



EE Seminar Series

Dallas Chapter of IEEE Signal Processing Society Presents

Model Based Imaging: In Search of the Free Lunch

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ECSS 2.102 (TI Auditorium)

Over the last two decades, digital imaging applications have evolved from a niche application into a huge commercial enterprise; and along the way, model-based imaging techniques have evolved into a core set of theoretical tools that form a major component of the field's theoretical foundation. The primary goal in model-based techniques is to construct a model of the image and the imaging system, and then to use this framework to infer information that is not directly available. This unifying framework can be used to solve a wide array of imaging problems ranging from image segmentation and analysis to image reconstruction and representation. We present examples in applications ranging from desktop to medical imaging, and show how in each case intelligent model-based methods can be used to improve image quality or reduce cost of the imaging system pipeline. In the field of desktop imaging, we show how model-based methods have been used to increase resolution of images, efficiently store documents, and correct image distortion in low-cost imaging systems. At the other end of the cost spectrum, we give examples of how model-based methods have the potential to dramatically increase the quality of medical computed tomography (CT) images, while simultaneously reducing dosage. Finally, we conclude by presenting some emerging analytical methods in the use of sparse techniques for the modeling and analysis of images, and show how these methods can improve model accuracy and/or dramatically reduce computation and storage.

Charles A. Bouman is the Michael J. and Katherine R. Birck Professor of Electrical and Computer Engineering at Purdue University where he also holds a courtesy appointment in the School of Biomedical Engineering and serves as a co-director of Purdue's Magnetic Resonance Imaging Facility. He received his B.S.E.E. degree from the University of Pennsylvania, M.S. degree from the University of California at Berkeley, and Ph.D. from Princeton University in 1989. Professor Bouman's research focuses on inverse problems, stochastic modeling, and their application in a wide variety of imaging problems including tomographic reconstruction and image processing and rendering. Prof. Bouman is the Editor-in-Chief of the IEEE Transactions on Image Processing and a member of the IEEE Signal Processing Society's Board of Governors. He is a Fellow of the IEEE, AIMBE, IS&T, and SPIE and has served as Vice President of Publications for the IS&T Society.

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