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** *Heidelberg University, Heidelberg, Germany.*

- **January 2012 –July 2012**   **Postdoctoral Fellow** *University of Houston, Houston, Texas.*

External Funding

- **Awarded Grants**

  1. NSF DMS 2110774: *Collaborative Research: Numerical Methods and Adaptive Algorithms for Sixth-Order Phase Field Models,* 2021-2024; **PI** (with PI at participating institute Amanda Diegel, Mississippi State University). **Funded** $125,000.00**.** Abstract.

  2. 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). **Funded** $159,999.00. Abstract

Research

- **Manuscripts Under Review**

  – *A. E. Diegel and N. Sharma, A C^0 Interior Penalty Method for the Phase Field Crystal Equation, 2020.* [preprint]

- **Peer Reviewed Publications**

  1. *N. Sharma, Robust a-posteriori error estimates for weak Galerkin method for the convection-diffusion problem, Applied Numerical Mathematics Volume 170, December 2021, Pages 384-397.* [preprint]

  2. *N. S. Sharma and G. Kanschat, A Contraction Property of an Adaptive Divergence-Conforming Discontinuous Galerkin Method for the Stokes Problem, Journal of Numerical Mathematics, 26(4), pp. 209-232, 2018.*

  3. *S. Brenner, M. Oh, S. Pollock, K. Porwal, M. Schedensack, N. Sharma, A C^0 interior penalty method for elliptic distributed optimal control problems in three dimensions with pointwise state constraints, in Topics in Numerical Partial Differential Equations and Scientific Computing, IMA Volumes in Mathematics and Its Applications, 160, 2016.*

  4. *G. Kanschat and N. S. Sharma, Divergence-conforming Discontinuous Galerkin Methods and C^0 Interior Penalty Methods. SIAM, Journal of Numerical Analysis, Vol. 52, Issue 4.*

  5. *R.H.W. Hoppe. and N. S. Sharma, Convergence Analysis of an Adaptive Interior Penalty Discontinuous Galerkin Method for the Helmholtz Equation. IMA Journal of Numerical Analysis, 2013.*

  6. *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**

  1. 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.
  2. N. S. Sharma (Joint work with R. H. W. Hoppe and T. 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.

- **Open-source code software**

  - N. Sharma, G. Kanschat, T. Heister, W. Bangerth, and Z. Wang, Biharmonic equation solver `deal.II` Version 9.2 step-47 tutorial program (2020). https://www.dealii.org/developer/doxygen/deal.II/step_47.html

- **Non-Peer Reviewed Articles**

  1. D. Beigel, M. Klingebiel, N. Sharma, *An adaptive DG-θ method with residual-type error estimates for linear parabolic problems, 2017. Technical Report.*
  2. R.H.W. Hoppe, J. Neher, N. Sharma, *A Posteriori Error Analysis of Hybridized Mixed Finite Element Methods for Second Order Elliptic Boundary Value Problems, 2009. Technical Report, opus.bibliothek.uni-augsburg.de*

- **Invited Presentations**

  1. Seminar on Numerical Analysis and Applied Mathematics at Valparaíso, Institute of Mathematics at PUCV, Chile, November 12, 2021
  2. 4th Annual Meeting of the SIAM Texas-Louisiana Section, University of Texas Rio Grande Valley, South Padre Island, TX, November 5-7.
  3. Peaceman Lecture Series on Numerical Mathematics, Rice University, October 25, 2021
  4. Annual Retreat 2021 Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences (HGS Mathcomp), Heidelberg University, Heidelberg Germany September 20-21 2021, (**held 100% virtual due to the pandemic**).
  5. 16th U.S. National Congress on Computational Mechanics, Chicago, Illinois, July 25-29, 2021 (**held 100% virtual due to the pandemic**).
  6. SIAM Conference on Mathematical Aspects of Materials Science, Bilbao, Spain, May 17-28 2021 (**held 100% virtual due to the pandemic**).
  7. Department of Mathematics and Statstics Seminar Texas A& M University, Corpus Christi, April 9, 2021 (**held 100% virtual due to the pandemic**).
  8. CMAM 2020: 9th Conference on Computational Methods in Applied Mathematics, TU Wien (Vienna University of Technology), Vienna, Austria, July 13-17, 2020 (**canceled due to the pandemic**).
  9. International Conference on Computational Methods and Applications in Engineering 2020, Mississippi State University, Starkville, Mississippi. May 7-9, 2020 (**canceled due to the pandemic**).
  10. SIAM SEAS Conference, Auburn University, Auburn, Alabama. March 14-15, 2020. (**rescheduled due to the pandemic**) .
  11. Seventh deal.II Users and Developers Workshop, Colorado State University, August 6-9, 2019.

