Prior distribution

For univariate normal mixture model, we adopt the conjugate Normal-inverse-Gamma prior for the component means and component variances, and Dirichlet prior for the component weights, that's,

$$
\begin{aligned}
p(\sigma^2) &= \frac{b^a}{\Gamma(a)}(\sigma^2)^{-a-1}e^{-b/\sigma^2} \\
p(\mu|\sigma^2,\kappa,\mu_0^2) &= \frac{1}{\sqrt{2\pi\kappa\sigma^2}}e^{-(\mu-\mu_0)^2/(2\kappa\sigma^2)} \\
p(\boldsymbol{\pi}) &\sim D(\delta,...,\delta)
\end{aligned}
$$

In the manuscript, the default values of those parameters are $a = 2$, $b = 1$, $\kappa = 10$, $\mu_0 =$ mean of y, $\delta = 1$. For the acidity data set, considering that the range of the data is relatively small, we set $\kappa = 1$, while for the galaxy data set, the range of the data is large and we set $\kappa = 20$.

For multivariate normal mixture model with d dimension, we adopt the conjugate Normal-inverse-Wishart prior for the component means and component variances, and Dirichlet prior for the component weights, that's,,

$$
\begin{aligned}
p(\boldsymbol{\Sigma}) &= \frac{|\boldsymbol{\Psi}|}{2^{\nu d/2}\Gamma_d(\nu/2)}|\boldsymbol{\Sigma}|^{-(\nu+d+1)/2}e^{-tr(\boldsymbol{\Psi}\boldsymbol{\Sigma}^{-1})/2} \\
p(\boldsymbol{\mu}|\boldsymbol{\Sigma},\kappa) &\sim N_d(\boldsymbol{\mu}_0,\kappa\boldsymbol{\Sigma}) \\
p(\boldsymbol{\pi}) &\sim D(\delta,...,\delta)
\end{aligned}
$$

In the manuscript, the default values of those parameters are $\boldsymbol{\Psi} = \boldsymbol{S}$(sample variance-covariance matrix), $\nu = d+2$, $\kappa = 10$, $\boldsymbol{\mu}_0 =$ mean of y.