University of Rochester
Department of Electrical and Computer Engineering
Colloquia Series

Computational Imaging: Enabling New Imaging Capabilities via Computation

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Abstract: Information sensing and processing systems face two broad challenges as we design the next generation of intelligent and interconnected devices. On one extreme, these systems will collect an enormous amount of data from a multitude of sources and require low-complexity, versatile algorithms that can make sense of all the data. On the other extreme, certain physical or system constraints on sensing devices, such as cost, energy, time, or size will limit us to imperfect or incomplete observations. My research interests lie in designing information sensing and processing systems that enable us to reliably capture and extract information-of-interest from the observed data. In this talk, I will present some of my research on computational imaging systems in which co-design of hardware and software enables new imaging capabilities under different physical constraints. I will discuss how we can design simple sensing systems that preserve the information-of-interest, which we can efficiently recover via computational algorithms by exploiting low-dimensional structures in the signals. I will first present a coded mask-based design for lensless imaging that can enable cameras with extremely thin form-factors and flexible geometries. I will then present a coded illumination and phase retrieval-based design for high-resolution imaging at long distances. Finally, I will discuss some exciting opportunities for the future research in the co-design of sensing methodologies and computational algorithms to break the limitations of the conventional designs.

Bio: Salman Asif is a Postdoctoral Scholar in the Department of Electrical and Computer Engineering at Rice University. Dr. Asif received his B.Sc. degree in 2004 from the University of Engineering and Technology, Lahore, Pakistan, and an M.S.E.E degree in 2008 and a Ph.D. degree in 2013 from the Georgia Institute of Technology, Atlanta, Georgia. He worked as a research intern at Mitsubishi Electric Research Laboratories in Cambridge, Massachusetts, in the Summer of 2009, and at Samsung Standards Research Laboratory in Richardson, Texas, in the Summer of 2010. Prior to joining Rice University, he worked as a Senior Research Engineer at Samsung Research America, Dallas. His research interests include compressive sensing, computational and medical imaging, and machine learning.

Light Refreshments Provided