Will Pazner

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Appointments

Sidney Fernbach Fellow, Lawrence Livermore National Laboratory 2018–present

Center for Applied Scientific Computing

Research Affiliate, Lawrence Berkeley National Laboratory 2018–present

Mathematics Group, Computational Research Division

Postdoctoral Scholar, UC Berkeley 5/2018–10/2018

Department of Mathematics

Education

Ph.D., Brown University, Division of Applied Mathematics 2014–2018

NDSEG fellow. Thesis topic: Efficient implicit solvers for the discontinuous Galerkin method
Co-advisors: Profs. Per-Olof Persson (UC Berkeley), Chi-Wang Shu (Brown)

Doctoral Exchange Scholar, University of California, Berkeley 2015–2018

Sc.M., Brown University, Division of Applied Mathematics 2014–2015

B.Sc., University of Toronto, Department of Mathematics, High Distinction 2007–2011

Awards & Honors

ECCOMAS Scholarship (2018)

First place, AIAA student paper competition in computational fluid dynamics (2017)

National Defense Science and Engineering Graduate (NDSEG) fellowship (2016–2019)

NSERC Doctoral Postgraduate Scholarship (2016)

NSF GRFP Honorable Mention (2016)

International Meshing Roundtable student travel award (2016)

SET (Science, Engineering and Technology) Award shortlist, top three projects in North America (2011)

Dr. James A. & Connie P. Dickson Scholarship in the Sciences and Mathematics (2011)

George Roderick Fraser Scholarship in Mathematics (2007–2011)

Dean's List, University of Toronto (top 10% of students) (2007–2011)

NSERC Undergraduate Student Research Award (2010)

C. L. Burton Scholarship in Mathematics and Modern Languages (2008, 2010)

Preprints

[1] W. Pazner and P.-O. Persson. *Analysis and entropy stability of the line-based discontinuous Galerkin method*. arXiv preprint 1809.09815 (submitted for publication). 2018. URL: https://arxiv.org/abs/1809.09815.

[2] W. Pazner, N. Trask, and P. J. Atzberger. *Stochastic discontinuous Galerkin methods (SDGM) based on fluctuation-dissipation balance*. arXiv preprint 1806.04317 (submitted for publication). 2018. URL: https://arxiv.org/abs/1806.04317.

Publications

[3] W. Pazner and P.-O. Persson. "Approximate tensor-product preconditioners for very high order discontinuous Galerkin methods". In: *Journal of Computational Physics* 354 (2018), pp. 344–369. DOI: 10.1016/j.jcp.2017.10.030.

[4] W. Pazner and P.-O. Persson. "On the convergence of iterative solvers for polygonal discontinuous Galerkin discretizations". In: *Communications in Applied Mathematics and Computational Science* 13.1 (2018), pp. 27–51. DOI: 10.2140/camcos.2018.13.27.

[5] W. Pazner and P.-O. Persson. "Interior penalty tensor-product preconditioners for high-order discontinuous Galerkin discretizations". In: *Proceedings of the 2018 AIAA Aerospace Sciences Meeting*. American Institute of Aeronautics and Astronautics, 2018. DOI: 10.2514/6.2018-1093.

[6] W. Pazner and P.-O. Persson. "Stage-parallel fully implicit Runge-Kutta solvers for discontinuous Galerkin fluid simulations". In: *Journal of Computational Physics* 335 (2017), pp. 700–717. DOI: 10.1016/j.jcp.2017.01.050.

[7] W. Pazner and P.-O. Persson. "High-order DNS and LES simulations using an implicit tensor-product discontinuous Galerkin method". In: *Proceedings of the 23rd AIAA Computational Fluid Dynamics Conference*. First Place, Student Paper Competition. American Institute of Aeronautics and Astronautics, 2017. DOI: 10.2514/6.2017-3948.

[8] W. Pazner, A. Nonaka, J. Bell, M. Day, and M. Minion. "A high-order spectral deferred correction strategy for low Mach number flow with complex chemistry". In: *Combustion Theory and Modeling* 20.3 (2016), pp. 521–547. DOI: 10.1080/13647830.2016.1150519.

Thesis

[9] W. Pazner. "Efficient Solvers and Time Integration for Discontinuous Galerkin Methods". Ph.D. thesis. Brown University, 2018.

