

Trevor Vincent

PHYSICIST · PHD

✉ trevor.j.vincent@gmail.com 🏠 trevorvincent.com 📄 git.io/tjv1 🔗 linkedin.com/in/tjv1

Experience

PhD Student

UNIVERSITY OF TORONTO

09/13 - Now

For my PhD, I have developed next generation numerical methods for solving the Einstein field equations (General Relativity) on supercomputers and implemented them in a self-maintained 200,000-line code available on GitHub. I've also worked on a team (10+ developers) to develop a task-based parallelism framework for numerical relativity called SpECTRE. On top of this, I was a member of the Nobel-prize winning LIGO collaboration, working on the neutrino and matter emission properties of binary neutron star mergers. This work has provided me with proficiency in C/C++, CMake, git, MPI and Python as well as working knowledge of next-generation frameworks such as Charm++.

Research Scientist

UNIVERSITY OF WINNIPEG

05/09 - 09/13

With funding from multiple NSERC and CIHR grants, I developed a pipeline for measuring axon properties via oscillating gradient diffusion MRI imaging. This work was done under the guidance of Prof. Melanie Martin, who runs a small-animal MRI lab. This work involved not only programming the MRI imaging equipment to handle oscillating magnetic fields, but writing a state-of-art GPU-accelerated (CUDA) C++ code for the diffusion and collision of water molecules around randomly oriented axons in 3d brain matter and writing a MCMC code for estimating axon distribution properties.

Education

PhD - Physics

UNIVERSITY OF TORONTO

2013 - 2019

PhD work was funded by an NSERC CGSD scholarship and a NSERC CGSM scholarship.

BSc - Mathematical Physics Honours

UNIVERSITY OF WINNIPEG

2009 - 2013

Undergraduate work was funded by 15 scholarships. Winner of the Governor General's Silver Medal for highest graduating GPA in the university.

Skills

• **HIGHLY PROFICIENT** : C/C++, PYTHON, BASH, GIT, CMAKE, EMACS, GDB, \LaTeX , GNU/LINUX

• **SUBSTANTIAL EXPERIENCE** : CUDA, OPENCL, MPI, MATLAB, MATHEMATICA, HDF5, PARAVIEW, VISIT

• **WORKING KNOWLEDGE** : FORTRAN, JAVA, OPENMP, CHARM++

Selected Awards

- 2015 NSERC CGSD Scholarship
- 2014 NSERC CGSM Scholarship
- 2013 Governor General's Silver Medal
- 2013 CIHR Undergraduate Research Award
- 2012 NSERC Undergraduate Research Award
- 2011 NSERC Undergraduate Research Award
- 2010 NSERC Undergraduate Research Award

Publications

- 2019 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]
- 2018 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. Physical Review D. Preprint: <https://arxiv.org/abs/1808.03836>.
- 2017 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.
- 2016 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.
- 2014 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.
- 2012 *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. 5:37–47. *These authors contributed equally to this paper.
- 2011 Vincent, T.J., Thiessen, J.D., Kurjewicz, L.M., Gertscheid, 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.