Applied Math Seminar scheduled on Friday, October 3, 2018, 2:30-3:30pm, JD1610

Speaker: Prof. Chiu-Yen Kao (Claremont McKenna College)

Title: Maximal Convex Combinations of Sequential Steklov Eigenvalues

Abstract:
In this work, we study a shape optimization problem in two dimensions where the objective function is the convex combination of two sequential Steklov eigenvalues of a domain with a fixed area constraint. We show the existence of the optimal domain and the nondecreasing, Lipschitz continuity, and convexity of the optimal objective function with respect to the convex combination constant. On one-parameter family of rectangular domains, asymptotic behaviors of lower eigenvalues are found. For general shapes, numerical approaches based on boundary integral methods and shape derivatives are proposed to find optimal shapes. The range of the first two Steklov eigenvalues are discussed for several one-parameter families of shapes including Cassini oval shapes and Hippopede shapes.

About the speaker:
Chiu-Yen Kao is a full professor in the Department of Mathematics and Computer Science at Claremont McKenna College. Before joining CMC, she was a tenured associate professor in the Department of Mathematics, The Ohio State University. She received her Ph.D. degree from the University of California, Los Angeles in 2004 and was an Industrial Postdoctoral Associate at the Institute for Mathematics and its Applications, University of Minnesota during 2004-2006. Her research focuses on shape optimization for eigenvalue problems, numerical methods for partial differential equations, level set methods, and their applications in image processing, physics, and biology. She received the Medical Image Computing and Computer Assisted Intervention (MICCAI) Society paper award in 2005, Alfred P. Sloan Fellowship in 2009, and the Electrical and Electronics Engineers (IEEE) Signal Processing Society Best Paper Award in 2013. Her current work on shape optimization for Steklov eigenvalue problems and biharmonic eigenvalue problems is supported by a NSF DMS grant.