

# Prashant K. Jha

## Assistant Professor

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Leslie A. Rose Department of Mechanical Engineering

South Dakota School of Mines and Technology

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## SUMMARY

I am the Principal Investigator of the Computational Engineering Analysis and Design (CEAD) Lab at South Dakota Mines. My research uses mechanics, applied mathematics, and computational methods to understand and represent the complex behavior of materials, e.g., modeling and design of functional soft materials, granular and particle-reinforced materials under extreme conditions, and hybrid AI-mechanics methodologies.

## POSITIONS

### Assistant Professor

Sep 2024 – present

Department of Mechanical Engineering

*South Dakota School of Mines and Technology, Rapid City, SD 57701, USA*

### ► PAST POSITIONS

### Lecturer (Asst. Professor)

Nov 2023 – Aug 2024

School of Mechanical and Design Engineering

*University of Portsmouth, Portsmouth, UK*

### Research Affiliate

Nov 2023 – Oct 2024

Oden Institute for Computational Engineering and Sciences

*The University of Texas at Austin, Austin, TX 78712, USA*

### Research Associate

Dec 2020 – Nov 2023

Oden Institute for Computational Engineering and Sciences

*The University of Texas at Austin, Austin, TX 78712, USA*

PI: Late Prof. 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, USA*

### Adjunct Faculty

Aug 2021 – Dec 2021

Department of Biomedical Engineering

*The University of Texas at Austin, Austin, TX 78712, USA*

### Peter O'Donnell

Aug 2019 – Nov 2020

Oden Institute for Computational Engineering and Sciences

*The University of Texas at Austin, Austin, TX 78712, USA*

PI: Late Prof. J. Tinsley Oden

### Postdoctoral Fellow

Oct 2016 – Jul 2019

Department of Mathematics

*Louisiana State University, Baton Rouge, LA 70803, USA*

PI: Prof. Robert Lipton

## EDUCATION

### Ph.D.

2012 – 2016

Civil and Environmental Engineering

*Carnegie Mellon University, Pittsburgh, PA 15213, USA*

Adviser: Prof. 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: Prof. 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*

## TEACHING EXPERIENCES

## ▷ ONGOING/FUTURE

<b>ME 322</b> Fall 2025	Machine Design I (Mechanical Engineering) <i>South Dakota School of Mines and Technology, Rapid City, SD 57701, USA</i> ( <a href="#">course site</a> )
<b>ME 428/528</b> Fall 2025	Applied Finite Element Analysis (Mechanical Engineering) <i>South Dakota School of Mines and Technology, Rapid City, SD 57701, USA</i> ( <a href="#">course site</a> )

## ▷ SPRING 2025

<b>ME 322</b> Spring 2025	Machine Design I (Mechanical Engineering) <i>South Dakota School of Mines and Technology, Rapid City, SD 57701, USA</i> ( <a href="#">course site</a> )
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## ▷ FALL 2024

<b>ME 322</b> Fall 2024	Machine Design I (Mechanical Engineering) <i>South Dakota School of Mines and Technology, Rapid City, SD 57701, USA</i> ( <a href="#">course site</a> )
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## ▷ SPRING 2024

<b>M21946</b> Spring 2024	Engineering Principles (Mechanical and Design Engineering) <i>University of Portsmouth, Portsmouth, UK</i> ( <a href="#">course site</a> )
<b>M21967</b> Spring 2024	Technology Concepts (Mechanical and Design Engineering) <i>University of Portsmouth, Portsmouth, UK</i> ( <a href="#">course site</a> )

## ▷ FALL 2021

<b>COE 311K</b> Fall 2021	Engineering Computation (Aerospace Engineering and Engineering Mechanics) <i>The University of Texas at Austin, Austin, TX 78712, USA</i> ( <a href="#">course site</a> , <a href="#">syllabus</a> )
<b>BME 313L</b> Fall 2021	Numerical Methods in Biomedical Engineering (Biomedical Engineering) <i>The University of Texas at Austin, Austin, TX 78712, USA</i> ( <a href="#">course site</a> , <a href="#">syllabus</a> )

## TEACHING LEADERSHIP

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<b>Undergraduate Advising</b> Fall 2024 - present	Mechanical Engineering <i>South Dakota School of Mines and Technology, Rapid City, SD 57701, USA</i>
<b>Module Coordinator</b> Spring 2024	Engineering Principles (M21946), Technology Concepts (M21967) School of Mechanical and Design Engineering <i>University of Portsmouth, Portsmouth, UK</i>

