Steven Byram Roberts | Curriculum Vitae

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Education

Virginia Tech
Ph.D. in Computer Science and Applications, 3.97 GPA   *Fall 2016–Summer 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–Spring 2021: 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]   Severiano González-Pinto, Domingo Hernández-Abreu, Maria S. Pérez-Rodríguez, Arash Sarshar, Steven Roberts, and Adrian Sandu. "A unified formulation of splitting-based implicit time integration schemes". In: *arXiv preprint arXiv:2011.03688* (submitted to *Journal of Computational Physics* 2021).

[2]   Arash Sarshar, Steven Roberts, and Adrian Sandu. "Alternating directions implicit integration in a general linear method framework". In: *Journal of Computational and Applied Mathematics* 387 (2021), p. 112619. DOI: 10.1016/j.cam.2019.112619.

[3]   Steven Roberts, John Loffeld, Arash Sarshar, Carol S Woodward, and Adrian Sandu. "Implicit multirate GARK methods". In: *Journal of Scientific Computing* 87.1, 4 (2021). DOI: 10.1007/s10915-020-01400-z.

[4] 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* (submitted to *SIAM Journal on Scientific Computing* 2020).

[5] Adrian Sandu, Michael Günther, and Steven Roberts. "Linearly implicit GARK schemes". In: *Applied Numerical Mathematics* 161 (2020), pp. 286–310. DOI: 10.1016/j.apnum.2020.11.014.

[6] Steven Roberts, Arash Sarshar, and Adrian Sandu. "Parallel Implicit-Explicit General Linear Methods". In: *Communications on Applied Mathematics and Computation* (2020). DOI: 10.1007/s42967-020-00083-5.

[7] 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.

[8] 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

SIAM Conference on Computational Science and Engineering　　　　**Online**
A New Multirate Time-Stepping Strategy for ODE Systems Equipped
with a Surrogate Model　　　　*March 5, 2021*
Steven Roberts, Andrey A Popov, Arash Sarshar, Adrian Sandu

Sayas Numerics Seminar　　　　**Online**
Parallel implicit-explicit general linear methods　　　　*October 20, 2020*
Steven Roberts, Arash Sarshar, and Adrian Sandu

International Conference on Scientific Computation and Diff Eqs　　　　**Innsbruck, Austria**
Implicit Multirate GARK Methods　　　　*July 23, 2019*
Steven Roberts, John Loffeld, Arash Sarshar, Adrian Sandu, and Carol Woodward

Virginia Space Grant Consortium Student Research Conference　　　　**Hampton, VA**
Practical Multirate Time Integration Methods　　　　*April 8, 2019*
Steven Roberts and Adrian Sandu

SIAM Conference on Computational Science and Engineering　　　　**Spokane, WA**
Implicit Multirate Generalized Additive Runge–Kutta Methods　　　　*March 1, 2019*
Steven Roberts, John Loffeld, Arash Sarshar, Adrian Sandu, and Carol Woodward

Software

ODE Test Problems　　　　**0.0.1**
A MATLAB suite of initial value problems
Steven Roberts, Andrey Popov, and Adrian Sandu
https://github.com/ComputationalScienceLaboratory/ODE-Test-Problems