Our research is broadly defined by multiphysics problems in fluid dynamics and transport engineering. Our work contributes to the understanding of these problems primarily through theoretical tools such as techniques of applied mathematics as well as massively-parallel simulations. Numerical simulations enable quantitative visualization of the detailed physical processes which can be difficult to detect experimentally. They also provide quantitative data that guide the development of reduced-order models, which would naturally induce insight for design, optimization and control. Most of our work involves complementary interactions with experimental groups within and outside of Stanford. Specific current research topics include:

(1) Electro-convection and microscale chaos near electrochemical interfaces

(2) Particle-laden flows with applications in solar receivers

(3) Applications of superhydrophobic surfaces for drag reduction of turbulent flows

(4) Micro-bubble generation by breaking waves

(5) Electrokineatics of micropores and nanopores
LINKS

- Mani Research Lab: http://www.stanford.edu/~alimani

Teaching

COURSES

2019-20
- Fluid Mechanics: ME 351B (Win)
- Introduction to Numerical Methods for Engineering: CME 206, ME 300C (Spr)
- Seminar in Fluid Mechanics: ENGR 298 (Aut)

2018-19
- Asymptotic Methods in Computational Engineering: ME 405 (Win)
- Fluid Mechanics: ME 351A (Aut)
- Introduction to Numerical Methods for Engineering: CME 206, ME 300C (Spr)

2017-18
- Fluid Mechanics: ME 351A (Aut)
- Fluid Mechanics: ME 351B (Win)

2016-17
- Physics-Based Computational Modeling: ME 405 (Win)
- Turbulence: ME 361 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)
Ronald Chan, Ji Hoon Kim, Pedro Montebello Milani, Suhas Suresh, Hilario Torres

Postdoctoral Faculty Sponsor
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Doctoral Dissertation Advisor (AC)
Raj Balaji, Jessie Liu, Kimberly Liu, Danah Park, Omkar Shende, yasaman shirian

Master's Program Advisor
Fay Colah, Hannah Williams

Doctoral Dissertation Co-Advisor (AC)
Aekaansh Verma, Taemin Yong

Publications

PUBLICATIONS

- Chaotic induced-charge electro-osmosis. Physical review letters
  Davidson, S. M., Andersen, M. B., Mani, A.
  2014; 112 (12): 128302-?

- Overlimiting Current and Shock Electrodialysis in Porous Media LANGMUIR
  Deng, D., Dydek, E. V., Han, J., Schlumberger, S., Mani, A., Zaltzman, B., Bazant, M. Z.
Statistical description of the free-space propagation of highly aberrated optical beams  *JOURNAL OF THE OPTICAL SOCIETY OF AMERICA A-OPTICS IMAGE SCIENCE AND VISION*

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