Christopher J. Swierczewski — Curriculum Vitae

Department of Applied Mathematics
University of Washington
Lewis Hall #304, Box 353925
Seattle, WA 98195

Cell: 253.223.3721
Fax: 206.685.1440
Website: www.cswiercz.info
E-mail: cswiercz@gmail.com

Areas of Interest

General: Complex Algebraic Geometry, Partial Differential Equations
Numerical Analysis, Computational Mathematics

Emphasis: Riemann Surfaces, Computational Geometry, Abelian Functions,
Symbolic and Numerical Computation, Nonlinear Waves

Education

- *Ph.D. in Applied Mathematics*, University of Washington, Seattle, Expected March 2016
  Advisor: Bernard Deconinck
- *M.S. in Applied Mathematics*, University of Washington, Seattle, June 2010
  Masters Project: *A Python Implementation of Chebyshev Functions*
- *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

Research Projects

- ABELFUNCTIONS*: A Python library for computing with complex algebraic curves, Riemann surfaces, and Abelian functions.* `http://abelfunctions.cswiercz.info`
  - Designed and implementated 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 undergraduate team on quickly and accurately computing Riemann theta functions.
  - Open-source code available on GitHub: `https://github.com/cswiercz/abelfunctions`
- 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`
- *Masters Project: 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`
- CLAWPACK *Development*
  - Performed foundational work on conversion of CLAWPACK, a high-performance numerical hyperbolic partial differential equation solver, to a dynamic library.

- Attended Scipy 2009 conference on scientific computing in Python.

- *Senior Thesis: Connections Between the Sato-Tate Conjecture and the Generalized Riemann Hypothesis*
  - 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 surgion training and evaluation.
- *Sage: Mathematics Software Developer*, Department of Mathematics, University of Washington, Seattle, WA. September 2007 – September 2008.
  - Implemented the Opentick financial data acquisition API. Created a new mathematical finance package. Devised methods of wrapping asynchronous functions in a synchronous environment.
  - Designed tests and wrote documentation for advanced mathematical functions in Python, Cython, and C/C++ under a UNIX environment.
  - Collaborated with other Sage developers from Germany, France, and Canada.
- *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.
  - Received background check in Spring 2007 and TOP SECRET clearance.
- *Teaching Assistant and Math Camp Counselor*, Department of Mathematics, University of Washington, Seattle, WA. June – August 2005 and 2006.

Publications

- B. Deconinck, M. S. Patterson, C. Swierczewski, *Computing the Riemann Constant Vector*, *Submitted for publication*, 2015, `http://www.cswiercz.info/assets/files/rcv.pdf`.
- C. Swierczewski, *Introduction to Differential Equations Using Sage (Book Review)*, SIAM Review, Book Reviews, 56(2), 373–382. `http://dx.doi.org/10.1137/140973669`.
- C. Swierczewski, B. Deconinck, *Computing Riemann theta functions in Sage with applications*, Mathematics and Computers in Simulation, Available online 16 May 2013, ISSN 0378-4754, `http://dx.doi.org/10.1016/j.matcom.2013.04.018`.

Professional Activities and Service

Session Organizer / Co-Organizer

- *AMS Special Session on Nonlinear Waves and Coherent Structures*, 2016 Joint Mathematics Meetings, American Mathematical Society, Seattle, WA. 6-9 January 2016.

- *Special Session on Riemann Theta Functions*, 1st SIAM-SIAG on Applied Algebraic Geometry, Society for Industrial and Applied Mathematics Conference, Raleigh, NC. 6-9 October, 2011.

Invited Speaker

- *Calculus on Riemann Surfaces in Python*, Symbolic Computation Seminar, North Carolina State University, Rayleigh, North Carolina. 18-20 March 2013.

