ECE 566

Dr. Marefat

Evidential Reasoning

1. Bayesian Inference

In this assignment you are to develop and carry out Bayesian inference for an example from Russel and Norvig. Consider the Burglary and Alarm example shown in Figure 14.2 (page 494) of Russel and Norvig, Artificial Intelligence A Modern Approach, 2003 edition. You are to solve this example with Bayesian message propagation approach.

2. Bayesian Belief Updating in Polytrees

Consider the Burglary and Alarm example shown in Figure 14.2 (page 494) of Russel and Norvig, Artificial Intelligence A Modern Approach, 2003 edition.

1. Please provide specific answers for the following:
    a. Describe and draw a Bayesian network (DAG) which can be used for π-λ message propagation in this example,
    b. What is the variable represented by each node in your network?
    c. What is the domain of values for each variable in your network?
    d. What are the conditional probability matrices for each arc relating the variables in the network (state each matrix numerically as well as state what probability each matrix element represents?

2. Using the Bayesian network like the one you presented in the above section 1 (a) ,
    a. Show belief propagation/accumulation with assumed conditional probabilities (hypothetical example conditional probabilities), prior probabilities, example evidences, etc. Show the belief accumulation results that you achieved.

Important Note: The network in this example is a polytree (it is not a simple tree). The example propagations discussed in the lectures were applied to a simple tree, and can not be duplicated identically for the polytrees. Some of the steps should be modified/extended. You are strongly recommended to look at the sections 4.1-4.3 of the Judea Pearl's book: Probabilistic Reasoning in Intelligent Systems (Morgan Kaufman, ISBN0-934613-73-7). I have posted a copy of these relevant sections of this book to the class website for your reference.

3. Turning your work in and miscellaneous

Please turn in your project/assignment file in pdf (you can scan hand written work to make into pdf) via email to ece566@ece.arizona.edu. Your turn in file shall include work described in section 2