

ESOB Masterclass 2025

Advances in Bayesian Finite Mixture Modelling

Abstract: Mixture models are a useful statistical model class for clustering and density approximation. In the Bayesian framework, mixture models require the specification of suitable priors in addition to the data model. These priors allow to avoid spurious results and provide a principled way to define cluster shapes and a preference for specific cluster solutions. A generic model estimation scheme for finite mixtures with a fixed number of components is available using Markov chain Monte Carlo (MCMC) sampling with data augmentation. The posterior allows to assess uncertainty in a comprehensive way, but component-specific posterior inference requires resolving the label switching issue.

We will discuss suitable specification, estimation and inference of the finite mixture model if the number of components is assumed to be known. We then explain suitable strategies for fitting Bayesian finite mixture models when the number of components is not known. We will consider different mixture models depending on the inclusion of covariates for the component weights or the component distributions. We will illustrate all steps required to perform Bayesian finite mixture modeling on data examples.

Suitable prior specification, estimation using MCMC and posterior inference are discussed for these examples assuming the number of components to be known as well as unknown.

Bio: Bettina Grün (Vienna University of Economics and Business) is an applied statistician who has been working on different aspects in finite mixture modeling since her PhD. These aspects include theoretic issues such as model identifiability, prior specification and estimation in Bayesian analysis and the application of these methods in different areas of application including business and economics. In addition, she is interested in statistical computing and the suitable implementation of statistical methods in software, in particular for the R environment for statistical computing and graphics.