Notice of dissertation defense 15.06.2018

Robust Statistical Inference for Large-scale Data

Title Robust large-scale statistical inference and ICA using bootstrapping

Content We live in an era of data deluge, where massive data volumes are generated by satellites, telescopes, high-throughput instruments, sensor networks, and supercomputers. Yet, as the size of data grows, so does the chance to involve outlying observations. This in turn motivates the need for robust (i.e., outlier-resilient) statistical analysis tools which can scale to big data sets.

The goal of this thesis is to develop robust statistical inference tools that are able to assign measures of accuracy (such as bias, variance, confidence intervals, or prediction error) to sample estimates that are calculated from large-scale data. Such tools are required, for example, for accurate decision making, choosing appropriate data analysis tools, or identifying relevant variables or features from the data.

The developed methods are founded on non-parametric data resampling method, called the bootstrap, which is particularly useful tool for large-scale data analysis as it avoids making parametric model assumptions on the data. The big data bootstrap methods developed in the thesis are compatible with distributed storage systems and parallel computing architectures and enable, for the first time, conducting robust statistical inference for large-scale data using the popular bootstrap principle. In addition, also robust statistical inference tools for the independent component analysis model are developed and applied in Electroencephalography (EEG) signal processing.

Field of research Statistical Signal Processing

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