Mehul Bapat

LinkedIn/mhlbapat | Google Scholar | mhlbapat@gmail.com | +1 412 886 3730

Ph.D. candidate in Computational Fluid Mechanics with expertise in CFD, FEA, and molecular dynamics. Experienced in COMSOL, ANSYS, LAMMPS, and FEniCS for simulating flow, deformation, and transport. Strong focus on powertrain-relevant modeling, including friction, lubrication, and mechanical response. Actively seeking roles in the automotive sector.

Education

- **Carnegie Mellon University, Pittsburgh, USA** — Jul'21 - Aug'25 (expected)
  Ph.D., Computational Fluid Mechanics
- **Carnegie Mellon University, Pittsburgh, USA** — Aug'19 - Dec'20
  M.S., Chemical Engineering
- **IIT (BHU) Varanasi, India** — Jul'15 - May'19
  B.S., Chemical Engineering

Skills And Interests

Skills: Computational Fluid Dynamics (COMSOL, ANSYS), Molecular Dynamics (LAMMPS), Multiphysics Modeling, Finite Element Analysis (FEniCS), Computer Aided Design (FreeCAD), Python, Familiar with Hypermesh and GT Suite

Interests: Engine and powertrain development, Lubrication and Interfacial Slip, Multiphase Flows

Publications and Conferences

- **M. Bapat and G. J. Wang, Nanoscale, Royal Society of Chemistry (2025)**
  "Revealing nanoscale slip within Taylor-Aris dispersion" DOI:10.1039/D4NR03468F
- **M. Bapat, J. Vinskus, G. J. Wang, K. Noonan (under preparation)**
  "Microscopic insights into degradability and crystalinity of disulfide-containing polymers"
- **American Institute of Chemical Engineers, AIChE, San Diego, CA (2024)**
  Effect of hydrodynamic slip on mixing in nanochannels
- **American Physical Society, Division of Fluid Dynamics, Indianapolis, IN (2022)**
  Microscopic insights into the onset of slip in polymeric Lennard-Jones fluids

Research and Experience

- **Modeling flow through a microreactor**
  Masters Research | Supervisors : Prof. Andrew Gellman and Prof. Grigorios Panagakos — Jan'20 - Jun'21
  - Performed CFD simulations of microreactor in COMSOL to study gas transport and mixing.
  - Achieved 95% mixing inside the reactor by optimizing flow rate and reaction rate.
- **Topology optimization of absorber column for carbon capture**
  Collaborative Research | Supervisors : Prof. Gerald J. Wang and Prof. Grigorios Panagakos — Jun'22 - Dec'23
  - Performed multiphysics FEA simulations with topology optimization of porous media flow.
  - Developed a novel technique to optimize wetted surface area of catalyst loading.
- **Understanding interfacial slip (hydrophobicity) through molecular simulations**
  Thesis Research | Supervisor : Prof. Gerald J. Wang — Feb'21 - Present
  - Modeled mechanical response of polymers under deformation, relevant to interfacial friction (lubrication).
  - Developed a dispersion model to predict interfacial slip with 99% accuracy (see RSC publication).
  - Saved 90% of computational costs by modeling viscosity, and shear dependence of interfacial slip.
- **Investigating mechanics of biodegradable polymer composites**
  Collaborative Research | Supervisors : Prof. Gerald J. Wang Collaborator: Prof. Kevin Noonan — Oct'23 - Present
  - Developed molecular models of polymers with disulfide (S2) bonds and measured their Stokes radius.
  - Predicted S2 bond dihedrals with 100% accuracy compared to experimental results.

Honors and Awards

- **Dr. Elio D'Appolonia Fellowship** to support research conducted on fluid-solid interfacial slip (2023-2024)
- **Neil and Jo Bushnell Fellowship in Engineering** to support research in nanotechnology (2021-2022)
- **Poster Award** at the **Chemical Engineering Symposium** for insightful research on Microreactors (2020).