

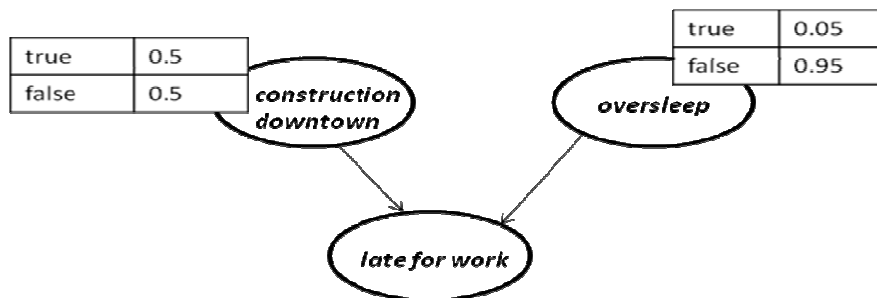
Homework 7

CS 441/541

Due Monday Dec. 1, 2008

1. For each bigram (pair of adjacent words), use Google to estimate the probability that the second word follows the first, in the following two sentences: ``Genius is born, not made", and ``Genius is born, not paid". Use these results to estimate the probability of these two sentences, given that the first word is "Genius".

2. Consider the Bayesian network below, which encodes causes and probabilities concerning whether or not Jean will be late for work.



late for work

construction downtown	oversleep	true	false
true	true	0.95	0.05
true	false	0.6	0.4
false	true	0.9	0.1
false	false	0.05	0.95

a. Suppose Jean is observed to be late to work. What is the probability that she overslept? (Show your work.)

b. Define "diagnostic", "causal", and "inter-causal" inference. Which type is required for question (a)?

c. Give an example of a causal inference problem using this network, and solve it, showing your work.

d. Give an example of an inter-causal inference problem using this network, and solve it, showing your work.

3. Use Bayes' rule to solve the following problem. At any given time in the winter, about one in every 20 people has the flu. If a person has the flu, there is an 80% chance that they will have a cough. However, if they don't have the flu, there is still a 20% chance that they will have a cough. It is January and your housemate is coughing. What is the probability that she has the flu?