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Covariance & Subspace Inference: Handling Robustness, Variability and Incompleteness

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In this talk, we focus on covariance matrix inference and principal component analysis in the context of non-regular data under heterogeneous environments. First, we briefly introduce mixed effects models, which are widely used to analyze repeated measures data arising in several signal processing applications that need to incorporate the same global individual's behavior with possible local variations. Then, we will expose classical strategies to learn under Gaussian assumptions. It is worth mentioning that in certain situations, in which there exist outliers within the data set, the Gaussian assumption is not valid and leads to a dramatic performance loss. To overcome this drawback, we will present an expectation-maximization-based algorithm in which the heterogeneous component is considered part of the complete data. Then, the proposed algorithm is cast into a parallel scheme, w.r.t. the individuals, in order to alleviate the computational cost and a possible central processor overload. In addition, extensions to deal with missing data, which refers to the situation where part of the individual responses is unobserved, will be presented. Finally, applications related to calibration and imaging in the context of large radio-interferometers will be considered.

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