Heather Switzer

Curriculum Vitae

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Education

- 2018 William & Mary, Ph.D. (in progress), Computer Science
- 8/2020 William & Mary, M.S., Computer Science
- 5/2018 Longwood University, B.S., Mathematics and Computer Science
- 5/2015 Richard Bland College, A.S., General Studies

Research Interests

Numerical Linear Algebra, iterative methods, subspace projections, preconditioning, matrix decomposition, and HPC

Publications and Presentations

Refereed Publications

[A1] Heather M. Switzer, Andreas Stathopoulos, Eloy Romero, Jesse Laeuchli, and Kostas Orginos. Probing for the trace estimation of a permuted matrix inverse corresponding to a lattice displacement. SIAM Journal on Scientific Computing, 44(4):B1096–B1121, 2022.

Oral Presentations

- [B1] Heather Switzer and Andreas Stathopoulos. Exploring performance benefits of sketched krylov methods in primme. In Numerical Analysis and Scientific Computation with Applications Conference, July 2023.
- [B2] Heather Switzer and Andreas Stathopoulos. Exploring performance benefits of sketched krylov methods in primme. In *Graduate and Honors Research Symposium*. William & Mary, July 2023.
- [B3] Heather Switzer and Andreas Stathopoulos. Probing for the trace estimation of a matrix inverse of a lattice discretization. In *Invited Colloquium*. Longwood University, Nov 2022.
- [B4] Heather Switzer, Lucca Skon, and Andreas Stathopoulos. Thick-restarted lanczos with sketched rayleigh-ritz for computing many eigenpairs. In SIAM Annual Meeting, July 2022.
- [B5] Heather Switzer and Julian Dymacek. Finding periods of linear recurrence relations. In Shenandoah Undergraduate Mathematics and Statistics Conference., Oct 2017.

Poster Presentations

[C1] Heather Switzer. Hierarchical probing for the trace of a matrix inverse. In Student Poster Symposium. Lawrence Livermore National Laboratory, 2019. [C2] Heather Switzer and Julian Dymacek. Finding periods of linear recurrence relations. In Spring Presentation of Undergraduate Research. Longwood University, 2017.

Research Skills

Experience, Krylov-based iterative methods, randomized subspace embeddings for symmetric eigenvalue problems, preconditioning techniques, LU matrix decomposition, trace estimation in Lattice QCD

Languages, C, C++, MatLab, Python, Unix Shell, MPI, OpenMP

Professional Experience

2023 Year-Round CSRI Graduate Intern, Sandia National Lab

Implemented a new randomized eigensolver in the Anasazi package of the Trilinos software suite. This randomized solver was used to evaluate and compare different eigensolvers for spectral graph partitioning using the Sphynx code in the Zolton2 package of Trilinos.

Spring 2023 Graduate Teaching Fellow, William & Mary

Was the instructor of record for one section of the undergraduate computer science course "CSCI243: Discrete Structures".

- 2020 **Graduate Research Assistant**, *William & Mary* Trace approximation for the inverse of a large matrix pertaining to disconnected diagrams in Lattice QCD. Preconditioning techniques for Lattice QCD matrices. Iterative methods via randomized subspace embeddings.
 - 2021 LLNL CASC Graduate Intern, Lawrence Livermore National Lab Implemented a parallel adaptive Factorized Sparse Approximate Inverse preconditioning method in the multigrid and scalable linear solver library, *HYPRE*.
- 2018 2020 **Graduate Teaching Assistant**, *William & Mary* Programming for Data Science (Fall 2018) – Python lab instructor and grader; Operating Systems (Spring 2019) – grader; Computational Problem Solving (Fall 2019, Spring 2020) – Python lab instructor and grader
 - 2019 **LLNL Computing Graduate Intern**, *Lawrence Livermore National Lab* Ported code into the LQCD library *MILC_QCD*, that used hierarchical probing to estimate the trace of an inverse of the discretization of a four dimensional lattice.

• Awards and Grants

- 5/2023 Graduate Research Fellowship, Virginia Space Grant Consortium
- 5/2023 Stephen K. Park Graduate Research Award, William & Mary
- 5/2023 Graduate Student Association Travel Grant, William & Mary
- 6/2020 Student Scholarship, Grace Hopper Celebration
- 8/2018, Dean's Nomination Fellowship, William & Mary
- 8/2019
- 5/2018 Badger-Magnifico Award, Longwood University
- 1/2017 CURIO Research Grant, Longwood University

Service

2021 Graduate Student Representative, William & Mary, Computer Science DEI Committee

Organizations

- 2021 Society for Industrial and Applied Mathematics (SIAM)
- 2021 Women in High Performance Computing in Virginia (WHPC–VA)
- 2018 Pi Mu Epsilon Honorary U.S. National Mathematics Society
- 2017 Upsilon Pi Epsilon International Honor Society for Computing and Information Disciplines
- 2017 2018 Association for Computing Machinery (ACM)

— Student Organizations and Activities

- 2021 2023 Computer Science Representative, William & Mary, Graduate Student Association
- 2017 2018 President, Longwood University, ACM Student Chapter
- 2016 2018 President, Longwood University, Math Club

References

Andreas Stathopoulos, Professor, William & Mary, andreas@cs.wm.edu

Robert Marmorstein, Professor, Longwood University, marmorsteinrm@longwood.edu

Eloy Romero Alcalde, High Performance Computational Scientist, Jefferson Laboratory, eromero@jlab.org

Erik Boman, Research Scientist, Sandia National Lab, egboman@sandia.gov