Compressed Sensing

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Abstract

One of the central tenets of signal processing and data acquisition is the Shannon/Nyquist sampling theory: The number of samples needed to capture a signal is dictated by its bandwidth. This talk introduces a novel sampling or sensing theory which goes against this conventional wisdom. This theory, now known as "Compressed Sensing" or "Compressive Sampling," allows the faithful recovery of signals and images from what appear to be highly incomplete sets of data, i.e. from far fewer measurements or data bits than used by traditional methods. We will present the key ideas underlying this new sampling or sensing theory, and will survey some of the most important results. We will emphasize the practicality and the broad applicability of this technique, and discuss what we believe are far reaching implications; e.g. procedures for sensing and compressing data simultaneously and much faster. Finally, there are already many ongoing efforts to build a new generation of sensing devices based on compressed sensing and we will discuss remarkable recent progress in this area as well.