N = number of states

T = number of observations

$\phi_{i=1...N,j=1...N}$ = probability of transition from state i to state j

$\boldsymbol{\phi}_{i=1...N}$ = N-dimensional vector, composed of $\phi_{i,1...N}$; must sum to 1

$\mu_{i=1...N}$ = mean of observations associated with state i

$\sigma^2_{i=1...N}$ = variance of observations associated with state i

$x_{t=1...T}$ = state of observation at time t

$y_{t=1...T}$ = observation at time t

β = concentration hyperparameter controlling the density of the transition matrix

μ_0, λ = shared hyperparameters of the means for each state

ν, σ_0^2 = shared hyperparameters of the variances for each state

$\boldsymbol{\phi}_{i=1...N} \sim \text{Symmetric-Dirichlet}_N(\beta)$

$x_{t=2...T} \sim \text{Categorical}(\boldsymbol{\phi}_{x_{t-1}})$

$\mu_{i=1...N} \sim \mathcal{N}(\mu_0, \lambda\sigma_i^2)$

$\sigma^2_{i=1...N} \sim \text{Inverse-Gamma}(\nu, \sigma_0^2)$

$y_{t=1...T} \sim \mathcal{N}(\mu_{x_t}, \sigma^2_{x_t})$