Brendan Keith

Curriculum Vitæ

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Education

Ph.D. - UT Austin (present). **G.P.A. 4.0/4.0**
Institute for Computational Engineering and Sciences
Computational Science, Engineering, & Mathematics

M.S. - UT Austin (2015). **G.P.A. 4.0/4.0**
Institute for Computational Engineering and Sciences
Computational Science, Engineering, & Mathematics

M.Sc. - McGill University (2013). **G.P.A. 4.0/4.0**
Department of Mathematics and Statistics
Applied Mathematics

B.Math - University of Waterloo (2011).
Department of Applied Mathematics &
Department of Physics
Honours Applied Mathematics with Physics Option

B.Math - University of Waterloo (2011).
Department of Pure Mathematics
Honours Pure Mathematics

Total U. Waterloo G.P.A. 87/100

Research Experience

Graduate Research Assistant - UT Austin
Supervisor: Dr Leszek Demkowicz
Graduate Research Assistant - McGill University
Supervisor: Dr George Haller (09/2011 - 08/2013)

Teaching Experience

Graduate Teaching Assistant - UT Austin
CSE 386M, Functional Analysis in Theoretical Mechanics (graduate course) Fall 2016
CSE 380, Tools and Techniques for Computational Science (graduate course) Fall 2015
M 408N, Differential Calculus for Science Fall 2014
Graduate Teaching Assistant - McGill University
Math 376, Honours Nonlinear Dynamics Fall 2012
Undergraduate Teaching Assistant - University of Waterloo
Math 124, Calculus and Vector Algebra for Kinesiology Fall 2010
Math 135, Algebra for Honours Mathematics Winter 2010 & Spring 2011
Math 136, Linear Algebra for Honours Mathematics Winter 2010 & Winter 2011
Math 137, Calculus 1 for Honours Mathematics Fall 2010
Math 138, Calculus 2 for Honours Mathematics Winter 2011
Math 239, Introduction to Combinatorics Fall 2009

Recent Awards

SIAM Student Certificate of Recognition for 2017
Computers and Mathematics with Applications Second Prize for "Best Mathematically Oriented Poster" at the 14th U.S. National Congress on Computational Mechanics, 2017.
University of Texas at Austin University Graduate Continuing Fellowship
University of Texas at Austin College Recruitment Fellowship Award

Notable Publications

Peer-Reviewed Journal Articles

A. Vaziri Astaneh, **B. Keith**, and L. Demkowicz (2018) On perfectly matched layers for discontinuous Petrov–Galerkin methods. *Submitted.*

B. Keith, A. Vaziri Astaneh, and L. Demkowicz (2017) Goal-oriented adaptive mesh refinement for non-symmetric functional settings. *Submitted.*

B. Keith, S. Petrides, F. Fuentes, and L. Demkowicz (2017) Discrete least-squares finite element methods. *Comput. Methods Appl. Mech. Engrg.*, 327:226–255.

B. Keith, P. Knechtges, N. V. Roberts, S. Elgeti, M. Behr, and L. Demkowicz (2017) An ultraweak DPG method for viscoelastic fluids. *J. Non-Newton. Fluid Mech.*, 247:107–122.

F. Fuentes, **B. Keith**, L. Demkowicz, and P. Le Tallec (2017) Coupled variational formulations of linear elasticity and the DPG methodology. *J. Comput. Phys.*, 348:715–731.

B. Keith, F. Fuentes, and L. Demkowicz (2016) The DPG methodology applied to different variational formulations of linear elasticity. *Comput. Methods Appl. Mech. Engrg.*, 309:579–609.

Feuntes, F., **B. Keith**, and L. Demkowicz (2015) Orientation embedded high order shape functions for the exact sequence elements of all shapes. *Comput. Math. Appl.*, 70(4):353–458.

Manuscripts in Preparation

B. Keith, L. Demkowicz, and J. Gopalakrishnan (2018) The DPG* method.

B. Keith, N. V. Roberts, and L. Demkowicz (2018) Goal-oriented adaptive mesh refinement with a DPG method for viscoelastic fluids.

Other

B. Keith, L. Demkowicz, and J. Gopalakrishnan (2017) DPG* method. *ICES Report 17-25, The University of Texas at Austin*.

B. Keith (2014) Lagrangian coherent structures in three-dimensional steady flows. Master's thesis. Supervisor: George Haller. McGill University.

