Practice Problem: Computing the Normalization Constant

PRACTICE PROBLEM: COMPUTING THE NORMALIZATION CONSTANT

It turns out that once we know the potential functions, the normalization constant Z becomes fixed since the distribution needs to sum to 1. Let's show this for a simple case. Consider a two node graphical model with an edge between the two nodes corresponding to

$$p_{X_1,X_2}(x_1,x_2) = \frac{1}{Z}\phi_1(x_1)\phi_2(x_2)\psi_{12}(x_1,x_2).$$

Suppose that we are given what the potential functions are. Show what Z is equal to as a function of ϕ_1, ϕ_2, and ψ_{12}.

Hint: Sum both sides over all values of x_1 and all values of x_2. What is $\sum_{x_1}\sum_{x_2} p_{X_1,X_2}(x_1,x_2)$ equal to?

Because knowing the potentials fixes what the value of Z is, often times we'll omit writing Z and instead write

Exercises due Oct 27, 2016 at 02:30 IST

Week 6: Special Case: Marginalization in Hidden Markov Models
Exercises due Oct 27, 2016 at 02:30 IST

Week 6: Homework 5
Homework due Oct 27, 2016 at 02:30 IST

Weeks 6 and 7: Mini-project on Robot Localization (to be posted)

$$p_{\underline{X}}(\underline{x}) \propto \prod_{i \in V} \phi_i(x_i) \prod_{(i,j) \in E} \psi_{ij}(x_i, x_j),$$

where "$\propto$" means "proportional to".