

ABHILASH REDDY MALIPEDDI

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EDUCATION

The George Washington University, Washington, D.C., USA

Ph.D., Mechanical Engineering

2021

Dissertation: Rheology, diffusion and micro-structure of sheared suspensions of deformable particles

Advisor: Kausik Sarkar

Indian Institute of Technology Madras, Chennai, India

Master of Technology, Mechanical Engineering Specialization in Energy Technology

Thesis: Influence of duct geometry on the performance of Darrieus turbine

Advisor: Dhiman Chatterjee

Indian Institute of Technology Madras, Chennai, India

Bachelor of Technology, Mechanical Engineering

PROFESSIONAL EXPERIENCE

University of Michigan Ann Arbor, MI, USA

Postdoctoral Research Fellow, ME & BME.

SEPTEMBER 2021–present

- Building next-generation computational tools for particle-laden biological flows in subject-specific geometries
- Implementing fully coupled Euler-Lagrange model in CRIMSON framework
- Developing scalable algorithms for Lagrangian particle tracking on unstructured grids

The George Washington University Washington, D.C., USA

Research Assistant, MAE/SEAS

SEPTEMBER 2014–JULY 2021

- Developed high-performance scalable parallel Fortran/MPI code to simulate flows of complex multi-specie multi-particle suspensions
- Applied dynamic structure factor-based methods to study the flow of inhomogeneous suspensions
- Predicted shear-induced gradient diffusivity of suspensions of droplets and cells

NTPC Limited Chennai & Ramagundam, India

Assistant Manager (Operation, Commissioning)

AUGUST 2011–JULY 2013

- Commissioned thermal power generation stations (VTPS Units 1 & 2)
- Led 10 person team in safe operation of a 500MW power generation unit
- Applied ML tools to solve process issues e.g. clinker formation in the furnace

Indian Institute of Technology Madras Chennai, India

Research Assistant (Turbo Machines Laboratory)

JULY 2009–MAY 2011

- Developed Euler-Lagrange cavitation model based on Rayleigh-Plesset theory
- Designed and developed ducts for vertical axis hydrokinetic turbines

Deccan Pumps Pvt. Ltd. Coimbatore, India

Intern (Special assistant to CEO)

SUMMER 2009

- Conducted research on cavitation resistant polymer impellers for centrifugal pumps
- Developed computer applications to support design and manufacturing of turbomachinery.

Indian Institute of Sciences Bangalore, India

Summer Fellow (Force Microscopy Lab)

SUMMER 2008

- Designed sample holder for Transmission Electron Microscope *in-situ* nano-indenter
- Optimized the sample holder design using finite element analysis

TEACHING
EXPERIENCEGraduate Teaching Assistant, *Mechanical and Aerospace Engineering*

- MAE 3166W: Materials Science & Engineering, (Writing G. A.) FALL 2017
(multiple)
- MAE 3187: Heat Transfer SPRING 2016
- MAE 6229: Propulsion (multiple)
- APSC 6213: Analytical Methods in Engineering III: PDEs

HONORS &
AWARDS

1. Outstanding Accomplishment in Research awarded by Office of Vice President for Research, The George Washington University 2015
2. Travel Award by APS to present at the APS Physics Canada-America-Mexico Conference in Oaxaca, Mexico 2015
3. GW Fellowship (multiple)
4. The MCM Scholarship awarded by Indian Institute of Technology Madras 2010

PROFESSIONAL
SKILLS

- Demonstrated knowledge of distributed computing and linux administration
- Parallel programming experience in Fortran, C, C++, Python, Julia
- High performance computing technologies: MPI, OpenMP, GPU, Cuda
- Experience with hypre, PETSc, Trilinos and other HPC libraries
- Data science libraries: SciPy, Numpy, Pandas, scikit-learn, Keras, PyTorch