12. International Congress on Industrial and Applied Mathematics 2019, Valenicia, Spain, July 15-19 2019.

13. MAFELAP 2019, Brunel University London, UK, June 18-21 2019.

14. Computational and Applied Mathematics Seminar, Mississippi State University, Starkville, MS, March 8 2019.

15. SIAM Annual Meeting 2018, Portland, Oregon, July 9-13, 2018.

16. Joint Mathematical Meetings, San Diego Convention Center, San Diego, California, January 10-13, 2018.

17. CPS 5195 Seminar, University of Texas at El Paso, El Paso, Texas, March 27, 2017.

18. Modeling and Computation Seminar, University of Arizona, Tuscon, Arizona, October 27 2016.

19. Colloquium Series, New Mexico State University, Las Cruces, New Mexico, April 28 2016.

20. Scientific Computing Seminar, University of Houston, Houston, Texas April 21 2016.

21. Computational Mathematics Seminar Series, Louisiana State University, Baton Rouge, Louisiana. February 3 2015.

22. Fall Southeastern Section Meeting University of North Carolina at Greensboro, Greensboro, North Carolina. November 8-9, 2014.

23. Joint Mathematical Meetings, Baltimore Convention Center, Baltimore, Maryland. January 15-18, 2014.

24. EnuMath, EPFL, Lausanne, Switzerland. August 26-30, 2013.

25. MAFELAP 2013, Brunel University, London, UK. June 11-14, 2013.

26. SIAM SEAS Conference, University of Alabama, Huntsville, Alabama, USA. March 24-25, 2012.

27. Theory and Applications of Discontinuous Galerkin Methods, Mathematisches Forschungsinstitut Oberwolfach, Germany. February 19-25, 2012.

28. Numerical Analysis Seminar, Texas A&M, College Station, Texas, USA. October 12, 2011.

29. Numerical Methods for Incompressible Fluid Flow, University of British Columbia, Vancouver, Canada. July 14-16, 2011.

30. Conference on Computational Electromagnetism and Acoustics, Mathematisches Forschungsinstitut Oberwolfach, Germany. February 14-20, 2010.

- **Contributed Presentations**

  1. Mathematics Colloquium UTEP, October 2, 2020.

  2. 2020 Finite Element Rodeo Conference at Baylor University

  3. 22nd Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences, New Mexico State University

  4. 2018 Finite Element Rodeo Conference at Louisiana State University

  5. 2014 Finite Element Rodeo Conference at University of Texas at Austin

  6. 2012 Finite Element Rodeo Conference at Rice University

  7. 2010 Finite Element Circus at Institute for Mathematics and its Applications

  8. 2010 Finite Element Rodeo Conference at Southern Methodist University

Thesis and Independent Study supervising

- 2020–2021 (at University of Texas at El Paso)

  1. Augustine Twumasi, Masters thesis supervisor, *Reinforcement Learning-Driven Adaptive Mesh Refinement for Partial Differential Equations* (Fall 2020–Summer 2021). **Joint Collaboration with Pacific Northwest National Laboratory.**

  2. Oula Khouzam, supervising an independent study on *Numerical Simulation of Grain Growth using Phase Field Crystal Equation* (Summer 2021).

- 2019–2020 (at University of Texas at El Paso)

  1. Ogochukwu N. Ifeacho, Masters thesis supervisor, *Mathematical Modeling of Micro emulsification Processes* (Fall 2019–Summer 2020).

- 2017–2021 (at University of Texas at El Paso)

  1. Amitabh Biswas, supervised a research project *Adaptive time-stepping schemes for Sixth-Order Phase Field Models* (Spring 2021–Summer 2021).

