

# JONAS LIPPUNER

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**Fluent languages:** English, German

## SUMMARY

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I am a staff scientist at the Los Alamos National Laboratory working on computational physics and applied computer science. I enjoy solving challenging problems and learning and applying 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

computational & nuclear astro-physics, core-collapse supernovae, nucleosynthesis, radiation transport

### Coding interests

programming for GPUs and FPGAs, large-scale parallel simulations, machine learning, automation

### Finance interests

quantitative trading algorithms, automated trading systems, Monte Carlo methods, Bayesian networks

## EDUCATION

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### California Institute of Technology

Pasadena, CA, USA

Oct 2012 – Jun 2017

*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)
- Served 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

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**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)

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## PROGRAMMING LANGUAGES AND TECHNOLOGIES

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### Highly Proficient

C/C++, NVIDIA CUDA, C#,  
Python, L<sup>A</sup>T<sub>E</sub>X, Linux / Unix, git,  
Eclipse, Microsoft Windows

### Substantial Experience

MATLAB, Mathematica, Intel MKL,  
CMake, Bash, Visual Studio, regex,  
SWIG, SQL, HTML, CSS, ASP.NET

### Working Knowledge

MPI, OpenMP, Fortran, Java,  
HDF5, Perl, OpenGL, JavaScript,  
Go, PHP, MySQL, XML, XSLT

## EXPERIENCE

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### Computational Physicist

*Computational Physics and Methods, CCS-2*

**Los Alamos National Laboratory (USA)**

**since Apr 2018: Staff Scientist**  
**Sep 2017 – Apr 2018: Postdoc**

- Computational astrophysics, computational fluid dynamics, and code infrastructure development

### Postdoctoral Scholar

*Division of Physics, Mathematics, and Astronomy*

**California Institute of Technology (USA)**

**Jul 2017 – Aug 2017**

### JPL Graduate Fellow

*Deep Space Tracking Systems*

**Jet Propulsion Laboratory (USA)**

**Jun 2016 – Sep 2016**

- 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

*CUDA DevTech*

**NVIDIA Corporation (USA)**

**Jun 2015 – Sep 2015**

- Implemented a prototype library for efficient MPI-style collective communication between multiple GPUs

### Volunteer Bookkeeper

*Accounting and tax compliance*

**Small non-profit organization (USA)**

**Apr 2013 – Jun 2014**

- 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

### Research Student

*Department of Mathematics*

**University of Manitoba (Canada)**

**Summer 2011 & 2012**

- Implemented a finite element method with MATLAB to numerically solve partial differential equations

### Research Student

*Medical Physics Department*

**CancerCare Manitoba (Canada)**

**Summer 2009 & 2010**

- 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

*City Clerk's Office*

**Local Government (Switzerland)**

**Oct 2007 – Aug 2008: Intern**  
**Sep 2008 – Sep 2009: Contractor**

- Developed database back end and front end of City Parliament website
- 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, PRIZES, AND FELLOWSHIPS (selected, see <http://jonaslippuner.com/cv>)

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- **CNLS Fellowship** (Center for Nonlinear Studies, Los Alamos National Laboratory, 2017)
- **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)