



**The Center for Control, Dynamical Systems, and Computation  
University of California at Santa Barbara  
Winter 2009 Seminar Series  
Presents**

## **Optimizing Sensing from Water to the Web**

**Carlos Guestrin  
Carnegie Mellon University**

**Friday, February 20, 2009 3:00 - 4:00pm Chem 1171**

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### **Abstract:**

In this talk, we tackle a fundamental problem that arises when using sensors to monitor the ecological condition of rivers and lakes, the network of pipes that bring water to our taps, or the activities of an elderly individual when sitting on a chair: Where should we place the sensors in order to make effective and robust predictions? Such sensing problems are typically NP-hard, and in the past, heuristics without theoretical guarantees about the solution quality have often been used. In this talk, I will present algorithms which efficiently find provably near-optimal solutions to large, complex sensing problems. Our algorithms are based on the key insight, that many important sensing problems exhibit submodularity, an intuitive diminishing returns property: Adding a sensor helps more if we have placed few sensors so far, and less if we have already placed many sensors. In addition to identifying most informative locations for placing sensors, our algorithms can handle settings, where sensor nodes need to be able to reliably communicate over lossy links, where mobile robots are used for collecting data or where solutions need to be robust against adversaries and sensor failures. I will present results applying our algorithms to several real-world sensing tasks, including environmental monitoring using robotic sensors, activity recognition using a built sensing chair, and a sensor placement competition. I will conclude with drawing an interesting connection between sensor placement for water monitoring, and the problem of selecting blogs to read in order to learn about the biggest stories discussed on the web.

### **About the Speaker:**

Carlos Guestrin's current research spans the areas of planning, reasoning and learning in uncertain dynamic environments, focusing on applications in sensor networks. He is the Finmeccanica Assistant Professor in the Machine Learning and in the Computer Science Departments at Carnegie Mellon University. Previously, he was a senior researcher at the Intel Research Lab in Berkeley. Carlos received his PhD in Computer Science from Stanford University and a Mechatronics Engineer degree from the University of São Paulo, Brazil. Carlos' work received awards at a number of conferences and a journal: KDD 2007, IPSN 2005 and 2006, VLDB 2004, NIPS 2003 and 2007, UAI 2005, ICML 2005, and JAIR in 2007. He is also a recipient of the ONR Young Investigator Award, the NSF Career Award, the Alfred P. Sloan Fellowship, the IBM Faculty Fellowship and the Siebel Scholarship. He was named one of the 2008 'Brilliant 10' by Popular Science Magazine. Carlos is currently a member of the Information Sciences and Technology (ISAT) advisory group for DARPA.

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