  2. Julio Solis supervised a research project *Towards a Hybridizable Discontinuous Galkerin Method for two phase flow problem in porous media* (Fall 2015–Summer 2018).

  3. Modupe Odusanya supervised an independent study on *Numerical Analysis of Cahn-Hilliard equation in one dimension* (Spring 2018).

- 2016–2017 (at University of Texas at El Paso)

  1. Jazmin Quezada supervised the independent study on *Multigrid Solvers* (Spring 2017).

  2. Mohammad Arifur Rahman, Masters thesis supervisor (Summer 2015–Summer 2016). *On numerical methods for linear and nonlinear fourth order problems.*

  3. Julio Solis, supervised the independent study on *Mathematical Modeling and Analysis of Methane Gas production* (Spring 2015–Summer 2015).

  4. Claudia Garcia, undergraduate summer research intern, UT System Louis Stokes Alliance for Minority Participation (LSAMP) working on *Efficient Solvers for Large Scale Linear Systems.* The duration of her internship is June–August 2016.

- 2015–2016 (at University of Texas at El Paso)

  1. Bethuel Khamala, supervised a research project on *Numerical Simulation of Cahn-Hilliard-Navier-Stokes system* (Spring 2015–Summer 2016).

  2. Mohammad Arifur Rahman, Masters thesis supervisor, *On numerical methods for linear and nonlinear fourth order problems* (Summer 2015–Summer 2016).

  3. Julio Solis, supervised the independent study on Mathematical Modeling and Analysis of Methane Gas production (Spring 2015–Summer 2015).

- 2013-2014 (at Heidelberg University)

  1. Patrik Esser, supervised the independent study on robust a posteriori error estimation for non conforming finite element methods (Winter semester 2013-14).

  2. 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).

  3. 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

1. Mentor, Computational Methods for PDEs Summer School, Colorado State University. August 3- 6 2019.

2. Faculty Advisor, Society for Industrial and Applied Mathematics Student Chapter at UTEP (2015–present).

3. Co-mentor, IMA Special Workshop WhAM! A Research Collaboration Workshop for Women in Applied Mathematics: Numerical Partial Differential Equations and Scientific Computing, August 2014.

4. 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

1. **Computational Methods of Linear Algebra**
   Teaching numerical methods for solving linear systems including error, stability analysis. Fall 2021.

2. **Mathematical and Computer Modeling, UTEP**
   Introducing graduate students to Mechanistic Models and related software. Spring Semester 2016–2021.

3. **Numerical Analysis, UTEP**
   Introducing undergraduate students to Numerical Analysis. Fall 2016-2021, Spring 2017–2020.

4. **Calculus II, UTEP**
   Teaching undergraduate students basics of Calculus II. Spring 2019, Fall 2017–2020.

5. **Introduction to Computational Science, UTEP**
   Held Lab sessions for this scientific computing course, Fall 2015.

6. **Transitioning to C++ for Scientific Computations, UTEP**
   Designed this pioneering course with the goal of mathematical modeling in Fall 2014 and 2015.

7. **Numerical Solutions to Partial Differential Equations, UTEP**
   Introduction to the analysis and implementation of numerical methods, Spring 2015.

8. **Implementation of numerical methods for PDE, Heidelberg University**
   Summer semester 2014, Winter semester 2013-14

9. **Solving differential equations with deal.II, Heidelberg University**
   Introduced graduate students to the use of the software deal.II during the Summer semester 2013.

10. **Convergent Adaptive Finite Element Methods, Heidelberg University**
    Designed and taught this pioneering compact course in February 2013 targeted at Ph.D. students.

11. **Fundamentals of Mathematics, University of Houston**
    Taught a class of 50 students during Spring 2012.

12. **Pre-Calculus, University of Houston**
    Taught a Pre-Calculus class consisting of 120 students during Spring 2011.

