

Aayush Kant, Ph.D.

Assistant Professor

Center for Biomedical Engineering (CBME)
Indian Institute of Technology Delhi
Office: Block II, Room 288
Hauz Khas, New Delhi - 110016, India,

Email: akant@iitd.ac.in
Website: [MIND Lab @ IITD](#)
ORCID: [0000-0001-9898-1852](#)
Phone: +91-11-2659 1337

EMPLOYMENT HISTORY

Position	Employer	Duration
Assistant Professor	Center for Biomedical Engineering Indian Institute of Technology Delhi, India	May 2025 - present
Research Associate	NSF Center for Engineering Mechanobiology, University of Pennsylvania, Philadelphia, PA, USA	Dec 2024 - Apr 2025
Postdoctoral Researcher	NSF Center for Engineering Mechanobiology, University of Pennsylvania, Philadelphia, PA, USA	Dec 2019 - Dec 2024
Research Consultant	Biomedical Engineering & Technology (incubation) center, Indian Institute of Technology Bombay, India	Jun 2019 - Nov 2019
Assistant Professor	Dept. of Mechanical Engineering, Sinhagad Academy of Engineering, Pune, Maharashtra, India	Jun 2013 - Jun 2014

EDUCATION

Qualification	Institute	Year
Doctor of Philosophy (Ph.D.)	Indian Institute of Technology Bombay AND Monash University, Australia (Joint PhD) <i>Thesis:</i> "Stress Driven Physiological Damage after Traumatic Brain Injuries" <i>Advisors:</i> Dr. Nikhil V. Medhekar (Monash) Dr. Tanmay K. Bhandakkar (IITB)	2019
Postgraduation (M.Tech.)	Visvesvaraya National Institute of Technology, Nagpur <i>Specialization:</i> CAD/CAM Dept. of Mechanical Engineering	2013
Undergraduation (B.Tech.)	National Institute of Technology Karnataka, Surathkal Dept. of Mechanical Engineering	2011

RESEARCH INTERESTS

- Mathematical modeling of fundamental physical principles applied to biological problems with focus on how chemo-mechanical cues are transduced to a cell drive its response.
- Role of non-equilibrium thermodynamic modeling in biophysical applications with focus on pathological tau aggregation in tauopathies such as Chronic Traumatic Encephalopathy (CTE).
- Biophysical modeling of repeated mild TBIs (concussions) and increased vulnerability to diffuse axonal injuries driving chronic neurodegeneration.
- High-fidelity finite element modeling of primary injuries after TBI by coupling multiscale (intra- and extraneuronal) secondary damage modalities.
- Cell environment-driven biophysical reorganization of chromatin in the nucleus, and its role in cell phenotypic fate determination in disease.

PAST RESEARCH EXPERIENCE

Postdoctoral Research

University of Pennsylvania, Philadelphia, PA

Advisor: Dr. Vivek B. Shenoy

- Developed a non-equilibrium thermodynamic model which captures the intranuclear chromatin reorganization in response to wide range of environmental cues including extracellular matrix remodeling, compression, shear, stretching and osmotic dysregulation.
- Developed theoretical scaling-relations to quantify chromatin organization with in-silico and in-vivo validations. Inversely used such relations to extract biophysical parameters from super-resolution STORM images.
- Developed an in-house Python (and R) based pipeline for RNA sequencing incorporating quality control checks to perform downstream analyses such as principal component analysis (PCA), differential expression analysis (DESeq) and gene clustering.
- Developed a mathematical modeling of sub-axonal cytoskeletal load transfer to show that the actin-spectrin cortex forms a mechano-protective sheath around the otherwise susceptible microtubule core.
- Conducted and formed national and international collaborations with medical, imaging and experimental researchers.
- Prepared and submitted six peer-reviewed manuscripts in high-impact journals (with two more first-author manuscripts under preparation), and nine conference abstracts.
- Mentored five undergraduate students over two-three month summer programs.

Doctoral Research

Indian Institute of Technology, Bombay, India

Monash University, Clayton, Australia

Advisors: Dr. Tanmay K. Bhandakkar (IITB) and Dr. Nikhil V. Medhekar (Monash)

- Development of a mathematical model to capture the altered calcium ion kinetics in a neuron, after a TBI.

- Calcium kinetics model was coupled with the transient force balance equations over a realistic brain geometry in two dimensions to predict the critical locations for primary and secondary injuries after TBI.
- Development of a numerical model to predict the extent of tau hyperphosphorylation following a mild TBI resulting in microtubule rupture.

TEACHING EXPERIENCE

Assistant Professor

Indian Institute of Technology Delhi

- BML815: Mechanics of Biological Systems (Autumn 2025)

Teaching Assistant

University of Pennsylvania

- MSE460: Introduction to Computational Materials Science (Fall 2021,22)

Teaching Assistant

Indian Institute of Technology Bombay

- ME201 - Solid Mechanics
- ME202 - Strength of Materials
- ME 370 - Kinematics and Dynamics of Machines Lab
- ME601 - Stress Analysis

Assistant Professor

Sinhgad Academy of Engineering, Pune

- Strength of Materials (Autum 2021)
- Computer Aided Design (CAD) Lab (Autumn 2021)
- Mechatronics Lab (Spring 2022)

