Kasia Świrydowicz

Curriculum Vitae

(540) 525 7487
kswirydo@vt.edu
LinkedIn Profile

Education

2009–2017 **Ph.D. in Mathematics**, Virginia Tech, Blacksburg, VA, USA.

Advisor Dr. Eric de Sturler

At first, worked with Dr. Reinhard Laubenbacher on biomathematics research (agent–based models, coupled cell networks, Boolean models).

GPA 3.88/4.0

2004–2009 **Master of Science in Mathematics**, Adam Mickiewicz University, Poznań, Poland.

Pure mathematics curriculum with a concentration on abstract algebra, graph theory and topology.

2005–2009 **Master of Science in Computer Science**, Adam Mickiewicz University, Poznań, Poland.

Five–year program completed in four years with focus on computer engineering.

Theses

Ph.D. *Strategies for recycling Krylov subspace methods and bilinear form estimation* [LINK].

Defended in July 2017.

M.Sc. Math. *On Ramanujan Graphs and modular forms.*

Advisor Professor Wojciech Gajda, Adam Mickiewicz University, Poznań, Poland.

Defended in July 2009 with grade 5.0 (top grade).

M.Sc. C.S. *Meshfree methods in the equations of physics.*

Advisor Dr. Wojciech Kowalewski, Adam Mickiewicz University, Poznań, Poland.

Defended in July 2010 with grade 5.0 (top grade).

Teaching & Work Experience

2017 August – present **Postdoctoral Researcher**, Math Department, Virginia Tech, Blacksburg, VA, USA.

Currently working for Dr. Timothy Warburton on GPU-accelerated discontinues Galerkin codes. My work involves GPU kernel optimization and optimization of the preconditioner used in algebraic multigrid solver.

2017 Spring **Teaching Assistant**, Math Department, Virginia Tech, Blacksburg, VA, USA.

Teaching asisstant for CMDA 3634 (junior-level course for Computer Modeling and Data Analytics majors) class taught by Dr. Timothy Warburton. Designed and graded homework assignments, held office hours and assisted students with debugging during code help sessions. Assisted during the class meetings, helped students with coding. The class covered C, MPI, openMP and CUDA programming.

2009–2010, 2011–2013, 2015–2016 **Teaching Assistant**, Math Department, Virginia Tech, Blacksburg, VA, USA.

Worked as a Math Emporium assistant, helping students on one-on-one basis, taught Math 1205 and Math 1225 (Calculus 1), Math 1206 and Math 1226 (Calculus 2), Math 2016 (Calculus 2 for non-engineering majors), Math 1016 (Basic Calculus with Trigonometry). Developed the curricula for Math 1016 and 2016, including syllabi, class materials, quizzes, assignments and tests.

2015 Summer **Summer Intern**, Sandia National Laboratories, Livermore, CA, USA.

Worked with Dr. Kevin Carlberg and Dr. Ray Tuminaro on a project involving parallel approach to modified Arnoldi algorithm.

2013–2015 **Graduate Research Assistant**, Math Department, Virginia Tech, Blacksburg, VA, USA.
Worked under the AFOSR BRI project [LINK]. Developed interdisciplinary research with computer scientists and aerospace engineers. The focus was on finding best strategies for implementing GPU-accelerated Krylov methods and applying them to solve problems arising in Computational Fluid Dynamics (CFD).

2010–2011 **Graduate Research Assistant**, Virginia Bioinformatics Institute, Virginia Tech, Blacksburg, VA, USA.

2007–2008 **Lab assistant**, Department of Mathematics and Computer Science, Adam Mickiewicz University, Poznań, Poland.
Worked as a floor assistant during recitation classes. Helped students solve practical problems with programming in C, C++ and Java, and with writing html scripts.

