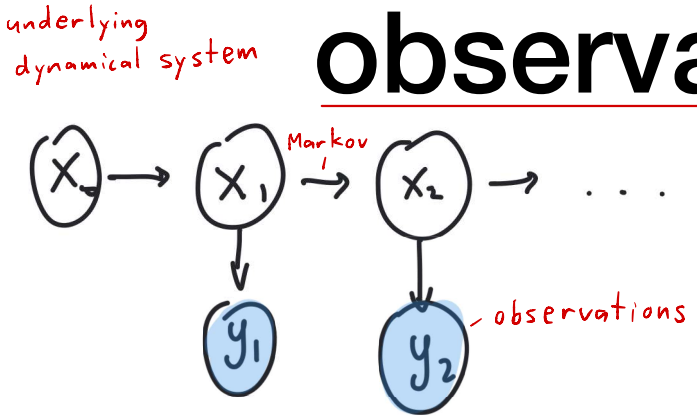
Markov model with observations



ingredients

Transition probabilities: $p(x_n \mid x_{n-1})$

initial probabilities: $p(x_0)$

Emission probabilities: $p(y_n \mid x_n)$

Joint prob. dist. of everything:

$$p(x_{0:n}, y_{1:n}) \overset{\text{Bayes}}{=} p(y_{1:n} \mid x_{0:n})\, p(x_{0:n})$$

$$= \left(\prod_{t=1}^{n} p(y_t \mid x_t) \right) \cdot p(x_0) \cdot \prod_{t=1}^{n} p(x_t \mid x_{t-1})$$

(↓ decomposes)

simplify

$$= p(x_0) \prod_{t=1}^{n} p(x_t \mid x_{t-1})\, p(y_t \mid x_t)$$

init. · transition · emission (measure)

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