

# Hemanshul Garg

Postdoc, Purdue University, USA

(+91) 9967308385  
hemanshul.garg@gmail.com  
Google Scholar



## Education

- 2020 **Doctor of Philosophy in Thermal and Fluids Engineering**  
*Department of Mechanical Engineering, Indian Institute of Technology, Bombay, India*  
**Cumulative Performance Index: 9.75/10**  
**Thesis Title:** Computational Study of Vortex-Induced Vibration in Isothermal and Non-isothermal Flows using a Sharp-Interface Immersed Boundary Method  
**Short Description:** Thesis work comprises of development and application of in-house fluid-structure interaction (FSI) solver. **Development** involves addition of new modules: conjugate heat transfer (CHT), natural/mixed convection (thermal buoyancy) and flow- or Vortex-induced vibration (FIV/VIV) modules. **Applications** involve: coupled VIV-mixed convection problems for several configurations of circular cylinders and square prisms, FIV of D-section cylinder along with applications in thermal augmentation and energy harvesting, and CHT of moving bluff bodies and deformable structures.  
**Advisor:** Prof. Rajneesh Bhardwaj ([website](#))
- 2013 **Master of Technology in Thermal and Fluids Engineering**  
*Department of Mechanical Engineering, Indian Institute of Technology, Guwahati, India*  
**Cumulative Performance Index: 9.62/10**  
**Thesis:** Least Squares Based Meshless Framework for Incompressible Fluid Flows  
**Short Description:** Thesis work focuses on development of least squares based a novel meshless framework for simulation of incompressible viscous flows.  
**Advisor:** Prof. Ganesh Natarajan ([website](#))
- 2010 **Bachelor of Engineering in Mechanical Engineering**  
*Jabalpur Engineering College, Jabalpur, India*  
**Percentage: 80.97%**  
(10<sup>th</sup> position in the merit list of the university which consists of more than 100 colleges.)

## Publications

### Published

- Garg, H., Soti, A. K., and Bhardwaj, R., "A sharp interface immersed boundary method for vortex-induced vibration in the presence of thermal buoyancy" (**Physics of Fluids**, 2018) [DOI-Link](#) (This article was selected as **Editor's pick**)
- Garg, H., Soti, A. K., and Bhardwaj, R., "Vortex-Induced Vibration of a Cooled Circular Cylinder" (**Physics of Fluids**, 2019) [DOI-Link](#)
- Garg, H., Soti, A. K., and Bhardwaj, R., "Vortex-Induced Vibration and Galloping of a Circular Cylinder in Presence of Cross-Flow Thermal Buoyancy" (**Physics of Fluids**, 2019) [DOI-Link](#)
- Kundu, A., Soti, A. K., Garg, H., Bhardwaj, R., and Thompson, M. C., "Computational modeling and analysis of flow-induced vibration of an elastic splitter plate using a sharp-interface immersed boundary method" (**SN Applied Sciences**, 2020) [DOI-Link](#)
- Kumar, V., Garg, H., Sharma, G., and Bhardwaj, R., "Harnessing flow-induced vibration of a D-section cylinder for convective heat transfer augmentation in laminar channel flow", (**Physics of Fluids**, 2020) [DOI-Link](#) (This article was selected as **Featured Article**.)
- Garg, H., Soti, A. K., and Bhardwaj, R., "Thermal Buoyancy Induced Suppression of Wake-Induced Vibrations", **International Communications in Heat and Mass Transfer**, 2020 [DOI-Link](#)

## Conferences

- Garg, H., and Bhardwaj, R., "Effect of Thermal Buoyancy on Vortex-Induced Vibration of a Cylinder at  $Re = 150$ " (7<sup>th</sup> **International and 45<sup>th</sup> National Fluid Mechanics and Fluid Power Conference IIT Bombay Mumbai, India, December 10-12, 2018**)
- Garg, H., Soti, A. K., and Bhardwaj, R., "Suppression or Agitation of Vortex-induced Vibration (VIV) of a Cylinder in the Presence of Thermal Buoyancy at Low Reynolds number" (71<sup>st</sup> **Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, USA, 2018**)

- Garg, H., and Bhardwaj, R., "A sharp interface immersed boundary-finite element method based fluid-structure interaction solver with conjugate heat transfer" (**Proceedings of the 23rd National Heat and Mass Transfer Conference and 1st International ISHMT-ASTFE Heat and Mass Transfer Conference IHMTC2015, Paper number IHMTC2015-1267**)

## Skill Set

- Modelling: Finite difference Method (FDM), Finite Volume Method (FVM), Finite Element Method (FEM), Meshless Methods
- Programming Languages: Fortran, C/C++, Python
- Mesh Generation Software: gmsh, Gambit
- Commercial Software: Fluent, Matlab, Maple and Mathematica
- Open Source Software: Lis library, PETSc (Krylov solver), LAPACK, OpenFOAM, OpenMPI, Tahoe, Latex, Inkscape, Fenics, openPNM
- Operating Platforms: Linux, Windows
- Post Processing Tools: Tecplot, Gnuplot, Python, Paraview