Conferences and Workshops

- *Computing Solutions to the Kadomtsev-Petviashvili Equation*, 2016 Joint Mathematics Meetings, Americano Mathematical Society, Seattle, Washington. 6-9 January 2016.
- *Calculus on Riemann Surfaces in Python*, The Eighth Annual IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Athens, Georgia. 25-28 March 2013.
- *Some Computational Problems Using Riemann Theta Functions in Sage*, AMS 2011 Fall Western Section Meeting, Salt Lake City, Utah. 22-23 October 2011.
- *Some Computational Problems Using Riemann Theta Functions in Sage*, SIAM Conference on Applied Algebraic Geometry, Chapel Hill, North Carolina. 6-9 October 2011.
- *A Python Implementation of Chebyshev Functions*, International Council for Industrial and Applied Mathematics (ICIAM), Vancouver, British Columbia, Canada. 18-20 July 2011.
- *Computing Bitangents of Quartics Using Riemann Theta Functions* (Poster), Algebraic Geometry in the Sciences, Center for Mathematics and Applications, Oslo, Norway. 10-14 January 2011.
- *Computing Bitangents of Quartics Using Riemann Theta Functions* (Poster), The Higher Genus Sigma Function and Applications, International Center for Mathematical Sciences, Edinburgh, UK. 11-15 October 2011.

Seminars and Colloquia

- *Object-Oriented Design in Scientific Software (Part 2)*, Numerical Analysis Research Group, Seattle, Washington. 24 April 2014.
- *Object-Oriented Design in Scientific Software (Part 1)*, Numerical Analysis Research Group, Seattle, Washington. 17 April 2014.
- *An Introduction to GPGPU Computing (Part 2)*, Applied Mathematics Special Topics Seminar, Seattle, Washington. 15 November 2012.
- *An Introduction to GPGPU Computing (Part 1)*, Applied Mathematics Special Topics Seminar, Seattle, Washington. 8 November 2012.
- *A Sample of Scientific Computing in Python*, Undergraduate Mathematical Sciences Seminar, Seattle, Washington. 17 May 2012.
- *Abelfunctions: Software for Computing with Riemann Surfaces*, Mathematical Methods Seminar, Seattle, Washington. 27 March 2012.
- *Determinantal Representations of Algebraic Curves and Riemann Theta Functions*, Convex Algebraic Geometry Seminar, Seattle, Washington. 18 February 2011.
- *Polynomial Approximations to Functions*, Undergraduate Mathematical Sciences Seminar, Seattle, Washington. 19 January 2011.
- *Computing Two–Phase Solutions to the Kadomtsev–Petviashvili Equation*, Mathematical Methods Seminar, Seattle, Washington. 4 January 2011.
- *Computing Three–Phase Solutions to the Kadomtsev–Petviashvili Equation*, Solitons and Nonlinear Waves Course: Final Talks, Seattle, Washington. 9 December 2010.

Service

- SIAM University of Washington Student Chapter: President, University of Washington, (September

2013 – August 2014)
- SIAM University of Washington Student Chapter: Math Fair Co-Organizer, Lockwood Elementary School, Seattle, WA. (December 2011, 2012)
- Math Hour Olympiad: Judge, University of Washington, (June 2013, 2014, 2015)
- SIAM University of Washington Student Chapter: Webmaster, University of Washington, (September 2011 – August 2013)
- Applied Mathematics Systems Administrator, University of Washington, (September 2011 – March 2014)
- Numerical Analysis Research Club Moderator, University of Washington, Department of Applied Mathematics. (Winter – Spring 2009)

Awards

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

Teaching Experience

- Instructor, University of Washington, Seattle:

- AMATH 301:	Beginning Scientific Computing	Summer 2014
- AMATH 301:	Beginning Scientific Computing	Summer 2011

- Teaching Assistant, University of Washington, Seattle:

- AMATH 301:	Beginning Scientific Computing	Winter 2015
- AMATH 351:	Introduction to Differential Equations and Applications	Autumn 2014
- AMATH 301:	Beginning Scientific Computing	Winter 2011
- AMATH 301:	Beginning Scientific Computing	Autumn 2010
- MATH 125:	Calculus with Analytic Geometry II	Spring 2010
- MATH 124:	Calculus with Analytic Geometry I	Winter 2010

AMATH 301 – An undergraduate course in numerical analysis. Computational solutions to linear systems, curve / data fitting, numerical integration and differentiation, solutions to differential equations, and optimization.

AMATH 351 – Standard techniques in solving first and second order equations, series solutions, Laplace transform, systems of linear equations and introductory linear analysis, systems of nonlinear equations and perturbation theory.