## GRANTS

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1. <b>MDACC-Oden-TACC</b> Sep 2020 – Mar 2022	A mechanistic tumor growth model for HP MRI (\$50k) PI: Fuentes (MD Anderson Cancer Center), co-PI: <b>Jha</b>
2. <b>NSF-CMMI</b> June 2025 - May 2027	ERI: Adaptive Multi-Fidelity Framework for Modeling Heterogeneous Materials Under Extreme Conditions. (\$200k). <a href="#">Link</a> PI: <b>Jha</b>
3. <b>SDBOR-CRG</b> June 2025 - Dec 2026	Modeling and Design of Magnetic Soft Materials Accelerated by Neural Operators South Dakota Board of Regents Competitive Research Grant (CRG) award (\$90k). PI: <b>Jha</b>

## ▷ GRANT REVIEWS

- Participated (completed) as a Reviewer in the NSF Review Panel twice for the CMMI division (year - 2025).
- Ad-hoc review for NSF proposal (year - 2025).

## JOURNAL RESPONSIBILITIES

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### ▷ JOURNAL EDITING

<b>Associate Editor</b>	Journal of Peridynamics and Nonlocal Modeling (JPER) ( <a href="#">link</a> )
<b>Topic Editor</b>	Journal of Open Source Software (JOSS) ( <a href="#">link</a> )
<b>Editorial Board Member</b>	Scientific Reports ( <a href="#">link</a> )

### ▷ JOURNAL REVIEWS

CMAME (30+ reviews), JMPS, SINUM, M3AS, MMS, Mathematical Reviews (AMS), JAM

▷ SPECIAL ISSUE GUEST EDITING

**CiSE IEEE**

Oct 2025 (tentative)

Celebrating the Life and Work of J. Tinsley Oden

Editors: Serge Prudhomme, Danial Faghihi, Prashant K. Jha

**EXPERTISE**

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▷ SKILLS

Bayesian Parameter Estimation; Continuum Mechanics; Finite Element, Finite Difference, and Meshfree Methods; Fracture Mechanics; Machine Learning; Mechanics of Granular Media; Multiphysics and Multiscale Modeling of Materials; Open Source Software Development; Peridynamics; Scientific Computing; Uncertainty Quantification

▷ PROGRAMMING LANGUAGES AND TOOLS

C and C++; MATLAB and OCTAVE; Python; Shell; Git; Docker

**PUBLICATIONS [GOOGLE SCHOLAR]**

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▷ PUBLISHED

1. 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.
2. 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.
3. R. Lipton, E. Said, and P. K. **Jha**, “Free damage propagation with memory,” Journal of Elasticity, vol. 133, no. 2, pp. 129–153, 2018.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. R. P. Lipton and P. K. **Jha**, “Nonlocal elastodynamics and fracture,” Nonlinear Differ. Equ. Appl. 28, vol. 23, 2021.
12. P. K. **Jha** and R. Lipton, “Finite element approximation of nonlocal dynamic fracture models,” Discrete & Continuous Dynamical Systems-B, vol. 26, no. 3, p. 1675, 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. Yankeeelov, “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.
  18. P. K. **Jha** and J. T. Oden, “Goal-oriented a-posteriori estimation of model error as an aid to parameter estimation,” Journal of Computational Physics, vol. 470, p. 111575, 2022.
  19. P. K. **Jha**, J. Marshall, J. Knap, and K. Dayal, “Atomic-to-continuum multiscale modeling of defects in crystals with nonlocal electrostatic interactions,” Journal of Applied Mechanics, vol. 90, 11 2022.
  20. P. K. **Jha**, T. Breitzman, and K. Dayal, “Discrete-to-Continuum Limits of Long-Range Electrical Interactions in Nanostructures,” Archive for Rational Mechanics and Analysis, vol. 247, no. 2, p. 29, 2023.
  21. L. Cao, T. O’Leary-Roseberry, P. K. **Jha**, J. T. Oden, and O. Ghattas, “Residual-based error correction for neural operator accelerated infinite-dimensional bayesian inverse problems,” Journal of Computational Physics, p. 112104, 2023.
  22. 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 13 c-pyruvate mri,” Scientific reports, vol. 13, no. 1, p. 18047, 2023.
  23. P. K. **Jha**, “Residual-based error corrector operator to enhance accuracy and reliability of neural operator surrogates of nonlinear variational boundary-value problems,” Computer Methods in Applied Mechanics and Engineering, vol. 419, p. 116595, 2024.
  24. P. K. **Jha**, P. Diehl, and R. Lipton, “Nodal finite element approximation of peridynamics,” Computer Methods in Applied Mechanics and Engineering, vol. 434, p. 117519, 2025.
  25. A. Patra, D. Faghihi, P. K. **Jha**, L. Cao, and K. A. Farrell-Maupin, “Predictive science: A quest for the holy,” Computing in Science & Engineering, 2025.

