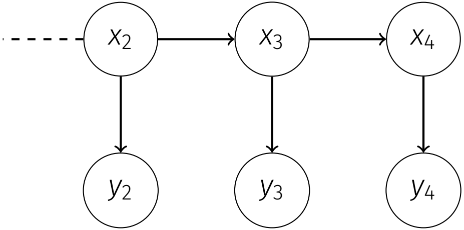
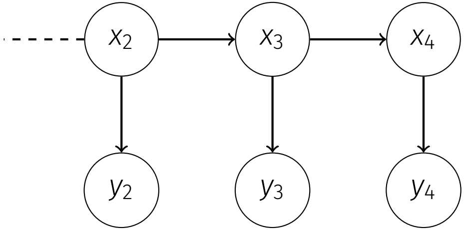
Information contained in state space models

Consider the following Bayesian network,





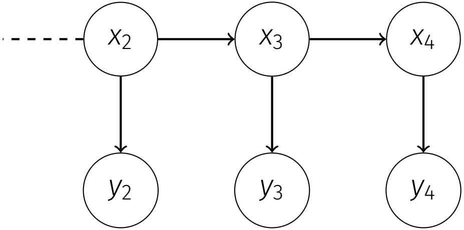
If we know x_2, we can learn about x_4 because of

green: the motion model.

yellow: the measurement model.

pink: both, the motion and measurement models.

orange: neither of them.



We can use data y_3 to learn about x_3 because of

green: the motion model.

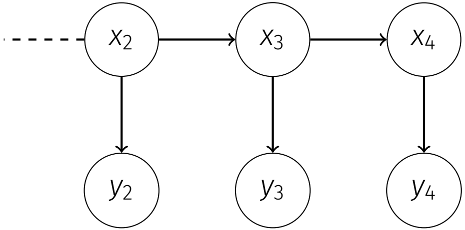
yellow: the measurement model.

$p(x_3|y_3) \propto p(y_3|x_3)$.

pink: both, the motion and measurement models.

orange: neither of them.

$p(x_3)$



We can use data y_2 to learn about x_4 because of

green: the motion model.

yellow: the measurement model.

pink: both, the motion and measurement models.

orange: neither of them.

$$p(x_4 | y_2) \propto \cdot$$

$$p(x_4 | x_3)\, p(x_3 | x_2)\, p(x_2 | y_2)$$

$$= p(x_4 | x_3)\, p(x_3 | x_2)\, p(y_2 | x_2)\, p(x_2)\, dx_3 x_2$$