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Résumé

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Summary of Qualifications

- **Mathematics:** computational geometry, complex algebraic geometry, numerical analysis, computer algebra systems, and partial differential equations.
- **Programming:** Python, Cython, C, C++, CUDA, Git, object-oriented design, software architecture, test-driven development, Matlab.
- Specialized in high performance symbolic-numerical software design and implementation to solve problems in computational geometry, numerical analysis, and algebraic geometry.
- Experience with parallel environments through CUDA-based GPU development.
- 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, Expected March 2016
Advisor: Bernard Deconinck
 - Designed and implemented algebraic and numerical 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 computational geometry, numerical analysis, and algebraic geometry.
 - Developed high performance code in both algebraic and numerical 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 Riemann theta functions.
 - Open-source code available on GitHub: <https://github.com/cswiercz/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.
 - Open-source code available on GitHub: <https://github.com/cswiercz/pychebfun>
- **B.S. in Mathematics (Comprehensive) with Distinction**, University of Washington, Seattle, June 2008
Thesis: *Connections Between the Sato-Tate Conjecture and the Generalized Riemann Hypothesis*
Advisor: William Stein

- 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.
- Results published in American Mathematical Society Bulletin v.45 no.2 (Fall 2007 - Spring 2008).

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 applications of Hidden Markov Models to problems in control theory and optimization.
 - Implemented algorithms in a C++ back-end for EDGE, a device used in laproscopic 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 synchronous 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, probabilistic, 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.