
SEMINARIO

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Improving Model Choice in Classification: An Approach Based on Clustering of Covariance Matrices

Abstract: This work introduces a refinement of the Parsimonious Model for fitting a Gaussian Mixture. The improvement is based on the consideration of groupings of the covariance matrices according to a criterion, such as sharing Principal Directions. This and other similarity criteria that arise from the spectral decomposition of a matrix are the bases of the Parsimonious Model. The classification can be achieved with simple modifications of the CEM (Classification Expectation Maximization) algorithm, using in the M step suitable estimation methods known for parsimonious models. This approach leads to propose Gaussian Mixture Models for model-based clustering and discriminant analysis, in which covariance matrices are clustered according to a parsimonious criterion, creating intermediate steps between the fourteen widely known parsimonious models. The added versatility not only allows us to obtain models with fewer parameters for fitting the data, but also provides greater interpretability. We show its usefulness for model-based clustering and discriminant analysis, providing algorithms to find approximate solutions verifying suitable size, shape and orientation constraints, and applying them to both simulation and real data examples.

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