Arielle K. Carr (she/her)

Contact Information

Room 314, Building C
113 Research Drive
Mountaintop Campus
Bethlehem, PA 18015
Website: https://wordpress.lehigh.edu/ariellecarr/

Phone: (610) 758-6492
E-mail: arg318@lehigh.edu

Education

Ph.D. Mathematics — **Virginia Tech**
Thesis: *Recycling Techniques for Sequences of Linear Systems and Eigenproblems* — June 2021
Advisor: Eric de Sturler
Committee: Julianne Chung, Mark Embree, Serkan Gugercin

M.S. Mathematics — **Virginia Tech**
Thesis: *Reusing and Updating Preconditioners for Sequences of Matrices* — May 2015
Advisor: Eric de Sturler
Committee: Julianne Chung, Serkan Gugercin

B.S. Mathematics, Minor in Computer Science, Summa Cum Laude — **Virginia Tech**
Thesis: *Improving the Near Diagonal Dominance of Slater Matrices for Insulators* — July 2012
Advisor: Eric de Sturler

B.S. Sociology, Minor in Education, Magna Cum Laude — **Roanoke College**
Honors Thesis: *Emotional Intelligence: The Gendered World of Leadership* — May 2008
Advisor: Laura O'Toole
Committee: Marit Berntson, Gary Whitt

Academic Appointments

Assistant Professor, Lehigh University, Bethlehem, PA — **2021 – Present**
Department of Computer Science and Engineering

Professor of Practice, Lehigh University, Bethlehem, PA — **2018 – 2021**
Department of Computer Science and Engineering

Honors, Awards, and Fellowships

Early Career Award for Distinguished Teaching, Lehigh University — **2020**
Creative Inquiry Faculty Fellow, Lehigh University — **2019 – 2020**
Graduate Teaching Assistant of the Year, Virginia Tech — **2018**
Senior Graduate Teaching Assistant, Virginia Tech — **2015 – 2018**
Position awarded to GTAs based on advanced teaching scholarship.
NSF Travel Award, *International Conference On Preconditioning Techniques For Scientific And Industrial Applications*, Vancouver, Canada — **2017**
SIAM Student Travel Award (funded by NSF), *SIAM Applied Linear Algebra Conference*, Atlanta, Georgia — **2015**
Pi Mu Epsilon, Math Honors Society, President, Virginia Tech — **2011 – 2012**
Kimball Award, Virginia Tech — **2011 – 2012**
TW Hatcher Math Scholarship, Virginia Tech — **2011 – 2012**
Meritorious New Teacher, Top 15^{th} Percentile Nationally — **2008**

Publications

1. **Arielle Carr**. Recycling Techniques for Sequences of Linear Systems and Eigenproblems. PhD Thesis, Virginia Tech, July 2021.
2. **Arielle Carr**, Eric de Sturler, Serkan Gugercin. (2021). Preconditioning Parametrized Linear Systems. *SIAM Journal on Scientific Computing*, 43(3), A2242-A2267.
3. **Arielle Carr**. The Power of Productive Struggle. In: *Teaching Gradually: Practical Pedagogy for Graduate Students, by Graduate Students*. Stylus Publishing. [to appear, September 2021].

4. **Arielle Grim-McNally**. Reusing and Updating Preconditioners for Sequences of Matrices. Master's Thesis, Virginia Tech, May 2015.

Invited Talks

Talks

1. Laboratory for Applied Mathematics, Numerical Software, and Statistics (LANS) Seminar, *Krylov Subspace Recycling for a Sequence of Eigenproblems*, Argonne National Laboratory, Chicago, IL (virtual), May 2021.

Conference Presentations

Talks

1. Society for Industrial and Applied Mathematics (SIAM) Conference on Applied Linear Algebra, *An Exploratory Analysis of Sparsity Patterns When Updating Preconditioners*, New Orleans, LA (virtual), May, 2021.
2. Applied Numerical Analysis Seminar, *Krylov Subspace Recycling for Computing Invariant Subspaces of Sequences of Linear Systems*, Blacksburg, VA (virtual), March 2021.
3. Mid-Atlantic Numerical Analysis Day, *An Inexact Krylov-Schur Algorithm for Computing Invariant Subspaces*, Temple University, Philadelphia, PA, November 2019.
4. SIAM Conference on Computational Science and Engineering, *Combining Preconditioner Updates with Krylov Subspace Recycling for Sequences of Linear Systems*, Spokane, WA, February 2019.
5. Mid-Atlantic Numerical Analysis Day, *Combining Preconditioner Updates with Krylov Subspace Recycling*, Temple University, Philadelphia, PA, November 2018.
6. SIAM Annual Meeting, *Recycling Preconditioners and Subspaces* Portland, OR, July 2018.
7. International Conference On Preconditioning Techniques For Scientific And Industrial Applications, *Recycling Preconditioners and Subspaces for Sequences of Linear Systems*, Vancouver, Canada, August 2017.
8. Applied Numerical Analysis Seminar, Blacksburg, VA, March 2017.
9. SIAM Annual Meeting, *Recycling Preconditioners and Subspaces*, Boston, MA, July 2016.
10. SIAM Student Chapter Seminar, Blacksburg, VA, April 2016.
11. SIAM Conference on Applied Linear Algebra, *Reusing and Recycling Preconditioners for Sequences of Matrices*, Atlanta, GA, October 2015, (*session chair*).
12. Master's Thesis Defense, Blacksburg, VA, May 2015.
13. Matrix Computations Seminar, Blacksburg, VA, April 2015.
14. SIAM Annual Meeting, *Recycling and Updating Preconditioners for Sequences of Linear Systems*, Chicago, IL, July 2014.
15. SIAM Student Chapter Seminar, Blacksburg, VA, December 2013.
16. SIAM Conference on Computational Science and Engineering, *Utilizing Slater Matrix Properties to Design Better Preconditioners for Quantum Monte Carlo Methods*, Boston, MA, March 2013.
17. SIAM Conference on Applied Linear Algebra, *Efficiently updating preconditioners in quantum Monte Carlo simulations*, Valencia, Spain, June 2012.

