G. R. Krishna Chand Avatar

Research Engineer - Structural Mechanics and Dynamics
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Links: Personal website, GitHub, LinkedIn, Google Scholar

Research Interests

Continuum and computational mechanics, Elasticity of slender structures, Biomechanics, Micromagnetism, Nonlinear finite element methods, High performance computing, Nonlinear dynamics, Contact and impact mechanics, Fluid-structure interactions, Scientific machine learning, Uncertainty modeling and analysis.

Education

Ph.D. (PMRF), Aerospace Engineering (CGPA: 10/10) *Aug 2021 – May 2026*
Indian Institute of Science, Bengaluru
Advisor: Dr. Vivekanand Dabade
Thesis topic: *Investigations on elastic deformation of ferromagnetic rods and ribbons*

Developed physics-rigorous mathematical models to investigate complex magnetoelastic coupling and nonlinear deformation in ferromagnetic slender structures (rods and ribbons). Implemented the models numerically using continuation methods in MATLAB/Python codes and conducted detailed stability analysis to determine stable equilibrium paths and identify bifurcation points, revealing complex loading behaviours. Validated the results using commercial FEA software (COMSOL and Abaqus) and confirmed findings through meticulous physical experiments.

M.Tech., Aerospace Engineering (CGPA: 9.8/10) *Aug 2019 – July 2021*
Indian Institute of Science, Bengaluru
Advisor: Prof. Kartik Venkatraman
Project: *Numerical simulations of hemodynamics and wall mechanics of abdominal aortic aneurysms*

Conducted computational modeling of blood flow through abdominal aortic aneurysms to assess rupture risk, examining the role of aneurysm geometry through fluid-structure interaction simulations with the *solids4Foam* computational mechanics package built on the *OpenFOAM* C++ library. Incorporated specialized constitutive models from the literature for blood rheology and aneurysmal tissue, and performed both uncoupled and coupled numerical simulations.

B.E., Aerospace Engineering with minor specialization in Airplane Design (CGPA: 8.92/10) *July 2014 – May 2018*
Punjab Engineering College, Chandigarh
Project: *Characterisation, design and fabrication of a turbogenerator impeller*

Led a team for the design and testing of an air-driven impeller, integrating analytical, numerical, and experimental approaches. Utilized tools such as TurbomachineryCFD, Hyperworks, LabView, and MATLAB, and conducted wind tunnel experiments in an in-house supersonic facility to evaluate impeller performance and characteristics.

Work Experience

Research Engineer - Structural Mechanics & Dynamics *March 2026 - present*
GE HealthCare, JFWTC, Bangalore

I am associated with Healthcare Technology & Innovation Center (research wing) of GE HealthCare. I work on the mechanical aspects of design and development of futuristic critical medical devices, namely, CT Scan, MRI System, and Ultrasound-based technologies.

High Performance Computing Intern *November 2025 – March 2026*
BQP (formerly, BosonQ Psi), USA [Remote]
Project: *Benchmarking of quantum-inspired evolutionary optimization algorithms on HPC systems*

Conducting strong- and weak-scaling analyses and in-depth profiling of complex High-Performance Computing (HPC) workloads to identify CPU, GPU, and MPI/OpenMP bottlenecks using advanced tools, including Nvidia Nsight Compute and Nsight Systems. Contribution in designing a performance testing framework, creating roofline plots and visualizations, and collaborating with the HPC team to enhance application efficiency and support technical reports.

PhD Intern, Mechanical/Thermal Design *February 2024 – August 2024*
GE HealthCare Technology & Innovation Center, JFWTC, Bangalore
Project: *Drop test simulations of medical devices using Ansys LS-DYNA*

Contributed to team capacity building by documenting methodologies and facilitating knowledge transfer to strengthen collective expertise in simulation-driven design. Developed a systematic workflow for virtual drop and impact testing of medical devices using Ansys LS-DYNA and Ansys Mechanical. Conducted nonlinear deformation analyses under varied orientations, ground textures, and contact scenarios to identify regions most susceptible to damage. These simulation insights informed design improvements, enhancing device durability and reliability under realistic impact loads.

Indian Academy of Sciences Summer Research Fellow *May 2017 – July 2017*
Indian Institute of Technology, Madras
Project: *Implementation of rotor disk model of helicopter rotor in OpenFOAM*
Implemented actuator disk model for a helicopter rotor as a source term in the Navier-Stokes equations to solve for flow dynamics in OpenFOAM, an open-source finite-volume C++ based library and validated it against analytical models.

Visiting Research Fellow *Jan 2017 – May 2017*
Indian Institute of Technology, Kanpur
Project: *Multiple Hopf Bifurcations in the 2D lid driven cavity*
Investigated the occurrence of multiple Hopf bifurcations underwent by the internal flow inside a 2D lid driven cavity by carrying out direct numerical simulations using in-house MPI-parallelized Fortran code, and employed a model reduction technique (proper orthogonal decomposition) to identify the bifurcation sequences.