Publications

2017 **GPU Accelerated Spectral Element Operators for Elliptic Problems**, Katarzyna (Kasia) Świrydowicz, Noel Chalmers, Ali Karakus, and Tim Warburton.
Submitted to International Journal of HPC Applications. [LINK]

2017 **Coupled Cell Networks: Boolean perspective**, Katarzyna (Kasia) Świrydowicz.
Biomath 6 (2017), 1703227. [LINK]

2017 **Efficient solvers and preconditioners on the GPUs for CFD applications**, Katarzyna (Kasia) Świrydowicz, Eric de Sturler, Christopher Roy, Xiao Xu.
In works, needs final revision. [LINK]; user: `guest`, password: `gpu`

2016 **Improved Functional-Based Error Estimation and Adaptation without Adjoints**, William C. Tyson, Katarzyna (Kasia) Świrydowicz, Joseph M. Derlaga, Christopher J. Roy, Eric de Sturler.
Published in proceeding of 46th AIAA Fluid Dynamics Conference, AIAA Aviation, (AIAA 2016–3809) and submitted to Journal of Computational Physics. [LINK]

2015 **Recycling Krylov subspaces for CFD applications and a new hybrid recycling solver**, Amit Amritkar, Eric de Sturler, Katarzyna (Kasia) Świrydowicz, Danesh Tafti, Kapil Ahuja.
Journal of Computational Physics, Vol. 303, 2015, 222–237. [LINK]

Talks

February 2017 **Estimating bilinear and quadratic forms using Krylov subspace solvers with recycling**, SIAM CSE 2017, Atlanta, GA, Katarzyna (Kasia) Świrydowicz, Eric de Sturler, Will Tyson, Christopher J Roy, Shelly Zhang, Glaucio Paulino.

August 2014 **Recycling Krylov subspaces for CFD applications**, ASME 2014 (4th Joint US-European Fluids Engineering Summer Meeting), Chicago, IL, Katarzyna (Kasia) Świrydowicz, Amit Amritkar, Eric de Sturler, Danesh Tafti.

July 2014 **Fast Solver and Preconditioners**, 2014 SIAM Annual Meeting, Chicago, IL, Katarzyna (Kasia) Świrydowicz, Eric de Sturler, Xiao Xu, Christopher J Roy.

Awards & Travels

2016 **SIAM Travel Award**, SIAM CSE 2017.

2008 **Scholarship of Polish Ministry of Science and Higher Education**.

2007 **First prize for the best poster in 10th International Workshop for Young Mathematicians *Combinatorics***, Cracow, Poland, with Agnieszka Kaszkowiak.

2007 **Fall semester in Genoa, Italy**, Erasmus program, Department of Computer Engineering, Genoa University.

Classwork

Applied math classes Attended Dr. Warburton's class on finite element methods and GPU computations (Fall 2016); the class covered MPI programming, OCCA (Open Concurrent Compute Abstraction), and nodal discontinuous Galerkin methods with strong emphasis on kernel optimization and efficient implementation. Completed a year-long class sequence on Numerical Analysis (2009-2010) and year-long class sequence on Numerical Analysis and Software (2013-2014); the class covered Krylov subspace methods and inverse problems.

C.S. classes While studying in Europe: attended variety of courses related to programming, including Data Structures and Algorithms, Effective Algorithm Coding, Programming Languages 2, Programming Methods, Objective Programming, Programming Laboratory 1 and 2, Computer Graphics, Theory of Computation, and Operational Research. Was a member of a local Student Scientific Club with particular interest in algorithm design, team programming and CUDA.

Biology classes While working with Dr. Laubenbacher: completed courses on Modeling and Simulation of Biological Systems, Computational Cell Biology, Paradigms of Bioinformatics, Computational Biochemistry for Bioinformatics and Advanced Inflammation Biology in order to learn how biological systems work and what methods could be used to model their behavior, and to learn how to analyze the models.

Scientific Interests

Krylov subspace methods and Krylov subspace recycling; efficiency and effectiveness of Krylov subspace solvers and preconditioners; applications of Krylov subspace methods to engineering problems, such as CFD codes and topology optimization.

Scientific computing; GPU programming and code optimization; parallel computing.

Technical Skills

C/C++, CUDA, matlab, LaTeX, OCCA, OMP, MPI

Languages

Polish	**First language**	
English	**Advanced**	*111/120 in Internet-based TOEFL test (2009).*
German	**Basic**	*Basic words and phrases.*
Italian	**Basic**	*Basic words and phrases.*

Personal Interests

- Literature
- Hiking/Backpacking
- Creative Writing
- Running/Swimming/Biking