

Conditional Mixture Modeling

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Due to the large number of parameters, finite mixture models are often at the risk of overparameterization even for a moderate number of components. One popular approach to alleviate this issue is to reduce the number of parameters by considering parsimonious models based on the reparameterization of covariance matrices associated with mixture components. We introduce a different approach to parsimonious modeling that relies on modeling locations rather than dispersions. For this purpose, the joint distribution of each component is written as a product of the marginal density and corresponding conditionals. As described in [1], the proposed mixture is capable of modeling non-compact clusters and can be easily implemented by means of the expectation-maximization algorithm, with all parameters being estimated through closed-form expressions. Conducted simulation studies and applications to well-known classification data sets demonstrate the remarkable flexibility of the proposed procedure.

[1] V. Melnykov and Y. Wang, “Conditional mixture modeling and model-based clustering,” *Pattern Recognition*, vol. 133, p. 108994, 2023.