Prashant K. Jha

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A POSITIONS

Research Associate
Dec 2020 – present
Oden Institute for Computational Engineering and Sciences
The University of Texas at Austin, Austin, TX 78712
PI: Dr. J. Tinsley Oden

Adjunct Faculty
Aug 2021 – Dec 2021
Department of Aerospace Engineering and Engineering Mechanics
The University of Texas at Austin, Austin, TX 78712

Adjunct Faculty
Aug 2021 – Dec 2021
Department of Biomedical Engineering
The University of Texas at Austin, Austin, TX 78712

Peter O'Donnell Postdoctoral Fellow
Aug 2019 – Nov 2020
Oden Institute for Computational Engineering and Sciences
The University of Texas at Austin, Austin, TX 78712
PI: Dr. J. Tinsley Oden

Postdoctoral Fellow
Oct 2016 – Jul 2019
Department of Mathematics
Louisiana State University, Baton Rouge, LA 70803
PI: Dr. Robert Lipton

B EDUCATION

Ph.D.
2012 – 2016
Civil and Environmental Engineering
Carnegie Mellon University, Pittsburgh, PA 15213
Adviser: Dr. Kaushik Dayal
Thesis: Coarse graining of electric field interactions with materials

M.E.
2010 – 2012
Mechanical Engineering
Indian Institute of Science, Bengaluru, KA 560012, India
Adviser: Dr. Chandrashekhar S. Jog
Thesis: A monolithic strategy for fluid-structure interaction in compressible flow

B.E.
2006 – 2010
Mechanical Engineering
Govt. Engineering College, Raipur, CG 492001, India

C TEACHING EXPERIENCES

1. **COE 311K**
Fall 2021
Engineering Computation
Department of Aerospace Engineering and Engineering Mechanics
The University of Texas at Austin, Austin, TX 78712

2. **BME 313L**
Fall 2021
Introduction to Numerical Methods in Biomedical Engineering
Department of Biomedical Engineering
The University of Texas at Austin, Austin, TX 78712

D JOURNAL RESPONSIBILITIES

D.i JOURNAL EDITING

Associate Editor — Journal of Peridynamics and Nonlocal Modeling (JPER) (link)
Jul 2021 – present

Topic Editor — Journal of Open Source Software (JOSS) (link)
Aug 2021 – present

D.ii JOURNAL REVIEWS

CMAME (15+ reviews), JMPS, SINUM, M3AS, JALCOM, IJMST, BMJ Open, Mathematical Reviews (AMS), PHYSA

E PROFESSIONAL ACTIVITIES AND SERVICE

E.i CONFERENCE ORGANIZATION

1. With colleagues, organized (as the main organizer) a USACM thematic conference on computational oncology. Jan 2022. Conference site.
2. Co-organized minisymposium M19 on "Nonlocal models in mathematics and computation" at SIAM TX-LA 3rd Annual Meeting. Oct 2020.
3. One of the nominated candidate for the election of members-at-large for USACM TTA on Mathematical Methods. Jun 2021.

E.ii MENTORING

- Co-mentored a student working on the development of distributed solver for a nonlocal diffusion equation. Google Summer of Code 2020. Related github repository. Summer 2020.

F GRANTS

1. **MDACC-Oden-TACC** — A mechanistic tumor growth model for HP MRI
   Sep 2020 – Aug 2021 — PI: Fuentes (MD Anderson Cancer Center), co-PI: **Jha**
   $50,000

G PUBLICATIONS

G.i PUBLISHED

1. P. **Jha** and R. Lipton, "Finite element approximation of nonlocal dynamic fracture models," Discrete & Continuous Dynamical Systems-B, vol. 26, no. 3, p. 1675, 2021.
2. P. K. **Jha** and R. Lipton, "Numerical analysis of nonlocal fracture models in holder space," SIAM Journal on Numerical Analysis, vol. 56, no. 2, pp. 906–941, 2018.
3. P. K. **Jha** and R. Lipton, "Numerical convergence of nonlinear nonlocal continuum models to local elastodynamics," International Journal for Numerical Methods in Engineering, vol. 114, no. 13, pp. 1389–1410, 2018.
4. R. Lipton, E. Said, and P. K. **Jha**, "Free damage propagation with memory," Journal of Elasticity, vol. 133, no. 2, pp. 129–153, 2018.
5. R. P. Lipton, R. B. Lehoucq, and P. K. **Jha**, "Complex fracture nucleation and evolution with nonlocal elastodynamics," Journal of Peridynamics and Nonlocal Modeling, vol. 1, no. 2, pp. 122–130, 2019.
6. P. K. **Jha** and R. Lipton, "Numerical convergence of finite difference approximations for state based peridynamic fracture models," Computer Methods in Applied Mechanics and Engineering, vol. 351, pp. 184–225, 2019.

7. P. Diehl, P. K. **Jha**, H. Kaiser, R. Lipton, and M. Lévesque, "An asynchronous and task-based implementation of peridynamics utilizing hpx—the c++ standard library for parallelism and concurrency," SN Applied Sciences, vol. 2, no. 12, pp. 1–21, 2020.