Service

- **Professional Service**

  1. NSF Panelist and reviewer, 2021.
  2. Co-organizer of Special Session at AMS Fall Central Sectional Meeting, University of Texas at El Paso, September 12-13, 2020.
  3. Co-organizer of Computational Methods for PDEs Summer School, Colorado State University, August 3-6 2019.
  4. Chair for Career Panel session and Minisymposium Co-organizer, International Congress of Industrial and Applied Mathematics, Valencia Spain, July 15-19, 2019.
  5. Minisymposium Co-organizer, MAFELAP 2019, Brunel University, UK, June 18-21 2019.
  6. Minisymposium Co-organizer, MAFELAP 2016, Brunel University, UK, June 14-17, 2016.
  7. Journal reviewer for Journal of Numerical Mathematics, IMA Journal of Numerical Analysis, Applied Numerical Mathematics, Journal of Scientific Computing, International Journal for Numerical Methods in Engineering, Cogent Mathematics, Science China Mathematics.

- **University Service**

  1. Undergraduate Advisor, (Fall 2018–current).
  2. Member, University Undergraduate Curriculum Committee (Fall 2015–Fall 2016).
  3. COURI judge representing UTEP College of Science (April 2015).

- **Department Service**

  1. Chair, PhD Qualifier Committee (Fall–Spring 2018)
  2. Member, PhD Qualifier Committee (Spring 2015–present)
  3. Member, Graduate Studies Committee (Fall 2016–present)
  4. Member, Concentration in Applied Mathematics Committee, (Fall 2015–2016).
  5. Member, Applied Mathematics and Computational Science Faculty Hiring Committee, (Fall 2015–2016).
  6. Member, Department Undergraduate Curriculum Committee (Fall 2014–present).

- **UTEP Master Thesis Committee**

  1. Manuel Martinez, Formulation and parallel implementation of iterative method for generating spatially variant lattices, Electrical Engineering Department, April 2019.

2. Md Al Masum Bhuiyan, Estimation of Volatility in the Study of Financial and Geophysical Time Series, Mathematical Sciences Department, Fall 2017.

3. Mohammad Tauhiduzzaman, Design Optimization of Sandwich Core, Department of Mechanical Engineering, Summer 2016.

4. Hasan Md Mahmudul, The New Issues for Classification Problems, Department of Mathematical Sciences, Summer 2016.

5. Henry R. Moncada, Towards the scalability and hybrid parallelization of a spatially variant lattice algorithm, Computational Science Program, Spring 2016.

6. Leobardo Valera, Contributions to the solution of large nonlinear systems via model order reduction and constraint-solving techniques, Computational Science Program, Fall 2015.

7. Sumi Dey, Numerical study of the supercritical solution of the stationary forced Korteweg-de Vries (sfKdV) equation, Department of Mathematical Sciences Fall 2015.

8. Maranda Bean, A Block Preconditioner for a Mixed Finite Element Method for a Biot's Equations, Computational Science Program, Fall 2014.

- **PhD Thesis Committee**

  1. Daewa Kim, A Kinetic Theory Approach To Pedestrain Motion And Onset of Disease Spreading, University of Houston, Spring 2019.

  2. Maranda Bean, A Mixed Finite Element Method for the Coupling of Linear Elasticity and Stokes Flow, Computational Science Program, Fall 2018.

  3. Leobardo Valera, Interval Constraint Solving Techniques and Model-Order Reduction to enhance the Solution of Dynamical Systems, University of Texas at El Paso, Spring 2018.

  4. Chandi Bhandari, C^0 IPDG approximations of fourth order total variation flow problems University of Houston, Spring 2018.

  5. Dina Alsheikh, The Hypercircle method and an equilibrated a posteriori error estimator for discontinuous Galerkin approximations of elliptic boundary value problems on simplicial meshes, University of Houston, Spring 2016.

Seminar Organization

- **Coding day with Kokkos Library, SIAM Student Chapter, (Fall 2015), UTEP.**

- **Graduate Seminar for Bioinformatics, (Spring 2015), UTEP.**

- **Graduate Seminar CPS 5195 (Fall 2014), UTEP.**

- **IWR Seminar on Scientific Computing (Summers 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 (Winters 2012-13), Heidlberg University:** Responsibilities include mentoring students and helping them present research papers.

- **Graduate Student Seminar (Fall 2010–Fall 2011), University of Houston:** Was responsible for hosting, organizing the seminar for graduate students.

Computing Skills

- **Languages:** C, C++, Fortran.

- **Software:** Deal.II, FEniCS, IFEM, NUDG, Netgen/NGSolve.

References available upon request