Stanford

Makrand Khanwale

Physical Science Research Scientist

Mechanical Engineering

Bio

BIO

I received my PhD from Iowa State University co-majoring in Mechanical engineering and Applied Mathematics. I was co-advised by Dr. Baskar Ganapathysubramanian and Dr. James Rossmanith. For my dissertation I worked on development and analysis of numerical schemes for high fidelity simulations of multiphase flows. Specifically I developed energy stable numerical methods to simulate two-phase flows using Cahn-Hilliard Navier-Stokes equations. I also have experience in development of tools to analyse and understand complex physical processes like multi-phase flows and turbulence. Before joining Iowa State for my graduate work, I had a brief stint as a research associate in Dr. Krishnaswamy Nandakumar's group in Louisiana State University (LSU). At LSU I worked on developing theoretical models for energy cascades in multi-phase flows.

ACADEMIC APPOINTMENTS

- Physical Science Research Scientist, Mechanical Engineering

HONORS AND AWARDS

- Research Excellence Award from Iowa State Graduate College, Iowa State University (May 2021)
- Teaching Excellence Award from Iowa State Graduate College, Iowa State University (May 2019)
- Dean's Fellowship from College of Engineering, Iowa State University (2016)
- Bal G. Joshi endowment award, Institute of Chemical Technology (2014)

PROFESSIONAL EDUCATION

- Doctor of Philosophy, Iowa State University , Mechanical Engineering and Applied Mathematics (2021)
- B.Tech, Institute of Chemical Technology , Chemical Technology (2015)

LINKS

- Personal Website: https://makrandak.github.io/about/

Teaching

COURSES

2023-24

- Partial Differential Equations in Engineering: CME 204, ME 300B (Win)

Publications

PUBLICATIONS

- **Direct numerical simulation of electrokinetic transport phenomena in fluids: Variational multi-scale stabilization and octree-based mesh refinement** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Kim, S., Saurabh, K., Khanwale, M. A., Mani, A., Anand, R. K., Ganapathysubramanian, B.
  2024; 500

- **Effect of interpolation kernels and grid refinement on two way-coupled point-particle simulations** *INTERNATIONAL JOURNAL OF MULTIPHASE FLOW*
  Keane, N. A., Apte, S. V., Jain, S. S., Khanwale, M. A.
  2023; 166

- **Assessment of an energy-based surface tension model for simulation of two-phase flows using second-order phase field methods** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Mirjalili, S., Khanwale, M. A., Mani, A.
  2023; 474

- **Scalable adaptive algorithms for next-generation multiphase flow simulations**
  Saurabh, K., Ishii, M., Khanwale, M. A., Sundar, H., Ganapathysubramanian, B., IEEE
  IEEE COMPUTER SOC.2023: 590-61021

- **A projection-based, semi-implicit time-stepping approach for the Cahn-Hilliard Navier-Stokes equations on adaptive octree meshes** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Khanwale, M. A., Saurabh, K., Ishii, M., Sundar, H., Rossmanith, J. A., Ganapathysubramanian, B.
  2023; 475 (C)

- **Computational framework for resolving boundary layers in electrochemical systems using weak imposition of Dirichlet boundary conditions** *FINITE ELEMENTS IN ANALYSIS AND DESIGN*
  Kim, S., Khanwale, M. A., Anand, R. K., Ganapathysubramanian, B.
  2022; 205

- **A fully-coupled framework for solving Cahn-Hilliard Navier-Stokes equations: Second-order, energy-stable numerical methods on adaptive octree based meshes** *COMPUTER PHYSICS COMMUNICATIONS*
  Khanwale, M. A., Saurabh, K., Fernando, M., Calo, V. M., Sundar, H., Ganapathysubramanian, B.
  2022; 280 (C)

- **Industrial scale Large Eddy Simulations with adaptive octree meshes using immersogeometric analysis** *COMPUTERS & MATHEMATICS WITH APPLICATIONS*
  Saurabh, K., Gao, B., Fernando, M., Xu, S., Khanwale, M. A., Khara, B., Hsu, M., Krishnamurthy, A., Sundar, H., Ganapathysubramanian, B.
  2021; 97: 28-44

- **Simulating two-phase flows with thermodynamically consistent energy stable Cahn-Hilliard Navier-Stokes equations on parallel adaptive octree based meshes** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Khanwale, M. A., Lofquist, A. D., Sundar, H., Rossmanith, J. A., Ganapathysubramanian, B.
  2020; 419

- **On nature of mass transfer near liquid-liquid interface in the presence of Marangoni instabilities**
  Khadamkar, H. P., Khanwale, M. A., Sawant, S. S., Mathpati, C. S.
  PERGAMON-ELSEVIER SCIENCE LTD.2017: 176-183

- **Bubble generated turbulence and direct numerical simulations Bubble generated turbulence and direct numerical simulations**
  Joshi, J. B., Nandakumar, K., Evans, G. M., Pareek, V. K., Gumulya, M. M., Sathe, M. J., Khanwale, M. A.
  PERGAMON-ELSEVIER SCIENCE LTD.2017: 26-75

- **Heat Transfer in Turbulent Boundary Layers of Pipe Flow: A Wavelet Transforms Approach**
  Khanwale, M. A., Sona, C. S., Mathpati, C. S., Peinke, J., Kampers, G., Oberlack, M., Waclawczyk, M., Talamelli, A.
  SPRINGER-VERLAG BERLIN.2016: 221-226

- **Effect of solute transfer and interfacial instabilities on scalar and velocity field around a drop rising in quiescent liquid channel** *PHYSICS OF FLUIDS*
  Khanwale, M. A., Khadamkar, H. P., Mathpati, C. S.
  2015; 27 (11)
- **Investigation of heat transfer characteristics and energy balance analysis of FLiNaK in turbulent boundary layers of pipe flow** *APPLIED THERMAL ENGINEERING*
  Khanwale, M. A., Sona, C. S., Mathpati, C. S., Borgohain, A., Maheshwari, N. K.
  2015; 75: 1022-1033
- **Investigation of flow and heat characteristics and structure identification of FLiNaK in pipe using CFD simulations** *APPLIED THERMAL ENGINEERING*
  Sona, C. S., Khanwale, M. A., Mathpati, C. S., Borgohain, A., Maheshwari, N. K.
  2014; 70 (1): 451-461