

# A Markov System

Has  $N$  states, called  $s_1, s_2 \dots s_N$

There are discrete timesteps,  $t=0, t=1, \dots$

On the  $t$ 'th timestep the system is in exactly one of the available states. Call it  $q_t$

Note:  $q_t \in \{s_1, s_2 \dots s_N\}$

Between each timestep, the next state is chosen randomly.

The current state determines the probability distribution for the next state.

$$P(q_{t+1}=s_1|q_t=s_2) = 1/2$$

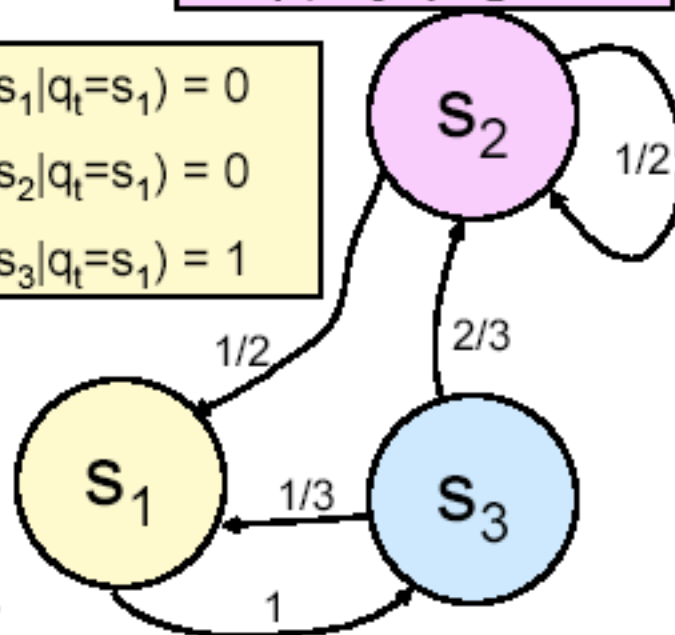
$$P(q_{t+1}=s_2|q_t=s_2) = 1/2$$

$$P(q_{t+1}=s_3|q_t=s_2) = 0$$

$$P(q_{t+1}=s_1|q_t=s_1) = 0$$

$$P(q_{t+1}=s_2|q_t=s_1) = 0$$

$$P(q_{t+1}=s_3|q_t=s_1) = 1$$



$N = 3$

$t=1$

$q_t=q_1=s_2$

$$P(q_{t+1}=s_1|q_t=s_3) = 1/3$$

$$P(q_{t+1}=s_2|q_t=s_3) = 2/3$$

$$P(q_{t+1}=s_3|q_t=s_3) = 0$$

Often notated with arcs between states