PUBLICATIONS

1. M. Dhankhar*, Z. Guo*, **A. Kant***, R. Basir, R. Joshi, S. Heo, R. L. Mauck, M. Lakadamyali, V.B. Shenoy. "Revealing the Biophysics of Lamin-Associated Domain Formation by Integrating Theoretical Modeling and High-Resolution Imaging." *Nature Communications* 16, 1 (2025).
2. **A. Kant**, Z. Guo, V. Vinayak, M.V. Neguembor, W.S. Li, V. Agrawal, E. Pujadas, L.M. Almassalha, V. Backman, M. Lakdamyali, M.P. Cosma, V.B. Shenoy. "Active Transcription and Epigenetic Reactions Synergistically Regulate Meso-Scale Genomic Organization." *Nature Communications* 15, 1 (2024).
3. **A. Kant**, N.V. Medhekar, T.K. Bhandakkar. "Chemo-Mechanical Regulation of Tau Phosphorylation Following Traumatic Brain Injuries" *bioRxiv* (2023).
4. A.E. Loneker, F. Alisafaei, **A. Kant**, D. Li, P.A. Janmey, V.B. Shenoy, R.G. Wells. "Lipid droplets are intracellular mechanical stressors that impair hepatocyte function." *Proceedings of the National Academy of Sciences* 120, 16 (2023).
5. M.K. Kolel-Veetil, **A. Kant**, V.B. Shenoy, M.J. Buehler. "SARS-CoV-2 Infection - Of Music and Mechanics of its Spikes! A Perspective" *ACS Nano* 16, 5 (2022).

6. **A. Kant**, V.E. Johnson, J.D. Arena, J.P. Dollé, D.H. Smith, V.B. Shenoy. "Modeling links softening of myelin and spectrin scaffolds of axons after a concussion to increased vulnerability to repeated injuries." *Proceedings of the National Academy of Sciences* 118, 28 (2021).
7. S. Talwar, **A. Kant**, T. Xu, V.B. Shenoy, R.K. Assoian. "Mechanosensitive smooth muscle cell phenotypic plasticity emerging from a null state and the balance between Rac and Rho." *Cell Reports* 35, 3 (2021).
8. **A. Kant**, N.V. Medhekar, T.K. Bhandakkar. "Spatial calcium kinetics after a traumatic brain injury" *Biomechanics and Modeling in Mechanobiology* 20, 1413–1430 (2021).
9. **A. Kant**, T.K. Bhandakkar, N.V. Medhekar. "Stress enhanced calcium kinetics in a neuron." *Biomechanics and Modeling in Mechanobiology* 17, 169-180 (2018).

CONFERENCES

1. **A. Kant**, V.B. Shenoy. "Viscoelastic chromatin reorganization by chemo-mechanical environmental cues drives nuclear response." *Biophysical Society Annual Meeting*, February 2024, Philadelphia, PA, USA.
2. M. Dhankhar, **A. Kant**, V.B. Shenoy. "Mesoscale genomic organization upon dynamic mechanical cues." *Biophysical Society Annual Meeting*, February 2024, Philadelphia, PA, USA.
3. **A. Kant**, V.B. Shenoy. "Reorganization of solid-like chromatin drives nuclear response to chemo-mechanical environmental cues." *American Society for Cell Biology CellBio*, December 2023, Boston, MA, USA.
4. **A. Kant**, Z. Guo, and V.B. Shenoy. "Active Transcription Regulates Mesoscale Genomic Organization via Active Extrusion of Chromatin Loops." *American Physical Society March Meeting*, March 2023, Las Vegas, NV, USA.
5. Z. Guo, **A. Kant**, and V.B. Shenoy. "Epigenetic Reactions and Chromatin-lamina Interactions Synergistically Regulate the Morphology of Lamina-associated Domains" *American Physical Society March Meeting*, March 2023, Las Vegas, NV, USA.
6. **A. Kant**, Z. Guo, and V.B. Shenoy. "Mesoscale chromatin organization is regulated by active transcription and epigenetic regulation" *Biophysical Society Annual Meeting*, February 2023, San Diego, CA, USA.
7. Z. Guo, **A. Kant**, V.B. Shenoy. "Interplay of epigenetic regulation and chromatin-lamina interaction modulates the morphology of lamina-associated domains." *Biophysical Society Annual Meeting*, February 2023, San Diego, CA, USA.
8. **A. Kant**, V.B. Shenoy. "How does the cell environment affect chromatin organization?" *World Congress of Biomechanics*, July 2022, Taipei, Taiwan (*attended virtually*).
9. **A. Kant**, V.B. Shenoy. "Modeling Links the Increased Axonal Vulnerability to Repeated Concussions" *Biomedical Engineering Society Annual Meeting*, October 2021, Orlando, FL, USA (*held virtually*).
10. **A. Kant**, N.V. Medhekar, and T.K. Bhandakkar. "Stress Induced Calcium Kinetics in a 1D Brain Tissue Geometry." *European Solid Mechanics Conference (ESMC)*, July 2018, Bologna, Italy.
11. **A. Kant**, R. Uddanwadikar, P.M. Padole. "Dynamic Analysis of Impact of Ball on Cricket Bat and Force Transfer to The Elbow", *1st International and 16th National Conference on Machines and Mechanisms (iNaCoMM2013)*, December 2013, Roorkee, India.

AWARDS AND HONORS

1. New Faculty Seed Grant worth INR 20,00,000 from Indian Institute of Technology Delhi (2025).
2. Young Faculty Incentive Fellowship from Indian Institute of Technology Delhi (2025).
3. 2022 MetNet Annual Meeting Three Minute Talk (TMT) presentation award for outstanding communication of metastasis research to a broad audience. Conducted by Metastasis Research Network, NIH.
4. Featured as "[Next-Gen Innovators](https://magazine.seas.upenn.edu/fall-2022/next-gen-innovators/)" , Fall 2022 Issue, Penn Engineering Magazine.
(<https://magazine.seas.upenn.edu/fall-2022/next-gen-innovators/>)