The Mismatch Principle and Its Applications to 1-Bit Compressed Sensing

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In the first part of this talk, we study how the generalized Lasso performs on semi-parametric observation models. While these types of estimators were originally designed for (sparse) linear regression, it will turn out that their outcome is still reliable in more advanced scenarios, such as single-index models or variable selection. For that purpose, a systematic framework for parameter estimation is introduced, applying to a large class of model situations. The key quantities of this statistical analysis are the so-called mismatch parameters, as a means to evaluate an estimation result regarding both its accuracy and its semantic meaning. This eventually leads us to the formulation of the Mismatch Principle, which provides a simple recipe to prove theoretical error bounds for the Lasso.

The second part of the talk then turns to a specific application of the Mismatch Principle to 1-bit compressed sensing. A typical problem in this research area is that most results in the well-studied Gaussian case do not remain valid for non-Gaussian measurements. In particular, consistent signal estimation is often impossible, regardless of the used recovery method. However, this issue can be resolved by a simple modification of the quantization process, based on dithering. In this setup, the Mismatch Principle allows us to derive a performance guarantee for the Lasso, certifying consistent signal recovery in the general sub-Gaussian case.

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