Abhishek Mukherjee

Research Computing Facilitator, New Jersey Institute of Technology

CONTACT INFORMATION

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ABOUT

Experienced in managing high-performance computing environments, with a strong background in HPC software installation, system troubleshooting, and providing solutions for efficient computational tasks. Proficient in parallel computing, system performance tuning, software debugging, and ensuring optimal utilization of HPC resources. Skilled in managing large-scale computational environments, monitoring system health, and troubleshooting issues across HPC clusters. Expertise includes HPC system solutions, software installations, and performance optimization, ensuring seamless execution of computational workflows. Additionally, experienced in computational fluid dynamics (CFD) simulations, including multiphase turbulent flow, WMLES (wall-modeled large eddy simulation), and FSI (fluid-structure interaction), leveraging HPC resources for efficient simulation execution.

EXPERTISE AND SKILLS

- Installation, configuration, and optimization of scientific software and libraries on HPC cluster
- Job Scheduling and Workflow Management via SLURM
- Development of HPC utility tools for job management and monitoring
- Linux shell scripting, Git
- Development of HPC utility tools for job management and monitoring
- Deployment and management of Open On-Demand applications
- Computational fluid dynamics (CFD), Finite Element Method, Fluid Turbulence, Numerical Analysis
- Expert in CFD software packages, ANSYS-Fluent, OpenFoam
- Experienced in grid generation and postprocessing software, ANSA, Gmsh, ParaView, Tecplot
- Parallel Computing (HPC)
- Code development skill, C/C++, FORTRAN, Python, R, MATLAB, Ruby
- CAD, 2D/3D modeling and design, AutoCAD, Pro/Engineer, and CATIA

RESEARCH AND PROFESSIONAL EXPERIENCE

- **Research Computing Facilitator, Advanced Research Computing**
  New Jersey Institute of Technology, NJ 2023–Present
  - Research Support - Provide consulting, programming, and other services to faculty and researchers in using HPC clusters and other research computing resources and by providing advanced consulting to identify, investigate, and resolve problems encountered.
  - User Guidance - Provide guidance to existing and potential users on utilizing the HPC cluster for their research projects through one-on-one consultations and training sessions. Offer assistance with scripting, programming, debugging, workflow management, software installation, and data management.
  - Software Stack Management - Develop, implement, and consistently update an accessible and user-friendly software stack easily accessible by the user community. Ensure the software stack meets the diverse needs of the user community, promoting ease of access and usability.
  - Training & Outreach - Develop and teach workshops, course modules, seminars, and training sessions in basic use of HPC, Programming languages such as C/C++, Fortran, Python, R, etc, Parallel Programming in MPI and OpenMP, GPU computing, debugging and profiling, specific HPC application, and other topics relevant to use of HPC. Understand and convey current trends in research computing technology to the user community. Write user guides, information material, and other documentation. Run workshops on SLURM usage, containerization via Apptainer, Conda create and manage environments, debug software/library, compilation of software packages, etc.
  - Collaboration with Researchers - Collaborate with faculty and student researchers to understand their needs and support them by developing and configuring software solutions that enable research projects.
  - Other Responsibilities
    - HPC cluster setup and configuration, performance monitoring, tuning, and troubleshooting, as well as virtual machine setup and management.

- Development of cluster utility tools, such as SLURM job detail viewers, user quota checkers, SLURM usage monitors, etc.
- Open OnDemand applications and Passenger apps development.
- Constantly adapt to new technologies, such as Open OnDemand, Apptainer containers for pipelines, and Jupyter Notebook, etc.

- **Adjunct Instructor**
  New Jersey Institute of Technology, NJ 2023–2024
  - Delivered engaging lectures on core concepts of computer-aided design, including 2D and 3D modeling, parametric design, and assembly modeling.
  - Conducted hands-on demonstrations using CAD software (e.g., Creo Parametric, Creo Simulate, SolidWorks, & Solidworks Simulate).
  - Assessed student performance through quizzes, assignments, and project evaluations.
  - Provided one-on-one and group support to address student queries and enhance understanding.

