

Kaihang Guo

Address: 2686 Murworth Dr, Apt 514, Houston, TX 77054

Cell: (281)702-8829 \diamond Email: Kaihang.Guo@rice.edu

SUMMARY

Ph.D student at Rice University who has strong mathematical background, with experience in numerical methods for partial differential equations and high performance GPU computing.

EDUCATION

Rice University *2018 – Expected May 2021*

Ph.D. in Computational and Applied Mathematics

Advisor: Dr. Jesse Chan

Thesis: Weight-adjusted high order DG methods for problems in wave propagation

New York University *2014 – 2016*

M.Sc. Degree in Mathematics

Sichuan University, China *2010 – 2014*

B.Sc. Degree in Applied Mathematics

KNOWLEDGE AND SKILLS

Numerical computing linear solvers, numerical PDEs, parallel computing, optimization

Programming Unix, Linux, C/C++, Fortran, Python, Matlab, MPI, CUDA, OCCA, Julia

WORK EXPERIENCE

Scientific Software Developer Intern at Total *May 2019 – Aug 2019*

- Assisted in the design of a multiphysics research simulator.
 - Implemented the discontinuous Galerkin method for the numerical discretization of PDEs.
 - Optimized algorithms for real-time performance using MPI parallelization.
-

RESEARCH EXPERIENCE

Mesh regularization for moving boundaries *Aug 2020 – present*

- Representing curved triangular elements using Bernstein control nets.
- Applying a spring-mass system to Bernstein control nets over all elements in the mesh.
- Adapting mesh nodes through the spring-mass system according to boundary deformations.

Discontinuous Galerkin methods on moving meshes *Aug 2019 – Aug 2020*

- Derived a skew-symmetric ALE-DG methods for wave propagation on moving domains.
- Applied a weight-adjusted approach to reduce cost for the evolution of solutions.
- Implemented ALE-DG methods using non-polynomial B-splines on tensor elements.

Multiwave imaging in complex media *Aug 2018 – May 2019*

- Developed high order discontinuous Galerkin methods for acoustic-elastic coupled media.
- Accelerated numerical implementations by GPU parallelization.
- Applied the discontinuous Galerkin solver to time-reversal method in photoacoustic imaging.

Bernstein-Bézier discontinuous Galerkin methods *Feb 2017 – Aug 2018*

- Developed a fast Bernstein polynomial L^2 projection algorithm.
- Applied fast Bernstein algorithms to weight-adjusted discontinuous Galerkin methods.
- Accelerated numerical implementations by GPU parallelization.

Structured background subtraction

Jan 2016 – May 2016

- Utilized the sparsity-inducing norm in low-rank and sparse matrix decomposition.
- Applied the network flow algorithm to solve quadratic min-cost flow problems.
- Compared with conventional background subtraction techniques.

PUBLICATIONS

A mesh regularization method for moving boundaries based on the Bernstein triangle representation, with J. Chan, in prepration

High order weight-adjusted discontinuous Galerkin methods for wave propagation on moving curved meshes, with J. Chan, submitted. [Link](#)

A weight-adjusted discontinuous Galerkin method for wave propagation in coupled elastic-acoustic media, with S. Acosta and J. Chan, *Journal of Computational Physics*, 2020. [Link](#)

Bernstein-Bézier weight-adjusted discontinuous Galerkin methods for wave propagation in heterogeneous media, with J. Chan, *Journal of Computational Physics*, 2020. [Link](#)

PRESENTATIONS

Graduate Seminar, Rice University, Houston, TX, USA	Nov 2020
Seminar, Chongqing University, Department of Mathematics, Chongqing, China	Jun 2020
Seminar, Nanjing University, Department of Mathematics, Nanjing, China	May 2020
SIAM Texas-Louisiana Sectional Meeting, Dallas, TX, USA	Nov 2019
Graduate Seminar, Rice University, Houston, TX, USA	Sep 2019
The US National Congress on Computational Mechanics, Austin, TX, USA	Jul 2019
North American High Order Methods Conference, San Diego, CA, USA	Jun 2019
Finite Element Rodeo, Austin, TX, USA	Mar 2019

POSTERS

A discontinuous Galerkin method for wave propagation in coupled elastic-acoustic media, with J. Chan, Rice Oil and Gas HPC conference, 2019.

GPU-accelerated Bernstein-Bezier weight-adjusted DG methods for wave propagation in heterogeneous media, with J. Chan, SIAM LA-TX sectional meeting, 2018.

GPU-accelerated Bernstein-Bezier weight-adjusted DG methods for wave propagation in heterogeneous media, with J. Chan, Rice Oil and Gas HPC conference, 2018.

AWARDS

Oil & Gas HPC Conference Graduate fellowship, Rice University 2017
Awarded to students engaged in research related to high performance computing.

Jack C. Pollard Endowed Fellowship in Engineering, Rice University 2016
Awarded to students for their educational achievements.

Science Scholarship, Sichuan University 2012
Awarded to top undergraduate students.

Excellent Comprehensive Scholarship, Sichuan University 2011
Awarded to top undergraduate students.

TEACHING EXPERIENCE

Rice University, Department of Computational and Applied Mathematics

Grader, CAAM 336, Differential Equations in Science and Engineering, Spring 2020

Grader, CAAM 336, Differential Equations in Science and Engineering, Fall 2019

Grader, CAAM 435, DYNAMICAL SYSTEMS, Spring 2019

Teaching assistant, CAAM 550, NUMERICAL ANALYSIS I, Fall 2018

Grader, CAAM 554, ADVANCED NUMERICAL ANALYSIS II, Spring 2018

Grader, CAAM 553, ADVANCED NUMERICAL ANALYSIS I, Fall 2017

Grader, CAAM 336, Differential Equations in Science and Engineering, Spring 2017

Grader, CAAM 336, Differential Equations in Science and Engineering, Fall 2016

New York University, Courant Institute of Mathematical Sciences

Grader, MATH-UA 325, Analysis, Spring 2016

Grader, MATH-UA 325, Analysis, Spring 2015