

Christopher J. Swierczewski

Curriculum Vitae

Department of Applied Mathematics
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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 June 2015
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

Publications

- C. Swierczewski, *Introduction to Differential Equations Using Sage (Review)*, SIAM Review, Book Reviews, 56(2), 373382. <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>

Presentations

Invited Speaker

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

Conferences and Workshops

- *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.

Research Projects

- ABELFUNCTIONS: A Python library for computing with complex algebraic curves, Riemann surfaces, and Abelian functions. <http://abelfunctions.cswiercz.info>
 - Implementation of routines and tools for computing with Riemann theta functions and Riemann surfaces in a Python-based open-source mathematical software package.
 - Open-source code available on GitHub: <https://github.com/cswiercz/abelfunctions>
- ZIPPER Development:
 - ZIPPER is a collection of Fortran programs developed by Donald Marshall of the Department of Mathematics at the University of Washington for computing conformal maps.
 - Integrated the software into Sage and added a web-based, interactive front-end.
 - Added functionality to the core library including routines for computing the Carleson map.
- Masters Project: *A Python Implementation of Chebyshev Functions*
 - Studied the Chebfun system developed by Lloyd Trefethen et. al. and implemented core functionality in Python using the Numpy/Scipy Python libraries.
 - Collaborated with Trefethen on porting Chebfun to an open-source license.
- CLAWPACK Development:
 - CLAWPACK is a Fortran program developed by Randall Leveque for numerical solutions to hyperbolic PDEs.
 - Performed foundational work on conversion of CLAWPACK 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 Sato-Tate conjecture and Generalized Riemann Hypothesis for elliptic curves over the rational numbers.
 - Performed computational verification of the Sato-Tate conjecture for rational elliptic curves. Results published in a paper by Barry Mazur in the AMS Bulletin v.45 no.2.

Professional Experience

- **(Current Assignment)** Ph.D. Student, Department of Applied Mathematics, University of Washington, Seattle, WA. September 2010 – Present.

- Software Developer, Simulab Corporation, Seattle, WA. January 2009 – March 2009.
 - Researched theory and applications of Hidden Markov Models to problems in control theory.
 - Implemented Hidden Markov Model C/C++ library, GHMM, in the EDGE project: a surgical trainer for evaluating surgeon performance.
- 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.

Professional Activities and 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)
- 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.

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 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

References

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