Presentations & Posters

[10] W. Pazner. "Computational physics at extreme scales: efficient solvers for discontinuous Galerkin methods". CFDIMPACT, Technion – Israel Institute of Technology. Haifa, Israel, 2018.

[11] W. Pazner. "Efficient solvers and preconditioners for the implicit time integration of discontinuous Galerkin methods". ECCOMAS ECFD. Glasgow, Scotland, 2018.

[12] W. Pazner. "Efficient solvers and preconditioners for the implicit time integration of discontinuous Galerkin methods". Heidelberg University Applied Mathematics Seminar. Heidelberg, Germany, 2018.

[13] W. Pazner. "Efficient stage-parallel time integrators and tensor-product solvers for discontinuous Galerkin methods". Applied/PDE Seminar, UCSB. Santa Barbara, CA, 2018.

[14] W. Pazner and P.-O. Persson. "The mathematics of computation". Friends of Berkeley Mathematics. Berkeley, CA, 2018.

[15] W. Pazner. "Computational physics at extreme scales". Pacific Northwest National Laboratory, Linus Pauling Distinguished Fellowship Seminar. Richland, WA, 2018.

[16] W. Pazner. "Computational physics at extreme scales: efficient solvers and time integration for discontinuous Galerkin methods". Lawrence Livermore National Laboratory, Sidney Fernbach Fellowship Seminar. Livermore, CA, 2018.

[17] W. Pazner. "Efficient solvers and preconditioners for the implicit time integration of DG methods". Sandia National Laboratories. Albuquerque, NM, 2018.

[18] W. Pazner. "Efficient solvers and preconditioners for the implicit time integration of DG methods". UC Berkeley Applied Mathematics Seminar. Berkeley, CA, 2018.

[19] W. Pazner and P.-O. Persson. "Very high-order symmetric interior penalty discontinuous Galerkin methods for LES flows using implicit tensor-product solvers". AIAA Science and Technology Forum and Exposition. Kissimmee, FL, 2018.

[20] W. Pazner. "Tensor-product preconditioners for very high order DG methods". The 20th Israeli Mini-Workshop in Applied and Computational Mathematics. Karmiel, Israel, 2017.

[21] W. Pazner and P.-O. Persson. "High-order DNS and LES simulations using an implicit tensor-product discontinuous Galerkin method". AIAA Computational Fluid Dynamics Conference. Denver, CO, 2017.

[22] W. Pazner. "Very high order implicit DG methods using approximate tensor-product preconditioners". Berkeley/Stanford Computational Mechanics Festival (CompFest). Berkeley, CA, 2017.

[23] W. Pazner and P.-O. Persson. "Approximate tensor-product preconditioners for very high order DG methods". SIAM Conference on Computational Science and Engineering (General Poster Session). Atlanta, GA, 2017.

[24] W. Pazner and P.-O. Persson. "Multi-implicit discontinuous Galerkin method for low Mach number combustion". SIAM Conference on Computational Science and Engineering. Atlanta, GA, 2017.

[25] W. Pazner and P.-O. Persson. "Stage-parallel implicit Runga-Kutta time-integration and efficient approximate block preconditioning for discontinuous Galerkin methods". SIAM Conference on Computational Science and Engineering. Atlanta, GA, 2017.

[26] W. Pazner and P.-O. Persson. "Stage-parallel fully implicit Runge-Kutta methods for DG". Stanford University Aerospace Computing Laboratory Seminar. Stanford, CA, 2017.

[27] W. Pazner. "Polygonal discontinuous Galerkin methods". Brown Applied Mathematics Graduate Student Seminar. Providence, RI, 2016.

[28] W. Pazner. "Polygonal elements for the discontinuous Galerkin method". Lawrence Berkeley National Laboratory, Student Poster Session. Berkeley, CA, 2016.

[29] W. Pazner. "High-order method for low Mach number combustion". Lawrence Berkeley National Laboratory, Student Poster Session. Berkeley, CA, 2015.

[30] W. Pazner. "The spectral deferred correction method for multi-process problems". Lawrence Berkeley National Laboratory, Student Seminar. Berkeley, CA, 2015.