#### ▷ UNDER REVIEW AND PREPRINT

26. P. K. **Jha**, “From theory to application: A practical introduction to neural operators in scientific computing,” arXiv preprint. arXiv:2503.05598, 2025.
27. M. Nandyala, A. Lanham, P. K. **Jha**, C. Wu, J. D. Hazle, T. E. Yankeelov, R. J. Stafford, A. A. El-Gendy, and D. Fuentes, “An information-theoretic framework for optimal experimental design in magnetic nanoparticle hyperthermia,” Available at SSRN 5200413.

#### ▷ BOOK CHAPTERS AND REPORTS

28. 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.
29. P. K. **Jha** and R. Lipton, Finite Differences and Finite Elements in Nonlocal Fracture Modeling: A Priori Convergence Rates, pp. 1457–1494. Cham: Springer International Publishing, 2019.
30. R. Lipton, E. Said, and P. K. **Jha**, Dynamic Brittle Fracture from Nonlocal Double-Well Potentials: A State-Based Model, pp. 1265–1291. Cham: Springer International Publishing, 2019.
31. R. Lipton, E. Said, and P. K. **Jha**, Dynamic Damage Propagation with Memory: A State-Based Model, pp. 1495–1523. Cham: Springer International Publishing, 2019.

### PROFESSIONAL ACTIVITIES

#### ▷ CONFERENCE ORGANIZATION

- Minisymposium M19 on “Nonlocal models in mathematics and computation” at the SIAM TX-LA 3rd Annual Meeting. Oct 2020.
- With colleagues, organized (as the main organizer) a USACM thematic conference on computational oncology. Jan 2022. [Website](#).
- Minisymposium M403 on “Uncertainty quantification for learning and data-driven predictive modeling of complex systems” at the 17th U. S. National Congress on Computational Mechanics. Jul 2023.
- Minisymposium on “Integrating machine learning and numerical methods to accelerate engineering design” at 2nd IACM MMLDE-CSET. Sep 2023.

- Minisymposium 1301 on “Uncertainty Quantification and Scientific Machine Learning for Predictive Modeling and Decision-Making in Complex Systems” at the 18th U. S. National Congress on Computational Mechanics. Jul 2025. [Website](#).
- Minisymposium 207 on “Operator Learning in Mechanics with Robust Error Estimation, Control, and Generalization” at the 20th U. S. National Congress on Theoretical and Applied Mechanics. Jun 2026 (upcoming). [Website](#).

#### ▷ MENTORING

- Advising three undergraduate students on research in the mechanics of materials and structures within my Computational Engineering Analysis and Design (CEAD) Lab at South Dakota Mines. [Lab Website](#). Fall 2024 - present.
- Co-mentored a student working on the Google Summer of Code 2020 summer project. [Related github repository](#). Summer 2020.

#### ▷ OPEN-SOURCED SOFTWARE

**PeriDEM** (Jha et al., JMPS 2021); **NLMech** (Jha & Diehl, JOSS 2021);  
**Angiogenesis3D1D** (Fritz et al., CMAME 2021); **neural\_operators** (Jha, arXiv 2025)

#### ▷ SERVICE

- Member, Faculty Senate, South Dakota Mines. Fall 2025 - present.
- Adviser, India Club, South Dakota Mines. Fall 2025 - present.

#### AWARDS AND ACHIEVEMENTS

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|--------------------------|--|
| 1. GATE (May 2010)       | All India rank 31 (score: 957/1000) in GATE-2010 Examination               |
| 2. TA Award (May 2013)   | Best TA for finite-element method course, Carnegie Mellon University       |
| 3. Fellowship (Aug 2019) | Peter O'Donnell Postdoctoral Fellowship, The University of Texas at Austin |

#### TRAVEL

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|---|--|
| 1. <b>Visit</b><br>Feb 2017 – May 2017    | Institute for Mathematics and its Applications<br><i>University of Minnesota Twin Cities, Minneapolis, MN 55455, USA</i> |
| 2. <b>Workshop</b><br>7 Jan – 12 Jan 2024 | Fracture as an Emergent Phenomenon<br><i>Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany</i>         |

