Kolloquium

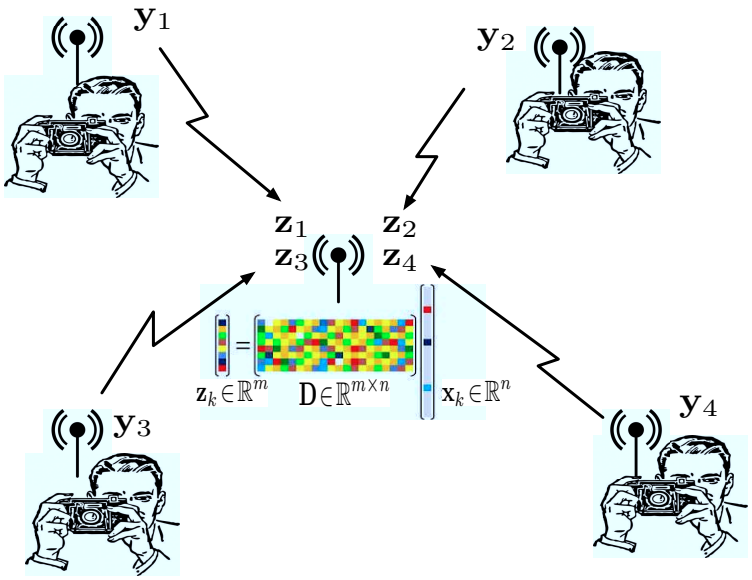
Institut für Mathematik

Universität Innsbruck

Alexander Jung, Technische Universität Wien

An Information-Theoretic Analysis of Dictionary Learning under Resource Constraints

The annual worldwide internet traffic is about to exceed the Zettabyte threshold. In view of the pervasive massive datasets generated at an ever increasing speed, it is mandatory to be able to extract the relevant information out of the observed data. A recent approach to this challenge, which has proven extremely useful for a wide range of applications, is sparsity and the related theory of compressed sensing (CS). By sparsity we mean that the observed signals can be represented by a linear combination of a small number of columns of an underlying dictionary matrix. The task of adaptively determining the underlying dictionary matrix is referred to as dictionary learning (DL).



In this talk I will first give a brief review of some of the most popular approaches to DL. These approaches rely on alternating optimization and (graph-) clustering techniques. The main part of my talk will be on fundamental performance limits which are intrinsic to DL and cannot be overcome even by the most expensive methods. In order to derive these performance limits we will adapt an established information-theoretic approach to minimax estimation. This information-theoretic approach is appealing as it naturally allows for incorporation of constraints on computational and communication complexity of the devised DL methods. Indeed, in typical information network scenarios the DL method has to be implemented in a distributed fashion using cheap processing nodes which communicate over channels with limited capacity.

Do·25·Jun

16:15·HSB 8