B. K. Robison[†] (2011) The wave equation and multi-dimensional time. *The Waterloo Mathematics Review.* 1(1):32-42.

Academic Service

Journal Reviewer

Computer Methods in Applied Mechanics and Engineering
Computers and Mathematics with Applications
IMA Journal of Numerical Analysis
Mathematics of Computation

Grant Proposal Reviewer

National Science Center, Poland (Panel ST8)

Conference Organizer

Texas Applied Mathematics and Engineering Symposium (`tames.io`)

Student Societies

President: UT Austin SIAM chapter. (09/2015 - present)
Treasurer: UT Austin SIAM chapter. (09/2013 - 08/2015)

Student Politics

Graduate Student Assembly Representative: UT Austin (09/2016 - 08/2017)
Graduate Student Council Member: McGill University (09/2012 - 08/2013)
Graduate Student Society Committee Member: McGill University (09/2012 - 08/2013)

[†]Personal name legally changed by the Government of Ontario to Brendan Keith on February 22, 2012.

Societal Membership

Institutional

Austin Chapter of SIAM

National/International

American Mathematical Society
Canadian Mathematical Society
Canadian Applied and Industrial Mathematics Society
Society for Industrial and Applied Mathematics (SIAM)
United States Association for Computational Mechanics

Software Development

Finite element shape function library (lead developer, Fortran) ESEAS (`github.com/libESEAS/ESEAS`).
Finite element software (developer, Fortran) hp3D.
Finite element software (developer, C++) Camellia (`bitbucket.org/nateroberts/camellia.git`).

Technical Skills

Knowledge

- Problem analysis and resolution
- Technical mathematics
- Software testing and troubleshooting
- Collaboration and teamwork
- Vector graphics editing
- Quality assurance
- End-user and technical documentation
- Parallel computing
- Splines
- Version control (e.g. git, svn)

Software

- hp2D & hp3D
- Camellia
- deal.II
- ESEAS
- AUTO
- Paraview
- Inkscape
- GDB
- OpenMP
- MPI

Languages

- Matlab
- Maple
- Mathematica
- Fortran 90
- Python
- C++
- LaTeX

Operating systems

- Unix/Linux
- OSX

Recent Conferences and Presentations

B. Keith, A. Vaziri Astaneh, and L. Demkowicz Goal-oriented adaptive mesh refinement for discontinuous Petrov–Galerkin methods, Minimum Residual & Least-Squares Finite Element Methods, Portland, Oregon, October 2–4, 2017

B. Keith, A. Vaziri Astaneh, and L. Demkowicz Goal-oriented adaptive mesh refinement for discontinuous Petrov–Galerkin methods, Texas Applied Mathematics and Engineering Symposium, Austin, Texas, September 21–23, 2017

B. Keith, A. Vaziri Astaneh, S. Petrides, and L. Demkowicz Goal-oriented error estimation and adaptivity with the DPG methodology, USNCCM14, Montreal, Canada, July 17–20, 2017

B. Keith, Discrete least-squares finite element methods, Oberwolfach Seminar: Discontinuous Petrov-Galerkin Methods, Oberwolfach, Germany, Jun 4–10 Jun 2017

B. Keith, A. Vaziri Astaneh, S. Petrides, and L. Demkowicz Goal-oriented error estimation and adaptive mesh refinement with the DPG methodology, Advances in Computational Sciences and Engineering (ACSE), March 20–21, 2017, Austin, TX

B. Keith, P. Knechtges, N.V. Roberts, S. Elgeti, M. Behr, and L. Demkowicz An ultraweak DPG method for viscoelastic fluids, The Finite Element Rodeo 2017, Houston, Texas, USA, March 3–4, 2017

B. Keith, P. Knechtges, N.V. Roberts, S. Elgeti, M. Behr, and L. Demkowicz An ultraweak DPG method for viscoelastic fluids, SIAM CSE17, Atlanta, Georgia, USA, February 27–March 3, 2017

B. Keith Some recent progress with the DPG method, MAFELAP 2016, Brunel University London, Uxbridge, UK, June 14–17, 2016

B. Keith Error estimation and adaptivity from a locally conservative and objective driven discontinuous petrov-galerkin methodology, Workshop for Advances in Mathematics for Finite Elements (conference in honor of the 90th birthday of Prof. Ivo Babuška), The University of Texas at Austin, TX, March 21–22, 2016.

B. Keith DPG applied to various variational formulations of linear elasticity, 2016 Finite Element Rodeo, Texas A&M University, College Station, TX, March 4–5, 2016.

B. Keith Orientation embedded high order shape functions for the exact sequence elements of all shapes, Polytopal Element Methods in Mathematics and Engineering, Georgia Institute of Technology, Atlanta, GA, October 26–28, 2015.

B. Keith DPG applied to various variational formulations of linear elasticity, Computational Engineering Workshop, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, September 27–October 3, 2015.

B. Keith High order shape functions for exact sequence elements of all shapes. Part I: Methodology, 13th U.S. National Congress on Computational Mechanics, San Diego, CA, July 26–30, 2015.