

Steven Byram Roberts | Curriculum Vitae

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👤 Steven-Roberts

Education

Virginia Tech

Ph.D. candidate in Computer Science, 3.97 GPA

Fall 2016–Spring 2021

Member of Computational Science Laboratory and advised by Dr. Adrian Sandu

Virginia Tech

B.S. in Computer Science and B.S. in Mathematics, 3.98 GPA

Fall 2012–Spring 2016

Highest GPA in both graduating classes

Skills and Qualifications

Programming Languages: Proficient in MATLAB and Mathematica, experienced with C (including OpenMP and MPI), C++, Python, CUDA, C#, and Java

Mathematics: Strong background in linear algebra, numerical analysis, and differential equations

Web Development: Experienced in HTML, JavaScript, Node.js, CSS, and creating Chrome Extensions

Databases: Experienced with SQL databases and basic querying

Work History

Virginia Tech Computational Science Laboratory

Research Assistant

Spring 2015–present

- Designing, analyzing, and testing new multirate time integrators for numerically solving multiscale differential equations
- Developing new implicit-explicit (IMEX) methods suitable for stiff problems and differential algebraic equations.
- Creating a new framework for multimethods based on partitioned general linear methods

CS 4234/5234: Parallel Computation

Graduate Teaching Assistant

Fall 2019–Spring 2020

- Held weekly office hours to help students with assignments
- Taught ten of the classes on topics including OpenMP, parallel performance metrics, and GPU computing with CUDA

Lawrence Livermore National Laboratory

Intern

Summer 2019

- Developed new implicit multirate Runge–Kutta methods for solving stiff, multiscale systems of ordinary differential equations
- Compared and implemented variants of multirate backward differentiation formula methods

Lawrence Livermore National Laboratory

Intern

Summer 2018

- Implemented and optimized finite element operators for GPUs using CUDA
- Achieved 10 to 100 times speedup over other CPU and GPU implementations
- Contributed to the open-source project libCEED

NASA Glenn Research Center

Intern

Summer 2017

- Created 1D hybrid direct kinetic simulation of a Hall thruster
- Developed software in C++ from the ground up
- Modeled time-dependent velocity distribution functions of various species in plasma
- Gained experience solving hyperbolic partial differential equations with the finite volume method and using visualization tools

Insurance Institute for Highway Safety (IIHS)

Intern

Summer 2013–2016

- Worked on C# applications for managing vehicle records stored in SQL databases
- Redesigned and updated mobile website
- Set up an OAUTH server
- Worked with several frontend web frameworks
- Gained firsthand experience in software development life cycle

Web Developer

Freelance

2015–present

- Developing and maintaining the website for the Computational Science Laboratory
- Designed and created websites for two Virginia Tech Materials Science and Engineering professors' research groups
- Created four Chrome Extensions used by more than 60,000 users

Volunteer Work and Involvement

Spring 2019–present: Treasurer of Chess Club at Virginia Tech

Fall 2017–Fall 2019: Volunteer for Virginia Tech CSRC Career Fair

2016: Volunteer Math Tutor for Teacher Praxis Preparation

2013–2015: Galipatia Academic Committee Member

Recognitions and Accomplishments

Fall 2018–Spring 2020: Virginia Space Grant Consortium Graduate STEM Research Fellowship Recipient

2017: Recipient of Virginia Tech Davenport Fellowship for “research performance and promise”

2016–present: Member of Phi Beta Kappa Honor Society

2016: Winner of Virginia Tech David Heilman Memorial Award for Outstanding Undergraduate Research

2016: Winner of Virginia Tech Math Outstanding Senior, Applied Computational Option

2016: Pivot Point Hackathon - Third place

2014–2016: Winner of Virginia Tech CS Sophomore, Junior, and Senior Scholar Awards

2012–2016: Virginia Tech Dean's List with Distinction

Publications

- [1] Steven Roberts, Andrey A Popov, Arash Sarshar, and Adrian Sandu. “A fast time-stepping strategy for ODE systems equipped with a surrogate model”. In: *arXiv preprint arXiv:2011.03688* (2020).
- [2] Adrian Sandu, Michael Günther, and Steven Roberts. “Linearly implicit GARK schemes”. In: *Applied Numerical Mathematics* (2020). ISSN: 0168-9274. DOI: 10.1016/j.apnum.2020.11.014.

- [3] Steven Roberts, Arash Sarshar, and Adrian Sandu. "Parallel Implicit-Explicit General Linear Methods". In: *Communications on Applied Mathematics and Computation* (2020), pp. 1–21. ISSN: 2096-6385. DOI: 10.1007/s42967-020-00083-5.
- [4] Steven Roberts, John Loffeld, Arash Sarshar, Carol S Woodward, and Adrian Sandu. "Implicit multirate GARK methods". In: *arXiv preprint arXiv:1910.14079* (submitted 2019).
- [5] Steven Roberts, Arash Sarshar, and Adrian Sandu. "Coupled Multirate Infinitesimal GARK Schemes for Stiff Systems with Multiple Time Scales". In: *SIAM Journal on Scientific Computing* 42.3 (2020), A1609–A1638. DOI: 10.1137/19M1266952.
- [6] Arash Sarshar, Steven Roberts, and Adrian Sandu. "Alternating directions implicit integration in a general linear method framework". In: *Journal of Computational and Applied Mathematics* (2019), p. 112619. ISSN: 0377-0427. DOI: 10.1016/j.cam.2019.112619.
- [7] Arash Sarshar, Steven Roberts, and Adrian Sandu. "Design of High-Order Decoupled Multirate GARK Schemes". In: *SIAM Journal on Scientific Computing* 41.2 (2019), A816–A847. DOI: 10.1137/18M1182875.

Presentations

Sayas Numerics Seminar

Parallel implicit-explicit general linear methods

Steven Roberts, Arash Sarshar, and Adrian Sandu

Online

October 20, 2020

International Conference on Scientific Computation and Diff Eqs

Implicit Multirate GARK Methods

Steven Roberts, John Loffeld, Arash Sarshar, Adrian Sandu, and Carol Woodward

Innsbruck, Austria

July 23, 2019

Virginia Space Grant Consortium Student Research Conference

Practical Multirate Time Integration Methods

Steven Roberts and Adrian Sandu

Hampton, VA

April 8, 2019

SIAM Conference on Computational Science and Engineering

Implicit Multirate Generalized Additive Runge–Kutta Methods

Steven Roberts, John Loffeld, Arash Sarshar, Adrian Sandu, and Carol Woodward

Spokane, WA

March 1, 2019

Software

ODE Test Problems

A MATLAB suite of initial value problems

Steven Roberts, Andrey Popov, and Adrian Sandu

<https://github.com/ComputationalScienceLaboratory/ODE-Test-Problems>

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