CS 188: HMMs

Thursday, May 5, 2016 3:04 PM

Dynamics: $P(x_{t-1} | x_{t})$

Erase: observed

Belief: $B_t(x_t) = P(x_t | e_t)$

Observation: $P(e_t | x_t)$

Elapsed time:

$$P(x_{t-1} | e_{t-1}) = \sum_{x_{t-1}} P(x_{t-1} | e_{t-1}) P(x_t | e_{t-1})$$

Belief at last timestep $B_{t-1}(x_{t-1})$

Observe:

$$P(x_t | e_{1:t-1}) \propto P(x_t | e_{1:t-1}) P(e_t | x_t)$$

$$B_t(x_t) \propto P(e_t | x_t)$$

$$P(e_t | e_{1:t-1})$$

$$|X_t| = N$$

State space size

$B_t(x_t) \rightarrow O(N^2T)$

$N$ observe steps, $N$ summations each

Particle Filter

Elapsed time:

$\frac{3}{5} \rightarrow \frac{2}{5} \rightarrow \frac{0}{5}$

Observe:

$w(x) = P(e_t | x_t)$ Give all particles a weight.

$$P(x_t | e_{1:t-1}) P(e_t | e_{1:t-1})$$

$$= P(x_t, e_t | e_{1:t-1}) = P(x_t | e_{1:t-1}) P(e_t | x_t)$$

$$= P(x_t, e_t | e_{1:t-1})$$

Elapsed: $P(x_t, y_t | e_{1:t-1}) = \sum_{x_t, y_t} P(x_t, y_t | e_{1:t-1})$