Summer Research Fellow *May 2016 – July 2016*
Indian Institute of Technology, Bombay
Project: *Implementation of equilibrium air chemistry for composition of hypersonic Flows*
Incorporated an equilibrium air chemistry based computational module into an in-house 2D Eulerian finite volume CFD solver written in C++ for inviscid hypersonic flows.

Technical Skills

- CAE softwares: Ansys Mechanical, Ansys LS DYNA, Abaqus, COMSOL, Creo Parametric, OpenFOAM
- Frameworks and Libraries: Finite element libraries (FEniCSx, deal.II), Parallel computing (MPI, OpenMP, CUDA), PyTorch, Git, NumPy, Matplotlib, SciPy, Simulink
- Programming and scripting languages: C, C++, Fortran, MATLAB, Mathematica, Python
- Open-source tools: Linux, Bash scripting, Git, Make

Achievements and Awards

- Awarded the prestigious Prime Minister's Research Fellowship in August 2022.
- Second batch topper in M.Tech. in Aerospace Engineering degree programme (2019-2021).
- Certificate of Merit for Academic Excellence from Indian Institute of Technology, Kanpur.
- AIR 3 in GATE Aerospace Engineering Exam in 2018.
- Foundation For Excellence Scholarship (funded by Boeing) during B.E. degree programme.
- National Talent Search Examination (2009) Scholar awarded by NCERT, New Delhi.

Course projects

- ME251 Biomechanics: *Comparative constitutive analysis of biological tissue samples using Fung and Neo-Hookean models.*
- AE291 Fluid-Structure Interactions: *Parametric analysis of linear dynamics of cantilevered fluid-conveying pipe in Python.*
- CE240 Uncertainty Modeling and Analysis: *Uncertainty analysis of binary flutter of 2D aeroelastic system: Effect of stiffnesses.*
- ME260 Structural Optimization: Size, Shape and Topology: *Topology optimization of Tesla microvalve using COMSOL Multiphysics.*
- CE268 Parallel Computing in Mechanics Problems: *Free longitudinal Vibration of a uniform rod: A numerical study using MPI framework in C++.*

Publications

1. G R Krishna Chand Avatar and Vivekanand Dabade. Spatial deformation of a ferromagnetic elastic rod. *Acta Mechanica*, July 2026b. doi: http://dx.doi.org/10.1007/s00707-026-04799-y
2. G R Krishna Chand Avatar and Vivekanand Dabade. Kirchhoff's analogy for a planar deformable ferromagnetic rod. *Journal of Applied Mechanics*, 92(8):1–12, May 2025c. doi: https://doi.org/10.1115/1.4068252

3. G R Krishna Chand Avatar and Vivekanand Dabade. Deformation of a planar ferromagnetic elastic ribbon. *Journal of Elasticity*, 157(1), Dec. 2024. doi: https://doi.org/10.1007/s10659-024-10100-w

4. Bhavesh Banjare, G R Krishna Chand Avatar, and Goudappa Ramanagouda Dodagoudar. Efficient MLM-DRM framework for seismic performance analysis of 3D tunnels in complex geologic media. *Computers and Geotechnics*, 197:108273, Sept. 2026. ISSN 0266-352X. doi: 10.1016/j.compgeo.2026.108273

5. Bhavesh Banjare, G R Krishna Chand Avatar, and G. R. Dodagoudar. Three-dimensional seismic response analysis of tunnels in layered media using modified domain reduction method. *International Journal for Numerical and Analytical Methods in Geomechanics*, 49(13):3027–3047, June 2025. doi: https://doi.org/10.1002/nag.70006

6. Bhavesh Banjare and G R Krishna Chand Avatar. Stochastic assessment of 3-D tunnels in near-fault ground motion using modified domain reduction method. *International Journal for Numerical and Analytical Methods in Geomechanics*, 48(9):2259–2284, 2024. doi: https://doi.org/10.1002/nag.3733

7. Lucas Lestandi, Swagata Bhaumik, G R Krishna Chand Avatar, Mejdi Azaiez, and Tapan K. Sengupta. Multiple Hopf bifurcations and flow dynamics inside a 2d singular lid driven cavity. *Computers and Fluids*, 166:86–103, apr 2018b. doi: https://doi.org/10.1016/j.compfluid.2018.01.038

8. Lucas Lestandi, Swagata Bhaumik, Tapan K. Sengupta, G R Krishna Chand Avatar, and Mejdi Azaiez. Proper orthogonal decomposition applied to numerical study of unsteady flow inside lid-driven cavity. *Journal of Mathematical Study*, 51(2):150–176, 2018a. doi: https://doi.org/10.4208/jms.v51n2.18.03

