NATASHA S. SHARMA

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Appointments

- **August 2014 – present** **Assistant Professor**, *University of Texas at El Paso, El Paso.*
- **August 2012 –August 2014** **Postdoctoral Fellow** *IWR, University of Heidelberg, Heidelberg.*
- **January 2012 –July 2012** **Postdoctoral Fellow** *University of Houston, Houston, Texas.*

External Funding

- NSF DMS 1520862: *Collaborative Research: Numerical Simulation of the Morphosynthesis of Polycrystalline Biominerals,* 2015-2018; PI (with PI at participating institute Ronald Hoppe, University of Houston).

Research

- **Research Interests**

  My research interests are a posteriori error analysis for partial differential equations discretized through Galerkin methods, developing efficient adaptive schemes and robust iterative methods to solve time dependent and stationary differential equations.
  My long term research goals are to apply the finite exterior calculus tools to nonlinear pdes and to investigate an adaptive electromagnetic field propagation in heterogeneous media where adaptivity is also driven by the material discontinuities.

- **Publications**

  – Guido Kanschat and Natasha Sharma, Divergence-conforming Discontinuous Galerkin Methods and C^0 Interior Penalty Methods. *(SIAM, Journal of Numerical Analysis, Vol. 52, Issue 4).*
  – R.H.W. Hoppe. and N. Sharma, *Convergence Analysis of an Adaptive Interior Penalty Discontinuous Galerkin Method for the Helmholtz Equation.* IMA Journal of Numerical Analysis, 2013.
  – C. Carstensen, R.H.W. Hoppe, N. Sharma and T. Warburton, *Adaptive hybridized Interior Penalty Discontinuous Galerkin methods for H(curl)-elliptic problems.* Numer. Math. Theor. Meth. Appl. **4**, 13–37, 2011.

- **Conference Proceedings**

  – N.S Sharma (Joint work with R.H.W Hoppe). *Convergence Analysis of an Adaptive Interior Penalty Discontinuous Galerkin Method for the Helmholtz Equation.* Oberwolfach Reports, Workshop on Theory and Applications of Discontinuous Galerkin Methods, 2012.
  – N.S Sharma (Joint work with Dr. R.H.W Hoppe and Dr. Tim Warburton). *A posteriori error analysis for hybridized Interior Penalty Discontinuous Galerkin Method for H(curl)-elliptic problems.* Oberwolfach Reports, Workshop on Computational Electromagnetism and Acoustics, Springer, Berlin-Heidelberg-New York 2010.

- **Submitted**
  - A C^0 Interior Penalty Method for elliptic distributed Optimal Control Problems in three dimensions with pointwise state Constraints. S.Brenner, M.Oh. S.Pollock, K.Porwal, M.Schedensack and N.Sharma.

- **Preprints**
  - D. Braess, R.H.W. Hoppe, N. S. Sharma, The Hypercircle Method and an equilibrated a posteriori error estimator for Discontinuous Galerkin approximations of elliptic boundary value problems on Quadilateral Meshes.
  - D. Beigel, M. Klingebiel, N. Sharma, An adaptive DG-θ method with residual-type error estimates for nonlinear parabolic problems.
  - Natasha Sharma and Guido Kanschat, Convergence of an adaptive Divergence-conforming Discontinuous Galerkin Method for the Stokes Problem.

- **Invited Presentations**
  - Computational Mathematics Seminar Series, Louisiana State University, Baton Rouge, Louisiana. February 3rd 2015.
  - Fall Southeastern Section Meeting University of North Carolina at Greensboro, Greensboro, NC, USA. November 8th-9th, 2014.
  - Joint Mathematical Meetings, Baltimore Convention Center, Baltimore, MD, USA. January 15th-18th, 2014.
  - EnuMath, EPFL, Lausanne, Switzerland. August 26th-30th, 2013.
  - MaFeLap, Brunel University, London, UK. June 11th-14th, 2013.
  - SIAM Seas Conference, University of Alabama, Huntsville, Alabama, USA. March 24th-25th, 2012.
  - Theory and Applications of Discontinuous Galerkin Methods, Mathematisches Forschungsinstitut Oberwolfach, Germany. February 19th-25th, 2012.
  - Numerical Analysis Seminar, Texas A&M, College Station, Texas, USA. October 12th, 2011.
  - Numerical Methods for Incompressible Fluid Flow, University of British Columbia, Vancouver, BC, Canada. July 14th - 16th, 2011.
  - Conference on Computational Electromagnetism and Acoustics, Mathematisches Forschungsinstitut Oberwolfach, Germany. February 14th-20th, 2010.

- **Research Visits**
  - January 2016: Computer Science Research Institute, Sandia National Laboratories, Alburquerque, New Mexico, USA.
  - December 2014: A week long research visit to Prof. Guido Kanschat, Dr. Doerte Beigel at Interdisciplinary Center for Scientific Computing, Heidelberg University, Heidelberg, Germany.
  - September 2013: A research visit to Prof. Andrea Bonito, Department of Math, Texas A&M, College Station, Texas, USA
  - March 2012 and April 2012: Week long research visits to Prof. Guido Kanschat, Department of Math, Texas A&M, College Station, Texas, USA

Thesis and Independent Study advising

- 2015–2016 (at University of Texas at El Paso)
  - Julio Solis, supervised the independent study on Mathematical Modeling and Analysis of Methane Gas production (Spring 2015–Summer 2015).
    He started his Masters thesis under my supervision (Fall 2015–present).
  - Bethuel Khamala, PhD thesis supervisor (Spring 2015–present).
  - Mohammad Arifur Rahman, Masters thesis supervisor (Summer 2015–present).
- 2013-2014 (at Heidelberg University)
  - Patrik Esser, supervised the independent study on robust a posteriori error estimation for non conforming finite element methods (Winter semester 2013-14).
  - Alexander Hoffmann, supervised the independent study on a posteriori error analysis adaptive Interior Penalty method for second order and fourth order elliptic problems. (Winter and Summer semester 2013-2014).
  - Egzon Miftari, Co-advised the student's bachelor's thesis on a posteriori error estimates for the strongly coupled Darcy-Stokes flow through differential relations (Winter semester 2013-14).

