## INTRODUCTION TO COMPRESSED SENSING

## Keijo Ruotsalainen

University of Oulu, Faculty of Information Technology and Electrical Engineering, Applied and Computational Mathematics, keijo.ruotsalainen@oulu.fi

The basic problem in several practical problems of science and technology is the task of inferring quantities of interest from measured information. When the information retrieval is linear, the problem reduces to solving a linear a system of equations

$$Ax = y,$$

where  $A \in \mathbb{C}^{m \times D}$  is the linear information retrieval process,  $x \in \mathbb{C}^{D}$  the signal to be reconstructed and  $y \in \mathbb{C}^{m}$  the measured data. In Big Data application then both m and D are Big Numbers. If we have random signals, then we may include the noise  $n \in \mathbb{C}^{m}$ :

$$Ax + n = y.$$

In this talk, I will present some basic ideas of compressed sensing: performing data collection and compression simultaneously. With some simple examples it will be demonstrated that under certain conditions it is possible to reconstruct signals when the number of measurements is less than the signal length, in contrary to Shannon's sampling theorem. The talk is non-technical and quite non-formal.