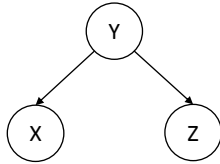


CS360 – Homework #11

Bayesian Networks

- 1) For the following Bayesian network



we know that X and Z are not guaranteed to be independent if the value of Y is unknown. This means that, depending on the probabilities, X and Z can be independent or dependent if the value of Y is unknown. Construct probabilities where X and Z are independent if the value of Y is unknown, and show that they are indeed independent.

Naive Bayesian Learner

- 2) A theme park hired you after graduation. Assume that you want to predict when the theme park receives lots of visitors. You gathered the following data:

	Feature 1 Sunny?	Feature 2 High Temperature?	Feature 3 Weekend?	Class Lots of Visitors?
Day 1	yes	yes	yes	yes
Day 2	yes	no	yes	yes
Day 3	no	yes	no	yes
Day 4	yes	yes	no	yes
Day 5	yes	yes	no	yes
Day 6	yes	no	no	no
Day 7	no data since you were on business travel			
Day 8	no	no	yes	no

- a) Show the Bayesian network (= hypothesis = model) that a naive Bayesian learner will learn from the data.
- b) What's the probability that the learned Bayesian network will predict that the theme park receives lots of visitors on a cloudy and hot weekend day?
- 3) Construct an example where a naive Bayesian learner predicts for a feature vector that the predicted class must be true with probability 1 when, in reality, it is false.

- 4) Give an example of a hypothesis (= model, here: joint probability distribution) that a naive Bayesian learner cannot learn correctly.
- 5) Give an example where the assumptions that a naive Bayesian learner makes are wrong.