#### KEY TALKS

1. Invited talk: *Coarse graining of electric field interactions with materials*. Mechanical Engineering Seminar, Indian Institute of Science, Bengaluru, India. Aug 2016.
2. Invited talk: *Coarse graining of electric field interactions with materials*. AEM Mechanics Research Seminar, University of Minnesota Twin Cities, Minneapolis, USA. Mar 2017.
3. Invited talk: *Numerical analysis of nonlocal fracture models*. IMA Postdoctoral Seminar, University of Minnesota Twin Cities, Minneapolis, USA. Apr 2017.
4. Conference: *Numerical analysis of nonlocal fracture models*. USNCCM14, Montreal, Canada. Jul 2017.
5. Conference: *Free damage propagation with memory*. 13th World Congress in Computational Mechanics, New York, USA. Jul 2018.
6. Conference: *Convergence results for finite element and finite difference approximation of nonlocal fracture*. ICIAM 2019, Valencia, Spain. Presented by Prof. R. Lipton. Jul 2019.
7. Conference: *Numerical fracture experiments using nonlinear nonlocal models*. US National Congress on Computational Mechanics USNCCM15, Austin, USA. Jul 2019.
8. Invited talk: *Application of peridynamics to fracture in solids and granular media*. Special Mechanics Seminar, University of Houston, Houston, USA. Oct 2020.
9. Invited talk: *Application of peridynamics to fracture in solids and granular media*. MAE Seminar Series, University at Buffalo, Buffalo, USA. Oct 2020.
10. 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.
11. Conference: *Analysis and Application of Peridynamics to Fracture in Solids and Granular Media*. EMI 2021, USA. May 2021.
12. Invited talk: *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.



13. Conference: *Goal-oriented a-posteriori estimation of model error as an aid to parameter estimation*. USNCCM 17, Albuquerque, USA. July 2023.
14. Invited talk: *Corrector operator to enhance accuracy and reliability of neural operator surrogates of nonlinear variational boundary-value problems*. CRUNCH Seminar, Brown University, USA. August 2023.
15. Conference: *Seamless multiphysics coupling with peridynamics enabled by nodal finite element approximation*. Midwest Numerical Analysis Day 2025 Workshop, University of Nebraska-Lincoln, USA. April 2025.
16. Conference: *Application of peridynamics to granular media*. Engineering Mechanics Institute (EMI) 2025 Conference, Anaheim, USA. May 2025.
17. Conference: *Reliable Neural Operators: Error Control through Residual Correction and Beyond*. Accuracy and Efficiency in Scientific Machine Learning Workshop organized by IVADO and Centre de recherches mathématiques (CRM), Montreal, Canada. June 2025.
18. Conference: *Seamless multiphysics coupling with peridynamics enabled by nodal finite element approximation*. USNCCM 18, Chicago, USA. July 2025.
19. Conference: *Neural Operators to Accelerate Parameter Estimation and Topology Optimization Problems*. Presenter: Ian (UG Researcher). USNCCM 18, Chicago, USA. July 2025.
20. Invited talk: *Peridynamics for Solids and Granular Media: From Fracture to Computational Frameworks*. Mechanical Engineering Seminar, University of Wyoming, Laramie, USA. Sep 2025. Host: Prof. Ankit Saxena.
21. Colloquium: *Rethinking Reliability in Neural Operators through Residual and Agent-Based Corrections*. Department of Mathematics Colloquium, University of Nebraska-Lincoln, Lincoln, USA. Oct 2025. Host: Prof. Petronela Radu and Prof. Mikil Foss.
22. Invited talk: *Residual and Agent-Based Corrections and Beyond for Reliable Neural Operators*. Applied Analysis and Data-Driven Mathematical Modeling (ADM) Seminar, Department of Mathematics, University of Nebraska-Lincoln, Lincoln, USA. Oct 2025. Host: Prof. Petronela Radu and Prof. Mikil Foss.
23. Invited talk: *Rethinking Reliability in Neural Operators through Residual and Agent-Based Corrections*. Center for Nonlinear Analysis (CNA) Seminar, Carnegie Mellon University, Pittsburgh, USA. Oct 2025. Host: Prof. Kaushik Dayal.
24. Conference: *Seamless multiphysics coupling with peridynamics enabled by nodal finite element approximation*. SIAM-NNP 2025, State College, USA. Nov 2025.

## KEY REFERENCES

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Prof. Kaushik Dayal	<i>Department of Civil and Environmental Engineering, Carnegie Mellon University</i> E: <a href="mailto:Kaushik.Dayal@cmu.edu">Kaushik.Dayal@cmu.edu</a> ; P: 1-412-268-2949; W: <a href="#">Homepage</a>
Prof. Robert Lipton	<i>Department of Mathematics, Louisiana State University</i> E: <a href="mailto:lipton@lsu.edu">lipton@lsu.edu</a> ; P: 1-225-578-1569; W: <a href="#">Homepage</a>