

BSU MATH Department Seminar

SIAM PNW Section Seminar Series – Winter 2017

When: Thursday, January 26, 2017, 4:00 PM Mountain Time

Where: MB139 (room 139 in Mathematics Building) via Video Conference

Speaker: Professor Nilima Nigam,
Department of Mathematics,
Simon Fraser University,
Burnaby, BC, Canada

Title: A MODIFICATION OF SCHIFFER'S CONJECTURE, AND A PROOF VIA FINITE ELEMENTS

Abstract: Approximations via conforming and non-conforming finite elements can be used to construct validated and computable bounds on eigenvalues for the Dirichlet Laplacian in certain domains. If these are to be used as part of a proof, care must be taken to ensure each step of the computation is validated and verifiable. In this talk we present a long-standing conjecture in spectral geometry, and its resolution using validated finite element computations. Schiffer's conjecture states that if a bounded domain Ω in \mathbb{R}^n has any nontrivial Neumann eigenfunction which is a constant on the boundary, then Ω must be a ball. This conjecture is open. A modification of Schiffer's conjecture is: for regular polygons of at least 5 sides, we can demonstrate the existence of a Neumann eigenfunction which does not change sign on the boundary. In this talk, we provide a recent proof using finite element calculations for the regular pentagon. The strategy involves iteratively bounding eigenvalues for a sequence of polygonal subdomains of the triangle with mixed Dirichlet and Neumann boundary conditions. We use a learning algorithm to find and optimize this sequence of subdomains, and use non-conforming linear FEM to compute validated lower bounds for the lowest eigenvalue in each of these domains. The linear algebra is performed within interval arithmetic. This is joint work with Bartłomiej Siudeja and Ben Green, at U. Oregon.

Notes: Due to the large geographic extent of our section, the seminar series consists of online talks only, currently one per academic quarter. The talks can be attended by clicking the above link, which will be live 15 minutes prior to the start of the talk. No gotomeeting account is necessary. Any computer with speakers or a headphone connection will allow one to attend the talk. A microphone is required to ask questions during or after the seminar.

Link: <https://global.gotomeeting.com/join/788816861>

Refreshments will be served at the room MB139.

The SIAM PNW Section Seminar is a quarterly seminar presented by a distinguished member of the section, invited by the officers of the section. Suggestions for future speakers are welcomed. The schedule for this academic year:

Autumn 2016: Randy LeVeque, UW

Winter 2017: Nilima Nigam, SFU

Spring 2017: Ralph Showalter, OSU