[31] W. Pazner. "Diameter of the universal covering". Canadian Undergraduate Mathematics Conference. Waterloo, ON, 2010.

[32] W. Pazner. "Inequalities: deck transformations and fundamental groups". University of Toronto Math Union Seminar. Toronto, ON, 2010.

Relevant Experience

Teaching Experience

Instructor, Math 128A, *Numerical Analysis* Summer, 2017

Main instructor for upper-divison class of 40 students at UC Berkeley

Received excellent student evaluations

Responsible for course coordination, designed syllabus, and held lectures four times weekly

Designed homework and programming assignments, midterm, and final exams

Graduate Student Instructor, UC Berkeley 2016–2017

Math 128B, Advanced Numerical Analysis, Spring 2017

Math 221, Graduate Numerical Linear Algebra, Fall 2016

ATDP Math Lab, Summer 2016

Math 128B, Advanced Numerical Analysis, Spring 2016

Outstanding student evaluations. Selected student comments: *"Best math GSI I've had in my 4 years here!", "Easily one of the best GSIs I've had."*

Guest Lecturer

UC Berkeley: *Communication Avoiding Algorithms* (April 2018, November 2016), *Finite Element Methods* (March 2017), *Collocation Methods* (March 2017), ATDP Explorations: *An Introduction to Scientific Computing* (July 2017)

Team Leader, Kobe-Brown-ICERM Joint Simulation Summer School 2016

Lead team of five graduate students from Brown and Kobe universities in Fall, 2016

Developed finite-element tsunami model with accurate coastline data and ocean floor bathymetry

Presented simulation results to Kobe University faculty and administration

Graduate Student Researcher, School of Education, UC Berkeley Summer 2016

Taught a variety of mathematics courses to academically talented middle school students

Received excellent student feedback

Teaching Assistant, University of Toronto 2010–2011

MAT135, Calculus, 2010–2011

Math Aid Centre Staff, 2010–2011

MAT157, Honors Analysis, problem solving office-hours, 2010–2011

Research Experience

NDSEG Fellow 2016–2019

Doctoral research at Brown University and UC Berkeley, supervised by Profs. Chi-Wang Shu and Per-Olof Persson, sponsored by the Air Force Research Laboratory

Research topics: high-order fully-implicit Runge-Kutta methods, Kronecker-product preconditioners for discontinuous Galerkin (DG) methods, convergence of iterative solvers for polygonal DG methods

Publications: [3], [4], [5], [6], [7]

Student Researcher, Lawrence Berkeley National Laboratory Summer 2016

Supervised by Professor Per-Olof Persson in the Mathematics Department

Researched implicit Runge-Kutta methods applied to discontinuous Galerkin discretizations, resulting in publication [6] above

Student Researcher, Lawrence Berkeley National Laboratory Summer 2015

Supervised by Dr. John Bell at the Center for Computational Science and Engineering

Researched multi-implicit spectral deferred correction method with applications to low Mach number combustion and reacting flow (see publication [8] above)

NSERC Researcher, University of Toronto — Summer 2010

Researched geometry of universal coverings of Riemannian manifolds

Supervised by Professor Alex Nabutovsky at the University of Toronto

Presented novel results of research at Canadian Undergraduate Mathematics Conference

Software Engineer, Catch Media, Inc. — Summers, 2006–2008

Improved search-algorithm performance

Worked on both back-end and front-end projects in C++ and Objective-C

Service, Outreach & Affiliations

Minisymposium organizer, SIAM CSE 2019

Reviewer: Journal of Computational Physics, Journal of Scientific Computing, International Journal of Hydrogen Energy (ICEEEE)

Guest lecturer on scientific computing, Academic Talent Development Program, Berkeley, CA, 2017

Project leader, Brown-Kobe Joint Simulation Summer School, 2016

Teacher for middle and high school students, Academic Talent Development Program, Berkeley, CA, 2016

Member, American Mathematical Society, 2014–present

Member, Society for Industrial and Applied Mathematics, 2015–present

Member, American Institute of Aeronautics and Astronautics, 2017–present

Skills

Computer programming: C++, MPI, Python, Fortran, Julia, Ruby

Mathematical software: Mathematica, MATLAB, LaTeX, LAPACK/BLAS