Posters

1. SIAM Conference on Computational Science and Engineering, *Krylov Subspace Recycling for Computing Invariant Subspaces of Sequences of Linear Systems*, Virtual, March 2021
2. SIAM Graduate Student Poster Session, co-organizer and presenter, Blacksburg, VA, April 2017
3. Poster Session at the American Association of Colleges and Universities Conference on Sharing Responsibilities for Essential Learning Outcomes, Savannah, GA November 2007, co-author Greg Weiss.

Special Lectures

1. Rossin Doctoral Fellows Intensive Teaching, *Engaged Learning: Asking the Right Question*, Lehigh University, January 2020
2. Women in Global STEM Career Panel, Lehigh University, Spring 2019
3. Rossin Doctoral Fellows Intensive Teaching, *Engaged Learning: Teaching Confidence*, Lehigh University, January 2019
4. TRU Math Seminar Series, Assistant to the lecturer, Virginia Tech, Fall 2016
5. Graduate Teaching Assistant Workshop, Co-presenter, *Teaching Confidence*, Virginia Tech, September 2015, 2016, 2017

Other Research Experience

Graduate Research Assistant - Virginia Tech **2012 – 2018**

Funded by:

AFOSR-BRI FA9550-12-1-0442
Co-Design of Hardware/Software for Predicting MAV Aerodynamics

NSF-DSM 1025327
QMC Calculations for Deep Earth Materials

NSF-DSM 1217156
Innovative Integrative Strategies for Nonlinear Parametric Inversion

Research Advising

Undergraduate - Lehigh University

1. Anna Thomas, Math, Undergraduate Independent Study, Summer 2021, *An Introduction to Model Reduction*
2. Colin Hussey, Finance, Undergraduate Independent Study, Spring 2020, *A Study of Numerical Methods and the LU Factorization*
3. Hannah Lee, CSB, Women in Data Science (WiDS) co-ambassador, Spring 2020, *WiDS@Bethlehem*, also presented at Lehigh Virtual Expo, May 2020
4. Rebecca Gjini, Math, Undergraduate Independent Study, Fall 2019, *A Study of Numerical Methods and Eigenvalues*
5. Forest Crowley, CSE, Undergraduate Independent Study, Summer 2019, *A Practical Survey of Cryptography*

Teaching

Instructor, Iterative Methods for Large, Sparse Linear Systems (Lehigh, CSE398/498)
Instructor, Design and Analysis of Algorithms (Lehigh, CSE340, $\times 3$)
Instructor, Theory of Computation (Lehigh, CSE318, $\times 3$)
Instructor, Discrete Structures and Algorithms (Lehigh, CSE140, $\times 3$)
Instructor, Programming and Data Structures (Lehigh, CSE017, $\times 4$)
Instructor, Fundamentals of Programming (Lehigh, CSE002, $\times 5$)
Instructor, Linear Algebra (Virginia Tech, MATH 2114)
Instructor, Numerical Analysis (Virginia Tech, MATH 4446, $\times 2$)
Instructor, (Integral) Calculus II (Virginia Tech, MATH 1226, $\times 5$)
Graduate Teaching Assistant, Linear Algebra I (Virginia Tech, MATH 3144)
Graduate Teaching Assistant, Linear Algebra II (Virginia Tech, MATH 4144)
Graduate Teaching Assistant, Iterative Methods for Large, Sparse Linear Systems and Eigenvalue Problems (Virginia Tech, MATH 5485)
Instructor's Assistant, Math Seminar (Virginia Tech, DaVinci Living-Learning Community)

Professional Societies

Member, SIAM, 2012-Present
Association for Women in Mathematics, 2013 - 2018
Vice President, Virginia Tech SIAM Student Chapter, 2017-2018
Member, Virginia Tech SIAM Student Chapter, 2016-2018

University & Department Service

Women in Computer Science Advisor, Lehigh University, 2019-Present
ICPC Club Faculty Advisor, Lehigh University, 2019-Present
Faculty Advisor, Zeta Tau Alpha, Lehigh University, 2020-2021
Remote Teaching Working Group, PC Rossin College of Engineering and Applied Science, Lehigh University, 2020
Search Committee Member, Professor of Practice, Lehigh University, CSE Department, 2019
Co-developed core curriculum CSE003/CSE004/CSE007, Lehigh University, CSE Department, 2019
Curriculum Committee Member, Lehigh University, CSE Department, 2018-2020
Co-organizer, Applied Numerical Analysis Seminar, Virginia Tech, Spring 2017-Fall 2017
Conference Staff, Householder XX Conference, Virginia Tech, June 2017
Math 1226 CTE Test Writing Committee, Virginia Tech, Fall 2016, Fall 2017

Community Outreach

WiDS@Bethlehem, Ambassador and Conference Organizer, 2019-present
Congressional App Challenge Judge, District PA-07, 2019, 2020

SKILLS

Preferred Scientific Tools: MATLAB, Mathematica, Excel
Preferred Programming Languages: C/C++
Preferred Formatting Tools: LaTeX/TeX
Other Experience: Java, Fortran