# Christopher J. Swierczewski

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# Résumé

## Summary of Qualifications

- **Mathematics**: linear analysis, numerical analysis, computational geometry, optimization, computer algebra systems, and partial differential equations.
- **Programming**: Python, Cython, C, C++, CUDA, OpenMP, MPI, Git, object-oriented design, software architecture, test-driven development, Matlab.
- Designed high performance scientific software to solve problems in numerical analysis, computational geometry, and algebraic geometry using a wide range of mathematical and computational tools.
- Effective in-person and remote (via Git/GitHub) collaborator. Experience in pair-programming environment and with code review processes.
- Dedicated to discovering optimal solutions techniques and improving software performance by focusing on mathematical and programmatical details.
- Cleared for Top Secret information and granted access to Sensitive Compartmented Information.

## Education

- **Ph.D. in Applied Mathematics**, University of Washington, Seattle, *In Progress*,
  Thesis: *Computational Approach to Riemann Surfaces and the Kadomtsev-Petviashvili Equation*
  - Designed and implementated numerical and algebraic tools for computing with Abelian functions and Riemann surfaces in an open-source mathematical software package, "Abelfunctions".
  - Applied research results to computing periodic solutions to a large class of nonlinear partial differential equations using techniques from algebraic geometry and numerical analysis.
  - Developed high performance code in both numerical and algebraic aspects of the software package using a Cython / C back-end with an easy to use Python front-end.
  - Mentored junior team on quickly and accurately computing the Riemann theta function.
  - Open-source code available on GitHub: `https://github.com/abelfunctions/abelfunctions`
- **M.S. in Applied Mathematics**, University of Washington, Seattle, June 2010
  Thesis: *A Python Implementation of Chebyshev Functions*
  - Studied high-performance and high-accuracy function interpolation using Chebyshev polynomials.
  - Developed "pychebfun", an Python library implementing these interpolation algorithms using tools from the Numpy and Scipy libraries: `https://github.com/cswiercz/pychebfun`
- **B.S. in Mathematics with Distinction**, University of Washington, Seattle, June 2008
  Thesis: *Connections Between the Sato-Tate Conjecture and the Generalized Riemann Hyptothesis*
  - Proved equivalence of the Sato-Tate Conjecture and the Generalized Riemann Hypothesis for elliptic curves over the rational numbers.
  - Performed computational experiments with elliptic $L$-functions to computationally verify the Sato-Tate conjecture and related number theory conjectures.

## Professional Experience

- **Research Mathematician**, Institute for Defense Analysis: Center for Communications Research, La Jolla, CA. June - August 2012
- **Software Developer**, Simulab Corporation, Seattle, WA. January 2009 - March 2009.
  - Researched theory and application of Hidden Markov Models to problems in control theory and optimization.
  - Implemented algorithms in a C++ back-end for EDGE, a device used in laparoscopic surgeon training and evaluation.
- **Sage: Mathematics Software Developer**, Department of Mathematics, University of Washington, Seattle, WA. September 2007 - September 2008.
  - Designed new Sage finance module around the Opentick financial data acquisition API. Devised methods of wrapping asynchronous functions in a synchonous environment.
  - Designed tests and wrote documentation for mathematical functions in Python, Cython, and C/C++ under a UNIX environment.
- **Applied Research Mathematician**, National Security Agency, Ft.Meade, MD. June - August 2007.
  - Applied algebraic, probabalistic, and statistical methods to improve cryptanalytic attacks against telecommunication encryption standards.
  - Collaborated with mathematicians in researching cryptographic algorithm weaknesses. Implemented algorithms in C.
- **Teaching Assistant and Math Camp Counselor**, Department of Mathematics, University of Washington, Seattle, WA. June - August 2005 and 2006.

## Additional Research Projects

- **Zipper Development**
  - Advised graduate students on the development of "Zipper", a high-performance library for computing with conformal maps.
  - Integrated the library into Sage and added a web-based, interactive front-end.
  - Open-source code available on Google Code: `https://code.google.com/p/zipper`
- **CLAWPACK Development**
  - Performed foundational work on conversion of CLAWPACK, a high-performance numerical partial differential equation solver, to a dynamic library.
  - Attended Scipy 2009 conference on scientific computing in Python.

## Awards

- Boeing Teaching Award, University of Washington, Applied Mathematics, June 2016.
- Student Chapter Award, Society for Industrial and Applied Mathematics (SIAM), June 2014.
- Boeing Service Award, University of Washington, Applied Mathematics, June 2013.
- American Mathetmatical Society Sectional Meeting Travel Grant, October 2011.
- University of Alaska Fairbanks Travel Grant, January 2011.