

Imaging by Compressive Sensing: A 1-Pixel Camera & Beyond

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Compressive sensing is an emerging field based on the revelation that a small number of random linear projections of an image contain enough information for reconstruction a high resolution one. We have been successful in translating this mathematical breakthrough into optical imaging systems from the ultraviolet to long-wave infrared portions of the spectrum. The camera we have built is capable of mega pixel images while utilizing a single optical detector for acquisition. Beyond imaging, the compressive mathematics can be tailored for high-speed target recognition by spatial and spectral signatures, and the design and development of the algorithms underlying such measurements will also be discussed. Inspired by this success, we have been developing systems for translating this technology to the millimeter-wave and Terahertz regimes. I will outline the various challenges for imaging in this context and the lessons our group has learned that may be relevant to the radar community.