1st order

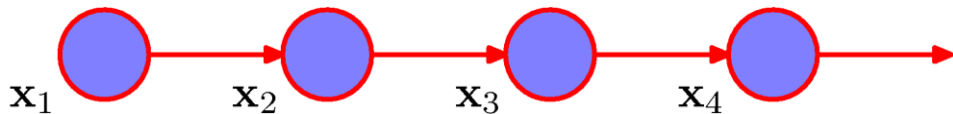$$p(\mathbf{X}) \;=\; \prod_{i=1}^{n} p(X_n | X_{n-1})$$

2nd order

$$p(\mathbf{X}) \;=\; \prod_{i=1}^{n} p(X_n | X_{n-1}, X_{n-2})$$