8. P. K. **Jha** and R. Lipton, "Finite element convergence for state-based peridynamic fracture models," Communications on Applied Mathematics and Computation, vol. 2, no. 1, pp. 93–128, 2020.

9. P. K. **Jha** and R. P. Lipton, "Kinetic relations and local energy balance for lefm from a nonlocal peridynamic model," International Journal of Fracture, vol. 226, no. 1, pp. 81–95, 2020.

10. P. K. **Jha**, L. Cao, and J. T. Oden, "Bayesian-based predictions of covid-19 evolution in texas using multispecies mixture-theoretic continuum models," Computational Mechanics, vol. 66, no. 5, pp. 1055–1068, 2020.

11. P. K. **Jha**, P. S. Desai, D. Bhattacharya, and R. Lipton, "Peridynamics-based discrete element method (peridem) model of granular systems involving breakage of arbitrarily shaped particles," Journal of the Mechanics and Physics of Solids, vol. 151, p. 104376, 2021.

12. R. P. Lipton and P. K. **Jha**, "Nonlocal elastodynamics and fracture," Nonlinear Differ. Equ. Appl. 28, vol. 23, 2021.

13. M. Fritz, P. K. **Jha**, T. Köppl, J. T. Oden, and B. Wohlmuth, "Analysis of a new multispecies tumor growth model coupling 3d phase-fields with a 1d vascular network," Nonlinear Analysis: Real World Applications, vol. 61, p. 103331, 2021.

14. M. Fritz, P. K. **Jha**, T. Köppl, J. T. Oden, A. Wagner, and B. Wohlmuth, "Modeling and simulation of vascular tumors embedded in evolving capillary networks," Computer Methods in Applied Mechanics and Engineering, vol. 384, p. 113975, 2021.

15. D. A. Hormuth, C. M. Phillips, C. Wu, E. A. B. F. Lima, G. Lorenzo, P. K. **Jha**, A. M. Jarrett, J. T. Oden, and T. E. Yankeelov, "Biologically-based mathematical modeling of tumor vasculature and angiogenesis via time-resolved imaging data," Cancers, vol. 13, no. 12, 2021.

16. P. Gadikar, P. Diehl, and P. K. **Jha**, "Load balancing for distributed nonlocal models within asynchronous many-task systems," in 2021 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), (Los Alamitos, CA, USA), pp. 669–678, IEEE Computer Society, jun 2021.

17. P. K. **Jha** and P. Diehl, "Nlmech: Implementation of finite difference/meshfree discretization of nonlocal fracture models," Journal of Open Source Software, vol. 6, no. 65, p. 3020, 2021.

G.ii UNDER REVIEW

18. P. K. **Jha**, T. Breitzman, and K. Dayal, "Discrete-to-continuum limits of long-range electrical interactions in nanostructures," Preprint: https://www.math.cmu.edu/cna/Publications/publications2020/papers/20-CNA-020.pdf, 2020.

19. P. K. **Jha** and J. T. Oden, "Goal-oriented a-posteriori estimation of model error as an aid to parameter estimation," To appear in Journal of Computational Physics. Preprint: https://arxiv.org/abs/2205.15131, May 2022.

20. P. K. **Jha**, C. Walker, D. Mitchell, J. T. Oden, D. Schellingerhout, J. A. Bankson, and D. T. Fuentes, "Mutual-information based optimal experimental design for hyperpolarized 13c-pyruvate mri," Submitted for review. Preprint: https://arxiv.org/abs/2206.12509, June 2022.

G.iii BOOK CHAPTERS AND REPORTS

21. P. K. **Jha** and R. Lipton, Well-posed nonlinear nonlocal fracture models associated with double-well potentials, pp. 1417–1456. Cham: Springer International Publishing, 2019.

22. P. K. **Jha** and R. Lipton, Finite differences and finite elements in nonlocal fracture modeling: A priori convergence rates, pp. 1–38. Cham: Springer International Publishing, 2018.

23. R. Lipton, E. Said, and P. K. **Jha**, Dynamic brittle fracture from nonlocal double-well potentials: A state-based model, pp. 1–27. Cham: Springer International Publishing, 2018.

24. R. Lipton, E. Said, and P. K. **Jha**, Dynamic damage propagation with memory: A state-based model, pp. 1–29. Cham: Springer International Publishing, 2018.

H MAJOR PROJECTS AND INTERESTS

1. Development of Bayesian inference methods for the calibration of model parameters under uncertainty.
2. Optimal experimental design for hyperpolarized MRI experiments.
3. Integrated machine learning and mechanistic glioma model for improved guidance of surgical resection.
4. High-fidelity modeling of granular media to resolve multiscale and multi-phase flow behavior.

