

**University of Rochester**  
**Department of Electrical and Computer Engineering Colloquia**  
**Statistically-Driven Methods for Sensor Data and Imaging Sciences**

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11:30 PM – 12:30 PM  
Gleason Building G318/418**

**Abstract:** The availability and reduced cost of a variety of sensing technologies have recently been motivating and enabling their use in a wide range of applications, leading to the emergence of ubiquitous and complex sensor data. This includes sensing through cell phone cameras, physiological sensors, miniature radars, mobile microscopes, visual sensor networks, to name a few. This poses the challenge of developing principled, automated, and efficient algorithms for information extraction at various levels of abstraction from such data. Many of these sensing tasks share some common challenges: data are generally uncertain and incomplete; sensing resources are limited and should be shared; inference goals are too demanding for the given data quality. In this talk, I will present several examples of recent work in my group (<http://spis.sabanciuniv.edu>) involving the development of statistically-based methods for sensor data and imaging sciences that are aimed at tackling these challenges and that incorporate learned contextual information into solution strategies effectively. The first line of research involves computational sensing and imaging, where I will describe how our work on sparsity and compressed sensing for radar imaging has had a major impact in this domain and how our current line of thinking, examining connections between radar imaging and machine learning, has the potential to inspire fundamentally new methods. The second line of research involves (bio)image analysis, where I will describe our contributions on the development of shape-based image segmentation methods and demonstrate examples from several application domains including segmentation of basal ganglia structures in magnetic resonance (MR) images of the brain and segmentation of dendritic spines in microscopic images of neurons. The third line of research I will describe involves Bayesian methods for electroencephalography (EEG) based brain-computer interfaces (BCIs) and brain-machine interfaces (BMIs), with connections to human-in-the-loop cyber-physical systems. I will discuss how our work in this domain can have impact on augmentative and alternative communication, rehabilitation, and cognitive state monitoring.

**Bio:** Mujdat Cetin is an Associate Professor at Sabanci University, Istanbul, where he currently directs the Signal Processing and Information Systems Laboratory (<http://spis.sabanciuniv.edu>). From 2001 to 2005, he was with the Laboratory for Information and Decision Systems, MIT. He received the Ph.D. degree from Boston University in 2001. Dr. Cetin has held visiting faculty positions at MIT, Northeastern Univ., and Boston Univ. Dr. Cetin's research interests lie within the field of data, signal, and imaging sciences, with cross-disciplinary links to several other areas within electrical engineering, computer science, and neuroscience. The overarching theme of his research is the development of probabilistic and machine learning-based methods for robust and efficient information extraction at various levels of abstraction from observed uncertain, complex data. Some of the recent application domains of his work include computational radar imaging, microscopic neuroimage analysis, brain-computer and brain-machine interfaces, wireless sensor networks, as well as several problems in computer vision. His publications in these areas have received close to 6000 citations based on Google Scholar records, with an associated h-index of 34. Dr. Cetin has received several awards including the 2010 IEEE Signal Processing Society Best Paper Award; the 2007 EURASIP/Elsevier Signal Processing Best Paper Award; the 2013 IET Radar, Sonar and Navigation Premium (Best Paper) Award; the 2008 Turkish Academy of Sciences Distinguished Young Scientist Award; the 2010 METU Mustafa Parlar Foundation Research Incentive Award; and the 2006 TUBITAK Career Award, as well as four conference best paper awards. Dr. Cetin was the Technical Program Co-chair for the IEEE Image, Video, and Multidimensional Signal Processing (IVMSP) Workshop in 2016; for the International Conference on Information Fusion in 2016 and 2013; for the International Conference on Pattern Recognition (ICPR) in 2010; and for the IEEE Turkish Conference on Signal Processing, Communications, and their Applications in 2006. He was one of the keynote speakers for the 2015 International Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar, and Remote Sensing. He served as an Area Chair for the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) and for the IEEE International Conference on Image Processing (ICIP) multiple times. Dr. Cetin is currently an Associate Editor for the IEEE Transactions on Computational Imaging. He has been an Associate Editor for the IEEE Transactions on Image Processing, the IEEE Signal Processing Letters, and the IEEE Transactions on Cybernetics; a Guest Editor for Pattern Recognition Letters; and an Area Editor for the Journal of Advances in Information Fusion. Dr. Cetin is the vice-chair of the IEEE Computational Imaging Special Interest Group, and will take over as chair in January 2018. He is also a member of the IEEE Image, Video, and Multidimensional Signal Processing Technical Committee and the IEEE Bioimaging and Signal Processing Technical Committee. He has served on the International Association for Pattern Recognition (IAPR) Conferences and Meetings Committee and the IAPR ICPR Liaison Committee. Dr. Cetin is a EURASIP Liaison Officer and a best paper award jury member for the EURASIP Journal on Advances in Signal Processing.

Pizza and soda will be provided.