2017 ISMAA GRADUATE STUDENT ABSTRACTS

Jooyeon Chung, University of Illinois at Urbana-Champaign

Free rods under compression: cascading and phantom spectral lines

In this talk, I will consider the spectrum of the one-dimensional vibrating free rod equation $u'''' - \tau u'' = \mu u$ under tension ($\tau > 0$) or compression ($\tau < 0$). The eigenvalues μ as functions of the tension/compression parameter τ are shown to exhibit three distinct types of behavior. In particular, eigenvalue branches in the lower half-plane exhibit a cascading pattern of barely-avoided crossings. I will graphically illustrate properties of the eigenvalue curves such as monotonicity, crossings, asymptotic growth, cascading and phantom spectral lines.

Aboubacar Seck

Other authors: Olcay Akman

Modeling the Influence of El Niño on Parasite Transmission in Sand Crab Populations and Shorebird Abundance Along the CA Coast

Pacific mole crabs (Emerita analoga) are one of the most important and abundant invertebrates in sandy beach environments. Consequently, they are a common food source for shorebirds and sea otters. Since the mole crab serves as the primary intermediate host for acanthocephalans parasites, they have been linked to a number of mortality events. It is currently estimated that 13-16% of deaths in the threatened California sea otter population have been caused by infection. In addition, unusually high loads of acanthocephalan parasites have been linked to episodic deaths of thousands of surf scoters. Studies suggest that acanthocephalan development and transmission may be strongly effected by weather patterns. In this presentation we will introduce a system of differential equations for parasite transmission between scoter, crab, and sea otter populations. Temperature-dependent parameters within the model allow us to examine the role climate oscillation in El Niño and La Niña years has on abundances of infected hosts.

Christopher Swindell, Illinois State University

Other authors: Olcay Akman

STUDY OF THE NICU ARCHITECTURE IN THE TRANSMISSION OF MRSA AMONG INFANTS AT THE CHILDREN'S HOSPITAL OF ILLINOIS, PEORIA, IL USING UNSUPERVISED NEURAL NETWORK (KOHONEN) SELF ORGANIZING MAPS

With advances in medical devices and knowledge about disease transmission many hospitals, including the Children's Hospital of Illinois in Peoria, have redesigned their NICUs from a single room housing multiple infants to individual rooms that allow greater privacy for parents and their newborns. This study uses data gathered during a five-year observational study of infants colonized by methicillin-resistant Staphylococcus aureus (MRSA). Using an unsupervised learning process within the neural network family known as Kohonen Self Organizing Maps our goal in this process is to map a continuous input space to a low dimensional, spatially discrete output space to identify key characteristics of the colonized patients. Our goal is to determine whether architecture plays an important role in the colonization of MRSA.

This talk is appropriate for undergraduates.