

George Stein

POSTDOCTORAL SCHOLAR · BERKELEY CENTER FOR COSMOLOGICAL PHYSICS · UNIVERSITY OF CALIFORNIA, BERKELEY

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Education

University of California, Berkeley

POSTDOCTORAL SCHOLAR

- Computational Cosmology & Machine Learning

Berkeley, USA

September 2019 – Current

University of Toronto

PHD IN ASTRONOMY & ASTROPHYSICS

- Dissertation: Computational Cosmology & Machine Learning
- Relevant Coursework: Parallel Computing, Algorithms, Neural Networks, Scientific Software Development

Toronto, Canada

September 2014 – August 2019

University of British Columbia

HONOURS B.Sc. IN PHYSICS & ASTRONOMY, WITH DISTINCTION

- Relevant Coursework: Linear Algebra, Differential Equations, Multivariable Calculus, Computational Physics, Probability

Vancouver, Canada

September 2010 – May 2014

Work Experience

Canadian Institute for Theoretical Astrophysics

PHD THESIS. ADVISOR: PROF. J. RICHARD BOND

- Developed high performance cosmological simulations utilizing MPI and OpenMP, and scaled to >5TB RAM across >2k processors
- Implemented machine learning techniques for astrophysical applications, including CNNs in Keras + TensorFlow (see publications)
- Lecturer/Teaching Assistant for 16 undergraduate level courses, including Computational Astrophysics. Co-supervised 9 students

Toronto, Canada

September 2015 – August 2019

University of Toronto

GRADUATE RESEARCHER

- GPU algorithm development in OpenCL for the purpose of fast radio burst detection in TBs of microsecond cadence radio data
- Theoretical modeling, and simulating, the late-time observable effects of non-standard physics in the early universe

Toronto, Canada

September 2014 – August 2015

Swinburne University of Technology

VACATION SCHOLAR

- Analysis of the cosmic rest frame using peculiar velocity survey data & determining the statistical significance with Bayesian inference

Melbourne, Australia

June 2014 – August 2014

University of British Columbia & Canadian Institute for Theoretical Astrophysics

UNDERGRADUATE RESEARCHER

- Numerous research projects centered around creating massively-parallel tools to forecast cosmological signals for future experiments

Vancouver, Canada

May 2013 – May 2014

Selected Publications

 11 JOURNAL ARTICLES (3 PRIMARY AUTHOR), 2 CONFERENCE PROCEEDINGS

A volumetric deep Convolutional Neural Network for simulation of mock dark matter halo catalogues

PHILIPPE BERGER AND **GEORGE STEIN**, 2018

MNRAS, 482, 3, 2861–2871

arXiv 1805.04537

The mass-Peak Patch algorithm for fast generation of deep all-sky dark matter halo catalogues

GEORGE STEIN, MARCELO A. ALVAREZ, J. R. BOND, 2018

MNRAS, 483, 2, 2236–2250

arXiv 1810.07727

Selected Presentations & Media Coverage

 20 CONFERENCE PRESENTATIONS

Training from ARC experts fuels discovery of AI methods to map the cosmos

INTERVIEW BY COMPUTE ONTARIO

Compute Ontario

November 2018

Machine Learning Cosmic Structure Formation

INVITED TALK

SciNet High Performance Computing Consortium

September 2018

Simulating the Universe

PUBLIC LECTURE

University of Toronto AstroTours

May 2018

Skills & Interests

Computing:

- **Python** (7 years): KERAS + TENSORFLOW, NUMPY, CYTHON, MPI4PY, ...
- **Fortran** (6 years): extensive experience with MPI, OPENMP
- **C** (various projects): experience with MPI, OPENMP
- **OpenCL** (4 month graduate project): GPU implementations
- **Git**; **Unix/Linux**

Organizations:

- **Head of Graduate Astronomy Students Association (GASA) Social Committee** (2016–2018)
- **UofT AstroTours monthly telescope operator** (2016–2018)
- **Organizer:** graduate soccer team *Hubble United* (2016–2019)
- **Co-organizer:** department softball team *the Iguanas* (2017)

Honours & Awards

2017 & 18	Queen Elizabeth II Graduate Scholarship in Science & Technology , University of Toronto	<i>\$15,000/yr</i>
2016	Compute Canada International HPC Summer School Grant , Ljubljana, Slovenia	<i>\$3,000</i>
2014 & 15	Dunlap Scholarship , Dunlap Institute for Astronomy & Astrophysics	<i>\$5,000/yr</i>
2014	Vacation Scholarship , Swinburne University of Technology	<i>\$10,500</i>
2013	Summer Undergraduate Research Award , Canadian Institute for Theoretical Astrophysics	<i>\$8,000</i>