Model-based clustering approaches are reviewed, with particular emphasis on an approach that utilizes a Gaussian mixture model with eigen-decomposition of the covariance structure. A Bayesian framework for parameter estimation is introduced as an alternative to the expectation-maximization framework, and we deviate from the traditional Bayesian information criterion approach to model selection. More specifically, variational approximations are used for the estimation of the parameters as well as the number of components and deviance information criterion is used for model selection. Our approach is illustrated on simulated data sets as well as an Italian wine data set.