computer Engineering Conference, St. John's, NL, Canada.

Activities

Member of Canadian MPEG delegation for ISO/IEC JTC 1/SC 29

Language Editor for the Central European Journal of Computer Science

Refereed papers for the 11th International Computing and Combinatorics Conference (COCOON 2005)

Skills

- Programming Experience: C/C++, GPGPU, CUDA, MPI, Java, TCL/Tk, MATLAB, DirectX, OpenGL, Cg and GLSL GPU Shading Languages, Visualization Toolkit (VTK).