

ALEXEY VORONIN

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EDUCATION

University of Illinois at Urbana-Champaign

Aug 2018 - Present

Doctor of Philosophy (Ph.D.) in Computer Science

- Research Area: Numerical Linear Solvers for Systems of PDEs
- Current GPA: 3.91/4.0

University of California, San Diego

Jun 2015

Bachelor of Science (B.S.)

- B.S. in Applied Mathematics
- B.S. in Computational Physics

EXPERIENCE

Scientific Computing Group Dept. of Computer Science, UIUC

Aug 2018 - Present

Graduate Research Assistantship

Urbana, IL

- Developing multilevel methods for solution of the discrete saddle point systems arising from mixed finite-element discretization of the incompressible Navier-Stokes equations
 - Supervisors: Luke Olson, Scott MacLachlan
 - Research Areas: Algebraic Multigrid, Systems of PDEs, Mixed-finite element methods

Sandia National Laboratories, Center for Computing Research

Summers 2020-2022

Graduate Student Intern

Livermore, CA

- Investigated novel algebraic multigrid coarsening approaches for problems with coupled fields such as Stokes equations
 - Supervisor: Raymond Tuminaro

Lawrence Livermore National Laboratory, CASC

May 2018 - Aug 2018

Computer Scientist in Computation Division, CASC

Livermore, CA

- Explored alternative approaches to forming multigrid components in order to decrease the overall setup costs for the non-linear time-dependent systems
 - Supervisor: Ulrike Meier Yang
 - Research Areas: Algebraic Multigrid, HYPRE

Lawrence Livermore National Laboratory, Computation Division

Jul 2015 - Aug 2018

Computer Scientist in Application Simulation, and Quality Group

Livermore, CA

- Optimised Hybrid MPICH/OpenMP particle-in-cell (PIC) plasma code used by LLNLs physics groups
 - Supervisor: Andrea Schmidt
 - Research Areas: Scalability, Load Balancing, Preconditioned Krylov Methods
- Helped develop the Livermore Design Optimization (LiDO) code, based on Modular Finite Element Discretization (MFEM) Library
 - Supervisor: Daniel White and Daniel Tortorelli
 - Research Areas: Matrix-free solvers, CUDA, Emerging Architectures, Topology Optimization

Skaggs School of Pharmacy and Pharmaceutical Sciences

Jun 2012 - Jun 2014

Undergraduate Researcher

La Jolla, CA

- Co-developed a new molecular dynamics approach to answer whether the shifts in electron density induced by external charges are best replicated by changes in atom-centered charges, or by addition of atom-centered dipoles

TEACHING EXPERIENCE

University of Illinois at Urbana-Champaign

Graduate Teaching Assistant, Computer Science Department

Urbana, IL

- Numerical Analysis (CS450) *Fall 2018 & Spring 2019*
 - Led discussion sessions and wrote course material for introductory scientific computing course, helping the students build a foundation in the formulation of numerical problems and their solution
- Numerical Methods (CS357) *Spring & Fall 2021*
 - Composed course content in introductory scientific computing and data analysis topics

PEER-REVIEWED PUBLICATIONS

- [1] Voronin, A, He, Y, MacLachlan, S, Olson, LN, Tuminaro, R. Low-order preconditioning of the Stokes equations. *Numer Linear Algebra Appl.* 2021;e2426. <https://doi.org/10.1002/nla.2426>
- [2] White, D, Voronin, A. "A computational study of symmetry and well-posedness of structural topology optimization." *Structural and Multidisciplinary Optimization* 59, no. 3 (2019): 759-766
- [3] Li, A, Voronin, A, Fenley, A, Gilson, M. "Evaluation of Representations and Response Models for Polarizable Force Fields." *The Journal of Physical Chemistry B* 120, no. 33 (2016): 8668-8684

TECHNICAL REPORTS AND PROCEEDINGS

- [1] Voronin, A, Tuminaro, R, Olson, LN, MacLachlan, S. AMG for Mixed Finite Element Representations of PDE Systems, in *Computer Science Research Institute Summer Proceedings 2020*, A.A. Rushdi and M.L. Parks, eds., Technical Report SAND2020-12580R, Sandia National Laboratories, 2020, pp. 127–137.
- [2] Voronin, A, Tuminaro, R. Algebraic Multigrid based on Low-order Systems, in *Computer Science Research Institute Summer Proceedings 2021*, J.D. Smith and E. Galvan, eds., Technical Report SAND2022-0653R, Sandia National Laboratories, 2020, pp. 147–158.

PRESENTATIONS

- [1] Monolithic SA-AMG for Saddle-point Systems, *AMG Summit (2021)*
- [2] AMG for Mixed Finite Element Representations of Systems of PDEs, *SIAM Conference on Computational Science and Engineering (2021)*
- [3] LFA of Low-Order Preconditioners for the Stokes equations, *20th Copper Mountain Conference On Multigrid Methods (2021)*
- [4] Performance Optimization of Bloch-wave Code for the CORAL Systems, *Applications, Simulations and Quality (ASQ) seminar at LLNL Seminar Series (2018)*

AWARDS, GRANTS AND ACHIEVEMENTS

- [1] NSF-CBMS Conference on Parallel Time Integration - Travel Award (2022)
- [2] Argonne Training Program on Extreme-Scale Computing (ATPESC) - Travel Award (2017)
- [3] President's Volunteer Service Award (2010)

OTHER WORK EXPERIENCE

Cymer, ASML

Data Analyst Intern

Jun - Sep 2014

San Diego, CA

- Co-designed and implemented a Markov chain Monte Carlo simulator in Python to improve the accuracy of part failure prediction in the currently installed lasers

SLAC National Accelerator Laboratory

Summer Intern

Jun - Aug 2009 and 2010

Menlo Park CA

- Automated collection of X-ray diffraction data and merging of different file formats
- Designed x-ray crystallography experiments and collected diffraction data, which I later used to solve and refine the molecular structure of proteins

ADDITIONAL INFORMATION

SIAM Student Chapter Treasurer (UIUC)

Aug 2019 - Aug 2022

SIAM Student Chapter Officer (UIUC)

Aug - May 2018