

MATH MATTERS 2008-2009

IMA Public Lecture Series www.ima.umn.edu/public-lecture

All Lectures are
at 7:00 pm
125 Willey Hall

WEDNESDAY OCTOBER 29, 2008

Ingrid Daubechies, Department of Mathematics and Program in Applied and Computational Mathematics, Princeton University

SURFING WITH WAVELETS

Wavelets are used in the analysis of sounds and images, as well as in many other applications. The wavelet transform provides a mathematical analog to a music score: just as the score tells a musician which notes to play when, the wavelet analysis of a sound takes things apart into elementary units with a well defined frequency (which note?) and at a well defined time (when?). For images wavelets allow you to first describe the coarse features with a broad brush, and then later to fill in details. Because wavelets allow you to do a similar thing in more mathematical terms, the wavelet transform is sometimes called a “mathematical microscope.”

Wavelets are used by many scientists for many different applications. Outside science as well, wavelets are finding their uses: wavelet transforms are an intergral part of the image compression standard JPEG2000.

The talk will start by explaining the basic principles of wavelets, which are very simple. Then they will be illustrated with some examples, including an explanation of image compression.

THURSDAY JANUARY 22, 2009

*Robert Ghrist, Department of Electrical and Systems Engineering/
Department of Mathematics, University of Pennsylvania*

MATHEMATICS MAKING SENSE OF SENSORS

Sensor networks are poised to impact society in fundamental ways analogous to the impact of networked personal computers. The rapid development of small-scale sensors coupled with wireless ad hoc networking capability foreshadows a day when our physical surroundings will wake up with sensory data, assuming it does not drown in the data first. In this lecture, Professor Ghrist will describe a recent calculus for sensor network data, whose origins lie in the century-old theory of algebraic topology. Sums and simplices, holes and homologies, counting and calculus, all converge to a tool for helping the walls to wake up.

WEDNESDAY MARCH 4, 2009

*Michael Trick, Tepper School of Business,
Carnegie Mellon University*

SPORTS SCHEDULING AND THE PRACTICE OF OPERATIONS RESEARCH

Major League Baseball is a multi-billion dollar per year industry that relies heavily on the quality of its schedule. Teams, fans, TV networks, and even political parties (in a way revealed in the talk) rely on the schedule for profits and enjoyment. Only recently have the computational tools of operations research been powerful enough to address the issue of finding “optimal” schedules. Trick will discuss his experiences in scheduling college basketball, major league baseball, and other sports, and show how operations research is revolutionizing the way sports scheduling is done.

TUESDAY APRIL 21, 2009

*Albert-László Barabási, Department of Physics,
Northeastern University*

NETWORK SCIENCE: FROM THE WEB TO HUMAN DISEASES

Systems as diverse as the world wide web, Internet or the cell are described by highly interconnected networks with amazingly complex structure. Recent studies indicate that the evolution of these complex networks is governed by simple but generic laws, resulting in apparently universal architectural features. I will discuss this amazing order characterizing our interconnected world, and its implications to how we perceive the impact of links and connections on communications and medicine.