

LECTURES ON MIXTURE MODELS

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MIXTURE MODELS

Theoretical Aspects:

- Introduction to Cluster Analysis and Classification
- General definition of a mixture model, examples and properties
- Focus on Gaussian Mixtures: parsimonious models and their geometric interpretation.
- Inferential methods: the Expectation-Minimization algorithm, its initialization, convergence criteria.
- Open issues: degeneracies and spurious solutions.
- Model selection: number of components and patterned covariance matrix
- Mixtures of student t: Expectation-Minimization algorithm
- Mixtures of factor analyzers: Expectation-Minimization algorithm
- Brief review of mixtures with other non Gaussian components

Lab with R: implementation of EM algorithm from scratch and use of dedicated software (mclust)

ROBUST MIXTURE MODELS

Theoretical Aspects:

- Theoretical foundation of robust statistics: outliers in multivariate data, Minimum Covariance Determinant, Forward Search
- Robust classification and clustering
 - Robust Gaussian mixtures with impartial trimming and constrained estimation
 - Cluster weighted model
 - Mixtures of factor analyzers
 - Mixtures of skew normal
- Robust semi-supervised classification and clustering
 - Gaussian parsimonious models
 - Adaptive mixtures to detect novel classes
 - Variable selection methods

Lab with R: implementation of trimmed k-means from scratch, use of dedicated software packages (tclust, fsda, Raedda, Varsel)

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