Shravan Veerapaneni
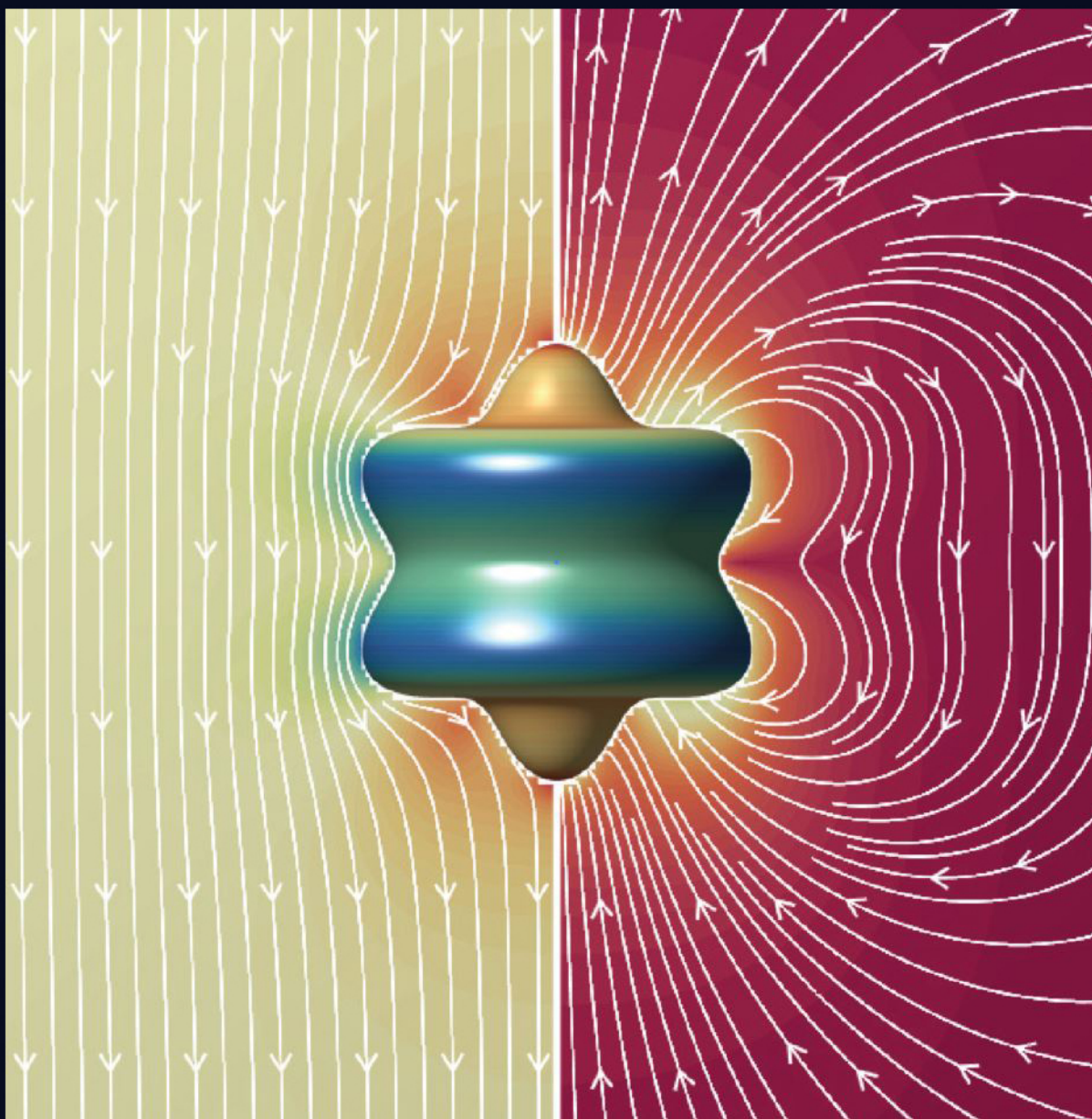
Department of Mathematics
University of Michigan

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University of Michigan

Fast solvers for optimal propulsion and transport problems in Stokes flow

In this talk, we present adjoint formulations for optimal control and shape optimization problems in Stokes flow. In particular, we will discuss two problems: (i) maximizing the swimming efficiency of micro-swimmers, and (ii) finding the optimal shapes of peristaltic pumps. A common theme in our formulations is that the derived sensitivities require evaluating physical variables (traction, pressure, etc.) on the domain boundaries only. By employing these formulas in conjunction with a boundary integral approach for solving forward and adjoint problems, we completely avoid the issue of volume remeshing as the optimization proceeds. We will discuss the optimal solutions and what physical insights can be gained from them.

Virtual Colloquium
3:30-4:30 p.m. Eastern Time (US and Canada)
Wednesday, November 18, 2020