Jonas Lippuner

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Fluent languages: English, German

Summary

I am a Ph.D. candidate in computational astrophysics at Caltech. I enjoy analyzing and solving challenging problems and building systems to automate repetitive tasks. I can quickly learn and apply new methods and concepts to help achieve specific goals. I am well-versed in numerous numerical, mathematical, statistical, and basic machine learning techniques, and I have substantial experience with writing and optimizing parallel code for GPUs.

Physics interests	**Coding interests**	**Finance interests**
computational & nuclear astrophysics, core-collapse supernovae, nucleosynthesis, radiation transport	programming for GPUs and FPGAs, large-scale parallel simulations, machine learning, automation	quantitative trading algorithms, automated trading systems, Monte Carlo methods, Bayesian networks

Education

California Institute of Technology   **Pasadena, CA, USA**   **Oct 2012 − Jun 2017 (expected)**
Ph.D. in Physics
- Investigating where in the universe heavy elements like gold, lead, and uranium were created
- Developing an open source, highly modular software package to adaptively evolve a network of 140,000 nuclear reactions, also includes code to make a movie of the results, and an easy-to-use Python interface; my code is actively being used by several other researchers
- Running parallel scientific codes on national supercomputers (e.g. NCSA Blue Waters, TACC Stampede)
- Serving as president of a student club, served as both chair and member of different organizing committees (for local lecture events and an international scientific conference)

University of Manitoba   **Winnipeg, MB, Canada**   **Sep 2008 − May 2012**
B.Sc. (Hons.) in Mathematics and Physics
- Graduated with the highest GPA (4.48/4.50, 99.6%) among all undergraduate students (about 2500)
- Received numerous merit-based awards and scholarships, see http://jonaslippuner.com/awards

Kantonsschule am Burggraben   **St. Gallen, SG, Switzerland**   **Jul 2007**
Schweizerische Maturität (Swiss federal university entrance diploma, equivalent to A-Level certificate)
- Graduating GPA: 5.3/6.0, 88.3%, senior thesis got published in a highly selective book series
- Special subject: Physics and Applied Mathematics, complementary subject: Chemistry
- Implemented a 3D graphical simulation of the solar system for senior thesis

Skills and Abilities

Communication skills: scientific writing, collaborative writing, data visualization and animation, making high quality graphs and figures, oral and poster presentations (won awards for some of my presentations)

Research skills: finding and understanding relevant literature, formulating and testing hypotheses, asking relevant questions, analyzing and understanding complex processes

Coding skills: parallelizing and optimizing existing code, collaborative development on big coding projects

Algorithms and Techniques
- Optimization and root-finding techniques (e.g. gradient descent, genetic algorithm, Newton−Raphson)
- Various numerical methods (e.g. differentiation, integration, smooth interpolation, Monte Carlo)
- Discretizing and solving partial differential equations (finite difference/element, spectral, discontinuous Galerkin)
- Basic signal processing (e.g. Fourier analysis, wavelet analysis, fast folding, template matching)
- Basic machine learning (neural network basics, convolutional neural networks, deep learning, autoencoder basics)

Programming Languages and Technologies

Highly Proficient	Substantial Experience	Working Knowledge
C/C++, NVIDIA CUDA, C#, Python, LaTeX, Linux / Unix, git, Eclipse, Microsoft Windows	MATLAB, Mathematica, Intel MKL, CMake, Bash, Visual Studio, regex, SWIG, SQL, HTML, CSS, ASP.NET	MPI, OpenMP, Fortran, Java, HDF5, Perl, OpenGL, JavaScript, Go, PHP, MySQL, XML, XSLT

Experience

JPL Graduate Fellow **Jet Propulsion Laboratory (USA)** **Jun 2016 − Sep 2016**
Deep Space Tracking Systems
- Implemented and accelerated algorithms for pulsar searches and radio astronomy time series analysis with GPUs
- Debugged and improved existing single radio pulse detection pipeline

Intern **NVIDIA Corporation (USA)** **Jun 2015 − Sep 2015**
CUDA DevTech
- Implemented a prototype library for efficient MPI-style collective communication between multiple GPUs

Volunteer Bookkeeper **Small non-profit organization (USA)** **Apr 2013 − Jun 2014**
Accounting and tax compliance
- Responsible for all business accounting, financial reports, recording donations, issuing donation receipts, payroll, filing tax documents, and making sure operations comply with requirements for tax exempt status
- Automated recording of donations, generating donation statements, and generating financial reports
- Introduced secure digital record keeping system and monthly wage statements for employees

Teaching Assistant **California Institute of Technology (USA)** **Sep 2012 − Dec 2014**
Department of Physics
- Recitation sessions, office hours, and grading for undergraduate and graduate level physics classes

Research Student **University of Manitoba (Canada)** **Summer 2011 & 2012**
Department of Mathematics
- Implemented a finite element method with MATLAB to numerically solve partial differential equations

Research Student **CancerCare Manitoba (Canada)** **Summer 2009 & 2010**
Medical Physics Department
- Developed an open source extension to an existing software package to simulate medical x-ray imaging
- Implemented a parallel Monte Carlo radiation transport for GPUs achieving speedups of $20 − 40$ times

Software Engineer, Web Developer **Local Government (Switzerland)** **Oct 2007 − Aug 2008: Intern**
Sep 2008 − Sep 2009: Contractor
City Clerk's Office
- Developed database back end and front end of City Parliament website showing sessions, business items, documents, members, committees, and interactive seating map (website still active!)
- Developed various small GUI programs to interface with existing software and databases
- Automated or drastically simplified various common repetitive, tedious tasks in the City Clerk's Office

Honors and Prizes (selected, see http://jonaslippuner.com/honors)

- **Best Talk** (Theoretical Astrophysics in Southern California Meeting, University of California, San Diego, 2014)
- **Governor General's Silver Medal** (for highest standing at the undergraduate level, University of Manitoba, 2012)
- **University Gold Medal in Science** (for highest standing in undergraduate Science, University of Manitoba, 2012)
- **Allen Medal in Physics** (for highest standing in the final two years of Honours Physics or Honours Physics and Mathematics, University of Manitoba, 2012)
- **Best Entry in Physics and Astronomy** (Faculty of Science Poster Competition, University of Manitoba, 2011)
- **Best Presentation** (Summer Student Symposium, CancerCare Manitoba, 2010)