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 *June - September 2014*
Data Analyst Intern *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 *June - August 2009 and 2010*
Summer Intern *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) *August 2019 - 2022*
SIAM Student Chapter Officer (UIUC) *August - May 2018*