I OPEN-SOURCED SOFTWARE

1. **PeriDEM.** Implementation of high-fidelity model (PeriDEM, JMPS 2021) of granular media.
2. **NLMech.** Peridynamics simulation library. (With P. Diehl).
3. **BayesForSEIRD.** Bayesian calibration and validation of the SEIRD epidemic model. (With L. Cao).
4. **Angiogenesis3D1D.** Angiogenesis and tumor growth using 3D-1D model. (With T. Köppl, A. Wagner, M. Fritz).

J TALKS

1. Seminar: *Coarse graining of electric field interactions with materials.* Mechanical Engineering Seminar, Indian Institute of Science, Bengaluru, India. Aug 2016.
2. Seminar: *Coarse graining of electric field interactions with materials.* Mechanical Engineering Seminar, Indian Institute of Technology, Chennai, India. Aug 2016.
3. Seminar: *Coarse graining of electric field interactions with materials.* AEM Mechanics Research Seminar, University of Minnesota Twin Cities, Minneapolis, USA. Mar 2017.
4. Seminar: *Numerical analysis of nonlocal fracture models.* IMA Postdoctoral Seminar, University of Minnesota Twin Cities, Minneapolis, USA. Apr 2017.
5. Conference: *Numerical analysis of nonlocal fracture models.* US National Congress on Computational Mechanics USNCCM14, Montreal, Canada. Jul 2017.
6. Seminar: *Finite element approximation of nonlocal fracture models.* Mathematics Department Applied Analysis Seminar, Louisiana State University, Baton Rouge, USA. Mar 2018.
7. Seminar: *Well-posedness of nonlocal fracture models and apriori error estimates of numerical approximations.* Mathematics Department Seminar, Indian Institute of Science, Bengaluru, India. May 2018.
8. Conference: *Free damage propagation with memory.* 13th World Congress in Computational Mechanics, New York, USA. Jul 2018.
9. Conference: *Convergence results for finite element and finite difference approximation of nonlocal fracture models.* SIAM TX-LA Annual Meeting, Baton Rouge, USA. Oct 2018.
10. Seminar: *Modelling fracture in solids using nonlocal interaction: A brief overview of Peridynamics.* Mechanical Engineering Seminar, Indian Institute of Technology, Delhi, India. Apr 2019.

11. Conference: *Convergence results for finite element and finite difference approximation of nonlocal fracture.* ICIAM 2019, Valencia, Spain. Presented by Dr. R. Lipton. Jul 2019.

12. Conference: *Numerical fracture experiments using nonlinear nonlocal models.* US National Congress on Computational Mechanics USNCCM15, Austin, USA. Jul 2019.

13. Informal seminar: *Numerical fracture experiments using nonlinear nonlocal models.* Oden Institute, The University of Texas at Austin, Austin, USA. Aug 2019.

14. Seminar: *A mechanistic tumor growth model for HP MRI.* Center for Computational Oncology Seminar, The University of Texas at Austin, Austin, USA. Sep 2020.

15. Seminar: *A mechanistic tumor growth model for HP MRI.* Civil and Environmental Engineering Seminar, Carnegie Mellon University, Pittsburgh, USA. Oct 2020.

16. Seminar: *Application of peridynamics to fracture in solids and granular media.* Special Mechanics Seminar, University of Houston, Houston, USA. Oct 2020.

17. Conference: *Application of peridynamics to fracture in solids and granular media.* SIAM TX-LA Annual Meeting 2020, USA. Oct 2020.

18. Seminar: *Application of peridynamics to fracture in solids and granular media.* MAE Seminar Series, University at Buffalo, Buffalo, USA. Oct 2020.

19. Seminar: *Modeling failure in solids and tissue-scale tumour growth via high-fidelity computational methodologies.* Department Seminar, Department of Computational and Data Science, Indian Institute of Science, Bengaluru, India. May 2021.

20. Conference: *Analysis and Application of Peridynamics to Fracture in Solids and Granular Media.* EMI 2021, USA. May 2021.

21. Conference: *Analysis and Application of Peridynamics to Fracture in Solids and Granular Media.* USNCCM 16, USA. Jul 2021.

22. Seminar: *High-fidelity mechanistic modeling of tumor growth at the tissue scale.* Babuška Forum, Oden Institute, The University of Texas at Austin, Austin, USA. Sep 2021.

K AWARDS AND ACHIEVEMENTS

1. **GATE exam** — All India rank 31 (957/1000 score) in GATE-2010 exam
   May 2010 — *India*

2. **TA Award** — Best Teaching Assistant award for the graduate level finite-element course
   May 2013 — *Carnegie Mellon University, Pittsburgh, PA 15213*

3. **Fellowship** — Peter O'Donnell Postdoctoral Fellowship (competitive, about 4 fellowships a year)
   Aug 2019 — *The University of Texas at Austin, Austin, TX 78712*

L TRAVEL

1. **Visit** — Visited Institute for Mathematics and its Applications
   Feb 2017 – May 2017 — *University of Minnesota Twin Cities, Minneapolis, MN 55455*

M KEY REFERENCES

Dr. Kaushik Dayal
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Associate Professor
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