PUBLICATIONS

1. Anik Tarafder, **Abhilash Reddy Malipeddi** and Kausik Sarkar. Pair interactions between viscous drops in a viscoelastic matrix in free shear: Transition from passing to tumbling trajectories. *Journal of Rheology*, 66 (3), 571-584, 2022
2. Swarnajay Mukherjee, Anik Tarafder, **Abhilash Reddy Malipeddi** and Kausik Sarkar. Shear-induced migration of a viscous drop in a viscoelastic liquid near a wall at high viscosity ratio: Reverse migration. *Journal of Non-Newtonian Fluid Mechanics*, 301, 104751, 2022
3. **Abhilash Reddy Malipeddi** and Kausik Sarkar. Shear-induced diffusivity of a red blood cell suspension: effects of cell dynamics. *Soft Matter*, 17(37):8523-8535, 2021.
4. **Abhilash Reddy Malipeddi** and Kausik Sarkar. Collective diffusivity in a sheared viscous emulsion: Effects of viscosity ratio. *Physical Review Fluids*, 4(9), 093603, 2019
5. **Abhilash Reddy Malipeddi** and Kausik Sarkar. Shear-induced collective diffusivity down a concentration gradient in a viscous emulsion of drops. *Journal of Fluid Mechanics*, 868:5–25, 2019.
6. Sagnik Singha, **Abhilash Reddy Malipeddi**, Mauricio Zurita-Gotor, Kausik Sarkar, Kevin Shen, Michael Loewenberg, Kalman B. Migler, and Jerzy Blawdziewicz. Mechanisms of spontaneous chain formation and subsequent microstructural evolution in shear-driven strongly confined drop monolayers. *Soft Matter*, 15(24):4873–4889, 2019.
7. Priyesh Srivastava, **Abhilash Reddy Malipeddi**, and Kausik Sarkar. Steady shear rheology of a viscous emulsion in the presence of finite inertia at moderate volume fractions: Sign reversal of normal stress differences. *Journal of Fluid Mechanics*, 805:494–522, 2016.
8. **Abhilash Reddy Malipeddi** and Dhiman Chatterjee. Influence of duct geometry on the performance of Darrieus hydroturbine. *Renewable Energy*, 43:292–300, 2012.
9. **Abhilash Reddy Malipeddi**, Anik Tarafder and Kausik Sarkar. Deformation characteristics and breakup of a viscoelastic drop in time-periodic extensional flows. In preparation.

GRANTS

Contributed to:

1. Extreme Science and Engineering Discovery Environment (XSEDE) research allocation grant, 2019. PI: Kausik Sarkar, "Rheology, diffusion and micro-structural evolution of emulsions of complex fluids", Grant # CTS180042 Renewal, Award value: **\$16,682.00**
2. Extreme Science and Engineering Discovery Environment (XSEDE) research allocation grant, 2018. PI: Kausik Sarkar, "Rheology, diffusion and micro-structural evolution of emulsions", Grant # CTS180042 New, Award value: **\$16,588.67**
3. Extreme Science and Engineering Discovery Environment (XSEDE) startup allocation grant, 2017. PI: Kausik Sarkar, "Rheology of emulsions in the presence of inertia", Grant # CTS170042, Award value: **\$1841.00**

CONFERENCE
TALKS

1. APS Division of Fluid Dynamics Conference 2019, Seattle, Washington, "Shear induced gradient diffusivity of red blood cell suspensions"
2. Burgers Symposium 2019, Johns Hopkins University, Baltimore, "Shear-induced diffusion of deformable particles using dynamic structure factor"
3. APS March Meeting 2018, Los Angeles, California, "Shear-induced gradient diffusivity of emulsions at finite inertia"
4. Burgers Symposium 2018, The George Washington University, "Hydrodynamic collective diffusion in emulsions under shear flow"
5. APS Division of Fluid Dynamics Conference 2017, Denver, Colorado, "Shear-induced gradient diffusivity in emulsions"
6. Northeast Regional Soft Matter Workshop, 2017, Princeton University, "Computation of shear-induced collective diffusivity in emulsions"
7. Burgers Symposium 2016, Johns Hopkins University, Baltimore, "Computation of viscoelastic drop deformation in periodic planar extensional flows"
8. APS Physics Canada-America-Mexico Conference 2015, Oaxaca, Mexico, "Effects of a fluid filament's curvature on its stability"
9. Society of Rheology 87th Annual Conference 2015, Baltimore, "Deformation of a viscoelastic drop in periodic planar extensional flows"

POSTER
PRESENTATIONS

1. SEAS R&D Showcase 2019, "Shear induced gradient diffusivity of red blood cell suspensions"
2. SEAS R&D Showcase 2018, "Computation of collective diffusivity in emulsions at finite inertia"
3. SEAS R&D Showcase 2017, "Flow induced diffusion of deformable particles"
4. GWU Research Days 2015, "Deformation characteristics of a viscoelastic drop in periodic plane extensional flows" (Award Winner)
5. SEAS R&D Showcase 2015, "Dynamics of a viscoelastic drop in time-periodic flows"

PROFESSIONAL
AFFILIATIONS

Member

- American Society of Mechanical Engineering (ASME) 2015–
- American Physical Society (APS) 2015–
- Society of Rheology (SOR) 2015–
- Society for Industrial and Applied Mathematics (SIAM) 2015–

PROFESSIONAL
SERVICE

Reviewer

- Journal of Fluids Engineering

OUTREACH
ACTIVITIES

2016 AIAA-National Capital Section Judge at DC STEM fair.

ACTIVITIES &
INTERESTS

Physical Computing, Embedded Systems, Cloud Computing, Computational Geometry, Science Outreach, Mechanical Design