Student Name: TODO

Collaboration Statement:

Total hours spent: TODO hours

I consulted the following resources:

- TODO

Contents

Prove the following property under a Hidden Markov Model.

$$p(z_{t+1}|x_t, z_t) = p(z_{t+1}|z_t) \tag{1}$$

1a: Solution

TODO

Prove the following property under a Hidden Markov Model.

$$p(x_{t+1}|x_{1:t}, z_{1:t}) = p(x_{t+1}|z_t) \tag{2}$$

1b: Solution

TODO

Write out an expression for the expected complete log likelihood:

$$\mathbb{E}_{q(z_{1:T}|s)}\left[\log p(z_{1:T}, x_{1:T}|\theta)\right] \tag{3}$$

Use the HMM probabilistic model $p(z_{1:T}, x_{1:T}|\theta)$ and the approximate posterior $q(z_{1:T}|s)$ defined above.

Your answer should be a function of the data x, the local sequence parameters s and $r(s)$, as well as the HMM parameters π, A, ϕ.

2a: Solution

TODO

Provide a short verbal summary of the update for ϕ_{kd} given below. How should we interpret the numerator? The denominator?

$$\phi_{kd} = \frac{\sum_{t=1}^{T} r_{tk} x_{td}}{\sum_{t=1}^{T} r_{tk}} \tag{4}$$

2b: Solution

TODO