St. Olaf Mathematics Department

Math Mess

This Week's Mathematics Colloquium

Title: Data Mining with Support Vector Machines
Speaker: Dave Musicant, Carleton College
Time: Tuesday, March 16, 1:30 PM (refreshments at 1:15)
Place: SC 182

This Week's Colloquium

In recent years, massive quantities of business and research data have been collected and stored, partly due to the plummeting cost of data storage. The "support vector machine" is a popular and current machine learning technique that performs quite well in solving data mining problems such as analyzing census data, World Wide Web logs, or retail sales databases. This talk will focus on describing what support vector machines are, how they relate to mathematical programming, and how they find good solutions to the above mentioned problems.

Dave Musicant is an assistant professor of computer science at Carleton College, where he has spent the last four years since receiving his Ph.D. in computer sciences at the University of Wisconsin - Madison. His research is in data mining and machine learning, and he teaches classes at Carleton in areas such as Artificial Intelligence, Data Mining, Database Systems, and Programming Languages. When he is not busy computing, he enjoys biking and playing electric bass.

Games Tournament

Molnar's annual Mathematical Games Tournament will commence the week after Spring Break, and careen out of control from there. This year's five games are Unlur, Zertz, Clobber, Domineering, and one more game to be determined involving crayons, and probably some small animals. Participants will compete in four of the five events, with an individual champion being determined in each event as well as an overall champion based on points earned in each game. Lovely prizes will be awarded. Check out the details at http://www.stolaf.edu/people/molnar/games/tournament/. Things will kick off on Monday night, March 29, from 7 to 9, in SC186.

Departmental Distinction

Seniors who would like to apply for Departmental Distinction in Mathematics can pick up an application from Donna Brakke in her office. Applications are due by April 16th.

Last Week's Problem

Let x and y be any positive real numbers. (We can assume that $x > y$.) Two sequences $\{a_n\}$ and $\{b_n\}$ are defined by letting $a_0 = x$ and $b_0 = y$, and then for any $n = 1$, taking $a_{n+1} = (a_n + b_n)/2$, and $b_{n+1} = 2a_n b_n /(a_n + b_n)$. Prove that the sequences $\{a_n\}$ and $\{b_n\}$ converge to the same limit. (On last week's Konhauser Problemfest, problem #1 was to find the value of this limit when $x = 200$ and $y = 4$.)

Not much action on last week's problem. We do not offer a complete proof, just an outline. First show that $a_n > b_n$ for all n. Use this to show that $\{a_n\}$ is a monotonically decreasing sequence, bounded below by y, while $\{b_n\}$ is increasing, bounded above by x. So they each have a limit. Showing that these limits are the same is equivalent to showing that the sequence $\{a_n - b_n\}$ converges to zero. Use induction to show that $a_n - b_n$ is less than or equal to $(1/2^n) \cdot (y-x)$, which goes to zero.

Note: a_n is the arithmetic mean of a_{n+1} and b_{n+1}; b_n is their harmonic mean. The common limit, as it turns out, is the geometric mean of x and y.

Problem of the Week

The decimal expansions of k/7 for various k are very pretty. For any k relatively prime to 7, k/7 will have a repeating decimal expansion with period 6, eg 1/7=.142857 (with a bar over it). Find the smallest n such that for any k relatively prime to n, k/n will have a repeating decimal expansion with period **8**.

If you want to get the Mess problems ahead of time, they will be sent out on Thursdays on Molnar's math-probsolv email alias. Let him know if you would like to be added to the alias.

*** Please submit all solutions by Wednesday at 5 o'clock to David Molnar by e-mail (molnar@stolaf.edu) or by placing them in his box at OMH 201.

If you would like to receive a copy of the Math Mess in your P.O. Box weekly, please e-mail Donna Brakke at brakke@stolaf.edu.