Machine Learning 2 — Homework 4

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Problem 1.

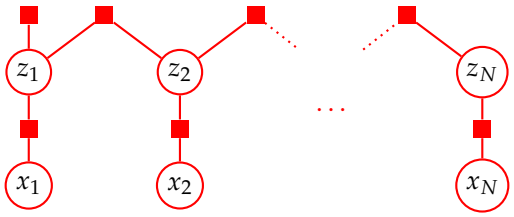
We have $\boldsymbol{X} = \{x_1, \dots, x_N\}$ and $\boldsymbol{Z} = \{z_1, \dots, z_N\}$.

1.

$$p(\boldsymbol{Z}, \boldsymbol{X}) = p(z_1) \cdot \left(\prod_{i=2}^{N} p(z_i | z_{i-1}) \right) \cdot \left(\prod_{i=1}^{N} p(x_i | z_i) \right)$$

2.

We present the factor graph for the Markov chain:



3.

$$p(\boldsymbol{X}) = f_1(z_1) \cdot \left(\prod_{i=2}^{N} f_i(z_i, z_{i-1}) \right) \cdot \left(\prod_{i=1}^{N} f_{N+1}(z_i, x_i) \right)$$

4.

$$p(z_n | \boldsymbol{X}) = \frac{\alpha(z_n)\beta(z_n)}{p(\boldsymbol{X})}$$

Problem 2.

1.

2.

Problem 3.

Problem 4.