Preprint/Submitted/Under preparation

1. G R Krishna Chand Avatar and Harmeet Singh. Stability analysis of general deformation of ferromagnetic rods. *(Under preparation)*, 2026

2. G R Krishna Chand Avatar, Bhavesh Banjare and Goudappa Ramanagouda Dodagoudar. Tunable magneto-mechanical metamaterials. *(Under preparation)*, 2026

3. G R Krishna Chand Avatar. A micromagnetics-based model for elastic ferromagnetic shells. *(Under preparation)*, 2026

4. G R Krishna Chand Avatar, Chinika Dangi, and Puneet Pushkar. A numerical study on the influence of geometry on the rupture risk of abdominal aortic aneurysms. *arXiv*, 2023b. doi: https://doi.org/10.48550/arXiv.2311.14147

Conferences

1. G R Krishna Chand Avatar, Chandan Nashine, Sandip Kumar Sarma, Ashif Iqbal, Kunalan N M, and Syed Jiaul Hoque. Numerical impact simulations of handheld medical devices. In *NAFEMS India Conference 2026, Bengaluru, India*, 2026

2. G R Krishna Chand Avatar and Vivekanand Dabade. Spatial deformation of a ferromagnetic rod. In *UKACM 2026 Conference, University of Liverpool, UK*, 2026a

3. G R Krishna Chand Avatar and Vivekanand Dabade. Magnetoelastic modeling of planar ferromagnetic rods and ribbons. In *2^{nd} Highly Flexible Slender Structures Conference, Germany*, 2025a

4. G R Krishna Chand Avatar and Vivekanand Dabade. Deformation of planar ferromagnetic elastic rod and ribbon. In *International Conference on Magnetic Materials and Applications, IISc Bangalore, India*, 2025b

5. Vivekanand Dabade, Chinika Dangi, and G R Krishna Chand Avatar. Multi-scale modelling and design of magnetoelastic materials and structures. In *Society of Engineering Science (SES) Technical Meeting 2024, Hangzhou, China*, 2024

6. Vivekanand Dabade, Chinika Dangi, and G R Krishna Chand Avatar. Two-scale analysis of magnetoactive polymers and bifurcation studies on slender ferromagnetic structures. In *IUTAM Symposium on Nonlinear Dynamics for Design of Mechanical Systems across different Length/Time Scales, Japan*, 2023

7. Bhavesh Banjare and G R Krishna Chand Avatar. Monte Carlo rock-tunnel (3d) dynamic interaction analysis in near-fault ground motion using domain reduction method. In *9th International Congress on Computational Mechanics and Simulations, IIT Gandhinagar, India*, 2023

8. G R Krishna Chand Avatar, Chinika Dangi, and Puneet Pushkar. Numerical simulations of hemodynamics and wall mechanics of idealized fusiform abdominal aortic aneurysms. In *International Conference on Recent Advances in Fluid Mechanics and Nanoelectronics, Manipal Institute of Technology, Bangalore, India*, 2023a

Relevant Coursework

Academic Coursework: Aerospace Structures, Aeroelasticity, Biomechanics, Vibrations, Continuum Mechanics, Computational Fluid Dynamics and Heat Transfer, Linear and Nonlinear Finite Element Methods, Parallel Computing in Mechanics, Numerical Linear Algebra, Structural Optimisation: Size, Shape and Topology, Uncertainty Modeling and Analysis, Plates and Shells, Flight Dynamics and Control.

Online Courses and Certifications: Introduction to Composites, Variational Calculus and its applications in Control Theory and Nanomechanics, Machine Learning, Image Processing for Engineering and Science, Neural Networks and Deep Learning, Introduction to Neural Networks and PyTorch, Random Processes.

Workshops and Summer Schools Attended

- *Geometry, Mechanics and the Physics of Growth*, ICTS-TIFR, Bangalore (4-14 November, 2025)
- *Emerging Topics in Architectured & Multiscale Materials, Soft Robotics, and Data-Driven Model Discovery*, CISM-IISc Workshop, Bengaluru (21–25 July, 2025)
- *Mechanics to Build and Program Soft Robots*, CISM, Italy (7-11 July, 2025)
- *An Introduction To Continuum Structural And Topology Optimization For Engineers*, GIAN Course, NIT Silchar, India (17-22 August, 2023)
- *Variational Methods for Complex Materials and Processes*, CISM, Italy (17-21 July, 2023)

Professional memberships

- Student Member, Society of Industrial and Applied Mathematics (SIAM) (2019 – *present*)
- Student Member, Association of Computing Machinery (ACM) (2022 – *present*)
- Student Member, Institute of Smart Structures and Systems (2024 – *present*)