

TREVOR VINCENT

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HIGHLIGHTS

Experienced C++, C and python programmer (over 100,000 lines+ in each) with expert-level knowledge in numerical solution techniques for partial differential equations and a broad knowledge of machine learning algorithms.

Four years of experience working with a team of 10+ programmers developing a next-generation code for upcoming exa-scale supercomputers.

Two years of experience working with a Nobel-prize winning scientific collaboration, analyzing time series data and writing simulation software.

Independent problem solver and researcher with lots of experience presenting scientific work (20+ presentations) and communicating to different audiences.

EXPERIENCE

Canadian Institute for Theoretical Astrophysics

Sept. 2013 - Aug. 2019

PhD Researcher in Computational Astrophysics

- Developed next generation numerical methods for solving the Einstein field equations (a non-linear set of partial differential equations) on supercomputers and implemented them in a $\sim 200,000$ -line code available on GitHub.
- Worked on a team (10+ developers) to develop a task-based parallelism framework for numerical relativity called SpECTRE, available on GitHub.
- Member of the Nobel-prize winning LIGO collaboration, working on extracting neutrino and matter emission properties from gravitational wave and electromagnetic counterpart signals of binary neutron star mergers.

University of Winnipeg

2009-2013

Summer Research Scientist

- Developed a state-of-art GPU-accelerated (via CUDA) C++ code for the diffusion and collision of water molecules around randomly oriented axons in 3d brain-matter coupled with a numerical solve of the Bloch partial differential equations to obtain the magnetic resonance imaging signal in such environments.
- Developed a Markov chain Monte Carlo code for estimating axon distribution properties from magnetic resonance imaging signals.
- Used machine learning techniques to study brain changes in mice with different Alzheimer-based gene modifications.

EDUCATION

University of Toronto, Toronto, ON

August 2014 - November 2018

PhD in Physics, specializing in computational astrophysics. PhD work was funded by an NSERC CGSD scholarship (\$105,000) and a NSERC CGSM scholarship (\$30,000).

Advisor: Prof. Harald Pfeiffer

University of Winnipeg, Winnipeg, MB

Sept 2008 - Sept 2013

Bachelors of Science in Physics. Undergraduate work was funded by 15 scholarships. Winner of the Governor Generals Silver Medal for highest graduating GPA in the university.

SKILLS

Highly Proficient	C/C++, CUDA, Bash, Git, CMake, Emacs, GDB, LaTeX
	Python (Pandas, Matplotlib, scikit-learn, tensorflow, keras, etc)
Substantial Experience	OpenCL, MPI, Matlab, Mathematica, HDF5, Paraview, Visit, SQL, HTML, OpenMP, Java, Fortran

PUBLICATIONS

- Vincent, Trevor, Pfeiffer, Harald. Fischer, Nils. A hp-adaptive discontinuous Galerkin solver for elliptic equations in numerical relativity. Submitted to Physical Review D. arXiv:1907.01572 [physics.comp-ph]. *2019*
- Vincent, Trevor, Foucart Francois, Duez, Matthew, Kidder, Lawrence, Pfeiffer, Harald, Scheel, Mark. Unequal Mass Binary Neutron Star Simulations with M1 Neutrino Transport: Ejecta and Neutrino Emission. Submitted to Physical Review D. arXiv:1908.00655 [gr-qc]. *2019*
- Hinderer, T., Nisanke, S., Foucart, F., Hotokezaka, K., Vincent, T., et al. Discerning the binary neutron star or neutron star-black hole nature of GW170817 with Gravitational Wave and Electromagnetic Measurements. Submitted to Physical Review Letters. arXiv:1808.03836 [astro-ph.HE]. *2018*
- Kidder, L.E., Field, S.E., Foucart, F., Schnetter, E., Teukolsky, S.A., Bohn, A., ... Vincent, T. Spectre: a task-based discontinuous Galerkin code for relativistic astrophysics. Journal of Computational Physics. arXiv:1609.00098 [astro-ph.HE]. *2017*
- Mercredi, M., Vincent, T. J., Bidinosti, C. P., Martin, M. (2016). Assessing the accuracy of using oscillating gradient spin echo sequences with AxCaliber to infer micron-sized axon diameters. Magnetic Resonance Materials in Physics, Biology and Medicine, 1-14. *2016*
- Hayes, K., Buist, R., Vincent, T.J., Thiessen, J.D., Zhangf, Y., Zhangg, H., Wang, J., Kongh, J., Li, X., Martin, M. Development of an In-Vivo Magnetic Resonance Imaging Method to Evaluate Hippocampus Volume in APP and PS1 Transgenic Mice. Neuroscience Methods. 221:103-111. *2014*
- *Thiessen, J.D., *Vincent, T.J., Herrera, S.L., Martin, M. Diffusion Tensor Metric Measurements as a Function of Diffusion Time in Rat Central Nervous System. Magnetic Resonance Insights. 5:3747. *These authors contributed equally to this paper. *2012*
- Vincent, T.J., Thiessen, J.D., Kurjewicz, L.M., Gerscheid, S.L., Turner, A.J., Zhilkin, P., Alexander, M.E., Martin, M. Longitudinal Brain size Measurements in APP/PS1 Transgenic Mice. Magnetic Resonance Insights. 4:19-26. *2011*

SELECTED AWARDS

NSERC CGSD Scholarship	<i>2015</i>
NSERC CGSM Scholarship	<i>2014</i>
Governor Generals Silver Medal	<i>2013</i>
CIHR Undergraduate Research Award	<i>2013</i>
NSERC Undergraduate Research Award	<i>2012</i>
NSERC Undergraduate Research Award	<i>2011</i>
NSERC Undergraduate Research Award	<i>2010</i>