Exercise: EM for for HMMs with mixture of Gaussian observations

Consider an HMM where the observation model has the form

$$p(\mathbf{x}_t|z_t = j, \boldsymbol{\theta}) = \sum_k w_{jk}\mathcal{N}(\mathbf{x}_t|\mu_{jk}, \boldsymbol{\Sigma}_{jk}) \quad (1)$$

- Draw the DGM.
- Derive the E step.
- Derive the M step.