Mentoring experience

- Faculty Advisor, Society for Industrial and Applied Mathematics Student Chapter at UTEP (2015–present).
- Co-mentor, IMA Special Workshop WhAM! A Research Collaboration Workshop for Women in Applied Mathematics: Numerical Partial Differential Equations and Scientific Computing, August 2014.
- Mentor for Michael Herbst, Ph.D. student, Theoretical and Computational Chemistry Group, IWR, Heidelberg University.

Education

- **University of Houston** — Houston, TX
  Ph.D., Applied Mathematics, ***Advisor:*** *Prof. R.H.W Hoppe* — *Jan. 2009 – Dec. 2011*
  Thesis Title: 'Convergence analysis of adaptive IPDG method for Helmholtz equation'
- **University of Houston** — Houston, TX
  Master of Science, Applied Mathematics — *Aug. 2006 – Dec. 2008*
- **Lady Shri Ram College, Delhi University** — Delhi, India
  Master of Arts, Mathematics — *Jul. 2004 – Jul. 2006*
- **Sri Venkateswara College, Delhi University** — Delhi, India
  Bachelor of Arts, Mathematics — *Jul. 2000 – Jul. 2004*

Awards

- Oberwolfach Leibniz Graduate Student Grant 2012.
- Supported as Research Assistant under NSF grant-'Collaborative Research:Tuning-free Adaptive Multilevel Discontinuous Galerkin Methods for Maxwell's Equations.' (DMS-0810176) *(Summer 2009 - Fall 2011).*
- Awarded Graduate Assistant Tuition Fellowship for Academic and Teaching excellence. (Fall 2007 – Spring 2012).

Teaching Experience

- **Introduction to Computational Science, UTEP**
  Currently holding Lab sessions for this scientific computing course, Fall 2015.
- **Transitioning to C++ for Scientific Computations, UTEP**
  Designed this pioneering course with the goal of mathematical modeling in Fall 2014 and 2015.
- **Numerical Solutions to Partial Differential Equations, UTEP**
  Introduction to the analysis and implementation of numerical methods, Spring 2015.
- **Implementation of numerical methods for PDE, Heidelberg University**
  Summer semester 2014, Winter semester 2013-14
- **Solving differential equations with deal.II, Heidelberg University**
  Introduced graduate students to the use of the software deal.II during the Summer semster 2013.
- **Convergent Adaptive Finite Element Methods, Heidelberg University**
  Designed and taught this pioneering compact course in February 2013 targeted at Ph.D. students.
- **Fundamentals of Mathematics, University of Houston**
  Taught a class of 50 students during Spring 2012.
- **Pre-Calculus, University of Houston**
  Taught a Pre-Calculus class consisting of 120 students during Spring 2011.

Service

- **University Service**
  - Member, University Undergraduate Curriculum Committee (Fall 2015–present).
  - COURI judge representing UTEP College of Science (April 2015).
- **Department Service**
  - Member, Applied Mathematics and Computational Science Faculty Hiring Committee, (Fall 2015–2016).
  - Member, Department Undergraduate Curriculum Committee (Fall 2014–present).
- **UTEP Master Thesis Committee**
  - Leobardo Valera, Contributions to the solution of large nonlinear systems via model order reduction and constraint-solving techniques (Fall 2015).
  - Sumi Dey, Numerical study of the supercritical solution of the stationary forced Korteweg-de Vries (sfKdV) equation (Fall 2015).
  - Maranda Bean, A Block Preconditioner for a Mixed Finite Element Method for a Biot's Equations (Fall 2014).

Seminar Organization

- **Coding day with Kokkos Library, SIAM Student Chapter, 23rd October 2015, UTEP.**
- **Graduate Seminar for Bioinformatics, (Spring 2015), UTEP.**
- **Graduate Seminar CPS 5195 (Fall 2014), UTEP.**
- **IWR Seminar on Scientific Computing (Summer 2013-2014), Heidelberg University.**

- **Approximation in Finite Element Spaces Seminar (Summer 2013), Heidelberg University:** Co-organized this seminar where undergraduate students were required to present research topics.
- **Adaptive Finite Elements Seminar (Winter 2012-13), Heidlberg University:** Responsibilities include mentoring students and helping them present research papers.
- **Graduate Student Seminar (Fall 2010 to Fall-2011), University of Houston:** Was responsible for hosting, organizing the seminar for graduate students between Fall 2010-2011.

Computing Skills

- **Languages:** C, C++, Fortran.
- **Software:** Deal.II, FEniCS, IFEM, NUDG.

References

- Prof. Dr. R.H.W Hoppe
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  669, Philip G. Hoffman Hall,
  Houston, TX 77004, USA
  rohop@math.uh.edu
- Prof. Dr. Guido Kanschat
  IWR, University of Heidelberg
  Room Number 234,
  Im Neuenheimer Feld 368,
  Heidelberg, 69120, Germany.
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