Monday, January 7, 2008, 2:00–3:15pm
Room 33A, San Diego Convention Center

2:00-2:15

Critical points of Infinity Harmonic Functions

Tiffany L. Troutman, University of California, Riverside, California
SPWM 2002

Abstract: In the late 1960s Aronsson initiated the study of the ∞-Laplace equation,

$$\Delta_\infty = \frac{1}{2}\langle \nabla u, \nabla |\nabla u|^2 \rangle = 0,$$

where $u : \mathbb{R}^n \to \mathbb{R}$. The solutions are now known as infinity harmonic functions, and they have applications in image processing, mass transfer processes, and shape metamorphisms. In this talk, we will discuss critical points of infinity harmonic functions.

2:15-2:30

A Tour of Computable Structure Theory

Sara Quinn, University of Notre Dame, Notre Dame, Indiana
SPWM 2002

Abstract: Computable structure theory is a branch of mathematical logic in which the algorithmic complexity of algebraic structures is examined. In other words, we determine how complicated it is to answer certain questions about algebraic structures, such as: "Are these two structures isomorphic?" There is a hierarchy we use to rank the complexity of these questions. In this talk I will give all of the necessary definitions, and then describe the kinds of questions that we ask in computable structure theory.

2:30-2:45

Persistence, a Topological Invariant of Data Sets

Aubrey HB, Duke University, Durham, NC
SPWM 2004

Abstract: Given a set of data points, I can use create a topological space by considering each individual data point to be a vertex of a simplicial complex. Persistence pairs homology of that given surface at various levels to look at a local structure. This talk will give a brief explanation of simplicial complexes, homology groups and persistence. This will provide the tools that detect noise versus important trends in our data sets that further the analysis and understanding of data collected.

2:45-3:00

Ramanujan's τ-Function and Counting Points on Elliptic Curves

Jenny G. Fuselier, United States Military Academy, West Point, NY
SPWM 2001

Abstract: Modular forms and elliptic curves are often of interest to number theorists. Connections between the two have given rise to many powerful results, including, for example, the proof of Fermat's Last Theorem. In this talk, we introduce Ramanujan's classical τ-function, $\tau(n)$, via the context of modular forms and describe some of its properties. We then discuss results relating the values $\tau(p)$ to counting the number of points on a family of elliptic curves over $\mathbb{F}_p$, when $p \equiv 1 \pmod{12}$ is prime.

3:00-3:15

Dynamics of Fish Migration

Alethea Barbaro, University of California, Santa Barbara, CA
SPWM 2002
Joint work with Björn Birnir, Baldvin Einarsson, and Sven Sigurdsson

Abstract: In this talk, we will address the problem of modeling the migration and behavior of the Icelandic capelin stock. We will discuss previous work on this problem, giving pertinent biological background, and then discuss the model which we are currently using. The model uses interactions among the fish in a school and information about ocean temperature and currents to simulate the fish during the spawning migration. This simplistic model captures the qualitative behavior of the stock surprisingly well. We will show several simulations which we have constructed of the migration of the capelin. We will end by discussing the dynamic energy budget (DEB) model from biology, which we hope will explain some of the intricacies of the migration.