## Research Interests

- Computational modeling: code development by utilizing FDM, FVM, FEM, Meshless methods and many more.
- Fluid-structure interaction (FSI): applications in biomedical engineering, energy harvesting, drag reduction, ocean engineering and renewable energy etc.
- Flow-induced or vortex-induced vibration (FIV or VIV): application to energy harvesting and thermal augmentation.
- Heat transfer applications involving conjugate heat transfer (CHT), mixed/natural convection, and convective heat transfer for instance in electronics cooling.
- Coupled dynamics: VIV-mixed/natural convection, CHT-mixed/natural convection, FSI-CHT-mixed/natural convection.
- Buoyancy-driven structures and flows.
- Renewable energy: development and implementation of the computational models to study electrochemistry, thermal safety and mechanics involved in Li-ion batteries.
- Multi-physics applications: learn, develop, and incorporate challenging computational methods for interdisciplinary applications.

## Experience

July'11- **Teaching Assistant**

May'13 *Department of Mechanical Engineering, Indian Institute of Technology (IIT) Guwahati, Assam, India*

Subjects:

- Fluid Mechanics (ME221)
- Engineering Drawing (ME111)
- Advanced Engineering Mathematics (ME501)
- Engineering Mechanics ( ME101)

July'13- **Teaching Assistant**

May'19 *Department of Mechanical Engineering, Indian Institute of Technology (IIT) Bombay, Mumbai, India*

Subjects:

- Advanced Fluid Dynamics (ME651)
- Computational Fluid Dynamics and Heat Transfer (ME415)
- Fluid Mechanics (ME219)
- Fluid Mechanics Lab (ME224)
- Thermal and Fluids Engineering Lab (ME657)
- Fluid-Structure Interaction (ME776)
- Mechanical Measurements Lab (ME307)

July'11- **Miscellaneous**

May'19 *Department of Mechanical Engineering, IIT Guwahati and IIT Bombay, India*

- Establishment of computational lab at IIT Guwahati under the supervision of Prof. Ganesh Natarajan: installation of Linux operating system, and all necessary software and tools.
- Server maintenance and installation of all necessary software and tools in Interfacial flows and FSI laboratory at IIT Bombay.

July'19- **Research Associate**  
Jan'20 *Department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India*

March'20- **Postdoctoral Research Associate**  
Present *School of Mechanical Engineering, Purdue University, West Lafayette, Indiana, USA*

---

## Extra-curricular activities:

- Sports Special Mention Award of hostel 13 at IIT Bombay for consecutive years (2016-2017, 2018-2019).
- Won Silver in Intra hostel Badminton tournament in 2018.
- Won Silver in Inter Branch PG Badminton tournament in 2018 at IIT Bombay.
- Won Gold in Institute Badminton League in 2017 at IIT Bombay.
- Won Gold in Inter Branch PG Cricket tournament in 2017 at IIT Bombay.
- Won Gold in Inter hostel Badminton tournament in 2016 at IIT Bombay.
- Won Gold in Inter Branch PG Badminton tournament in 2016 at IIT Bombay.
- Won Gold in Intra Mechanical Badminton tournament in 2016 at IIT Bombay.
- Won Bronze in Inter Branch PG Badminton tournament in 2014 at IIT Bombay.
- Won Bronze in Spardha (Inter hostel Cricket tournament) in 2012 at IIT Guwahati.
- Won Gold in Big Bash League (Intra hostel Cricket tournament) in 2012 at IIT Guwahati.
- Won Gold in Inter Branch PG Volleyball tournament in 2012 at IIT Guwahati.
- Batch Representative of Master of Technology 2011-2013 batch in the department of Mechanical Engineering at IIT Guwahati.
- Won Gold in 200 meters Boys Running in 2003 at SDM School.

---

## References

- **Prof. Rajneesh Bhardwaj** (Ph.D. Supervisor)  
Associate Professor, Department of Mechanical Engineering, IIT Bombay, India  
Email: rajneesh.bhardwaj@iitb.ac.in, Phone: (+91) 22 - 2576 7534
- **Prof. Ganesh Natarajan** (M.Tech. Supervisor)  
Associate Professor, Department of Mechanical Engineering, IIT Palakkad, Kerala, India  
Email: n.ganesh@iitpkd.ac.in, Phone: (+91) 8011016625
- **Prof. Amitabh Bhattacharya** (Ph.D. Research Progress Committee (RPC) member)  
Associate Professor, Dept. of Applied Mechanics, IIT Delhi, India  
Email: bhattach@am.iitd.ac.in; bhattach@gmail.com; bhattach@iitb.ac.in
- **Prof. Atul Sharma** (Ph.D. Research Progress Committee (RPC) member)  
Professor, Department of Mechanical Engineering, IIT Bombay, India  
Email: atulsharma.iitb@gmail.com; atulsharma@iitb.ac.in
- **Prof. Partha Sarathi Goswami** (Ph.D. Research Progress Committee (RPC) member)  
Assistant Professor, Department of Chemical engineering, IIT Bombay, India  
Email: psg@che.iitb.ac.in, Phone: (+91) 22 2576 7230