Decentralized Random-field Estimation for Sensor Networks
Using Quantized Spatially Correlated Data and Fusion-center Feedback

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Abstract: In large-scale wireless sensor networks, sensor-processor elements (nodes) are densely deployed to monitor the environment; consequently, their observations form a random field that is highly correlated in space. We consider a fusion sensor-network architecture where, due to the bandwidth and energy constraints, the nodes transmit quantized data to a fusion center. The fusion center provides feedback by broadcasting relevant information to the nodes. In addition to saving energy, this feedback ensures reliability and robustness to node and fusion-center failures. We assume that the sensor observations follow a linear-regression model with known spatial covariances between any two locations within a region of interest. We propose a Bayesian framework for fusion-center feedback, adaptive quantization, and estimation of the random field and its parameters. We also derive a simple suboptimal approach for estimating the unknown parameters, and present numerical examples demonstrating the performance of the proposed methods.

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Light Refreshments: 9:45 AM

Host: Prof. Arye Nehorai

Bio: Aleksandar Dogandzic received the Dipl. Ing. degree (summa cum laude) in Electrical Engineering from the University of Belgrade, Serbia, in 1995, and the M.S. and Ph.D. degrees in electrical engineering and computer science from the University of Illinois at Chicago in 1997 and 2001, respectively, under the guidance of Professor Arye Nehorai. In August 2001, he joined the Department of Electrical and Computer Engineering, Iowa State University, Ames, where he is currently an Associate Professor. His research interests are in statistical signal processing theory and applications. Dr. Dogandzic received the 2003 Young Author Best Paper Award and 2004 Signal Processing Magazine Best Paper Award, both by the IEEE Signal Processing Society. In 2006, he received the CAREER Award by the National Science Foundation. At Iowa State University, he was awarded the 2006-2007 Litton Industries Assistant Professorship in Electrical and Computer Engineering. Dr. Dogandzic serves as an Associate Editor for the IEEE Transactions on Signal Processing. He is a Senior Member of the IEEE.