- **Graduate Research, Computational Natural Hazard Laboratory**
  New Jersey Institute of Technology, NJ 2018–2023
  - Provided numerical simulation of tsunami bore propagation through on-shore vegetation. Quantified the tsunami wave attenuation for different vegetation parameters using the two-way coupling FSI model.
  - Analyzed the energy balance for different elastic moduli to study the effect of rigidity and bendability in energy reflection and dissipation.
  - Evaluated the turbulence statistics, the effect of flexible vegetation on bed shear stress, and turbulent flow structure using WMLES turbulence model.
  - Provided LES simulation of wave breaking in a tank, validated the numerical results with experimental data, and quantified the energy dissipation rate.
  - Implemented the transport model to study the motion of different-sized oil particles in water.
  - Conducted numerical study implementing WMLES to analyze the wake generation and velocity profiles at different body surfaces of blue whales.
  - Developed postprocessing code based on Python to calculate the coefficient of drag, the field averaged velocity profile from 3d data, and compare the findings with analytical results.

- **Teaching Assistant, Research Advisor**
  New Jersey Institute of Technology, NJ 2017–2021
  - Laboratory course of ME215 (Engineering Materials and Manufacturing Processes) (2017–2021)
  - Mechanical Laboratory III (ME406) - Performance Test Of A Vapor Compression Refrigeration Cycle. (2018–2020)
  - Advised an undergrad student in the project **"Study of oil droplet motion in water"** to train him for CFD postprocessing and data analysis.

Education

New Jersey Institute of Technology, NJ 2017-2023

- Ph.D. in Department of Mechanical Engineering.
- Advisor: Dr. Simone Marras.
- Dissertation: *Importance of Vegetation in Tsunami Mitigation: Evidence from Large Eddy Simulations with Fluid-Structure Interactions.*

Jadavpur University, India. 2012–2014

- M.E., Mechanical Engineering.
- Thesis: *Transient Study of Natural Convection in an Alternately Heated Square Enclosure.*

Kalyani Govt. Engineering College, India. 2007–2011

- B.Tech., Mechanical Engineering
- Project: *Analysis of Velocity Profile in a Laminar Open Channel Flow.*

Journal Publications

1. Flammang B., Marras S., Anderson E., Lehmkuhl O., **Mukherjee A.** *et. al,*. "Remoras pick where they stick on blue whales". *Journal of Experimental Biology 223(20)*, 2020.
2. Watanabe M., Arikawa T., Kihara N., Tsurudome C., Hosaka K., Kimura T., Hashimoto T., Ishihara F., Shikata T., Morikawa D. S., Makino T., Asai M., Chida Y., Ohnishi Y., Marras S., **Mukherjee A.** *et. al,*."Validation of tsunami numerical simulation models for an idealized coastal industrial site". *Coastal Engineering Journal 64(20)*, 2022.
3. **Mukherjee A.**, Cajas, J.C., Houzeaux G., Lehmkuhl O., Suckale J., Marras S.. "Forest density is more effective than tree rigidity at reducing the onshore energy flux of tsunamis". *Coastal Engineering Journal 182(104286)*, 2023.
4. Liu R., Daskiran C., **Mukherjee A.**, Xin Q., Cui F., Marras S., Farooqi H., Dettman H., Boufadel M.."Characterization and modelling of water mixing energies and particle behavior during wave generation in CanmetENERGY Devon spill test tank". *Ocean Engineering 278(114237)*, 2023.

Conference Presentation

1. **Mukherjee A.** *et. al,*. "Using fluid-structure interaction to evaluate the energy dissipation of a tsunami run-up through idealized flexible trees". *ParCFD 2020*, France
2. **Mukherjee A.** *et. al,*. "A large eddy simulation study of the effect of vegetation on the energy reduction during tsunami runup". *SIAM 2021*
3. **Mukherjee A.** *et. al,*. "Tsunami Wave Interaction With Rigid And Flexible Vegetation: A 3D Large Eddy Simulation Study". *AGU 2021*