Christopher J. Swierczewski Résumé

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Summary of Qualifications

- **Mathematics**: linear analysis, numerical analysis, tensor methods, algebraic geometry, optimization, and machine learning.
- **Programming**: (Expert) Python, Cython. (Advanced) C, CUDA. (Intermediate) C++, OpenMP, MPI. (Additional) object-oriented design, software architecture, test-driven development.
- Lead the design, development, and testing of high performance scientific software used to solve abstract mathematical problems using a huge range of mathematical and computational tools.
- Dedicated to discovering optimal solution techniques and improving software performance by combining mathematical discovery and efficient computational methods.
- Exceptional ability to clearly present technical information as evidenced by recognition for academic talks and teaching performance in computational mathematics courses.
- Detailed in-person and remote collaborator with experience in pair-programming environment, code review processes, as well as in giving numerous talks and presentations.

Professional Experience

- **Applied Scientist**, Amazon Web Services - Amazon AI, Seattle, WA. May 2017 - Present
  - Co-creator of SageMaker LDA, a topic modeling first-party algorithm provided by AWS SageMaker which is faster and more scalable than known open-source alternatives. Algorithm serves as key component to AWS Comprehend, an easy-to-use natural language processing product.
  - Contributor to SageMaker RCF, a Random Cut Forest-based anomaly detection first-party algorithm provided by AWS SageMaker.
  - Contributor to MXNet and Tensorly, a Python package for tensor learning.
- **Software Development Engineer**, Amazon, Seattle, WA. November 2016 - May 2017.
  - Expanded the space of advertising metrics which our Elasticsearch-based reporting backend can process and serve.
  - Designed a serverless, automated, and generalized database auditing system using AWS Lambda and AWS DynamoDB.
- **Research Mathematician**, Institute for Defense Analysis: Center for Communications Research, La Jolla, CA. June - August 2012
  - Applied number theoretic, optimization, and statistical techniques to solving cryptographic problems in a high-performance computing setting.
- **Software Developer**, Simulab Corporation, Seattle, WA. January 2009 - March 2009.
  - Applied Hidden Markov Models to problems in control theory and optimization with application to classifying surgical proficiency.
  - Implemented mathematical and sensor data collection algorithms in C++.
- **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.

Education

- **Ph.D. in Applied Mathematics**, University of Washington, Seattle, *In Progress*,
  Thesis: *Computational Approach to Riemann Surfaces and the Kadomtsev-Petviashvili Equation*
  - Led the design and development of "Abelfunctions", an open-source mathematics software package for computing with Abelian functions and Riemann surfaces.
  - Designed and improved new and existing algorithms using a wide variety of tools from various branches of mathematics, such as numerical analysis, linear analysis, and algebraic geometry; as well as using high-performance software development strategies.
  - Used object-oriented design principles to create software that was easy for mathematicians to use yet maintained high performance standards while providing extendibility to future developers.
  - Mentored team of bright undergraduate students in developing algorithms for 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.
  - Created "Pychebfun", a 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.

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.