Washington State University
School of Electrical Engineering and Computer Science
Fall 2021

CptS 440/540 Artificial Intelligence
Homework 8
Due: October 28, 2021 (11:59pm pacific time)

General Instructions: Put your answers to the following problems into a PDF document and upload the document as your submission for Homework 8 for the course CptS 440 Pullman (all sections of CptS 440 and 540 are merged under the CptS 440 Pullman section) on the Canvas system by the above deadline. Note that you may submit multiple times, but we will only grade the most recent entry submitted before the deadline.

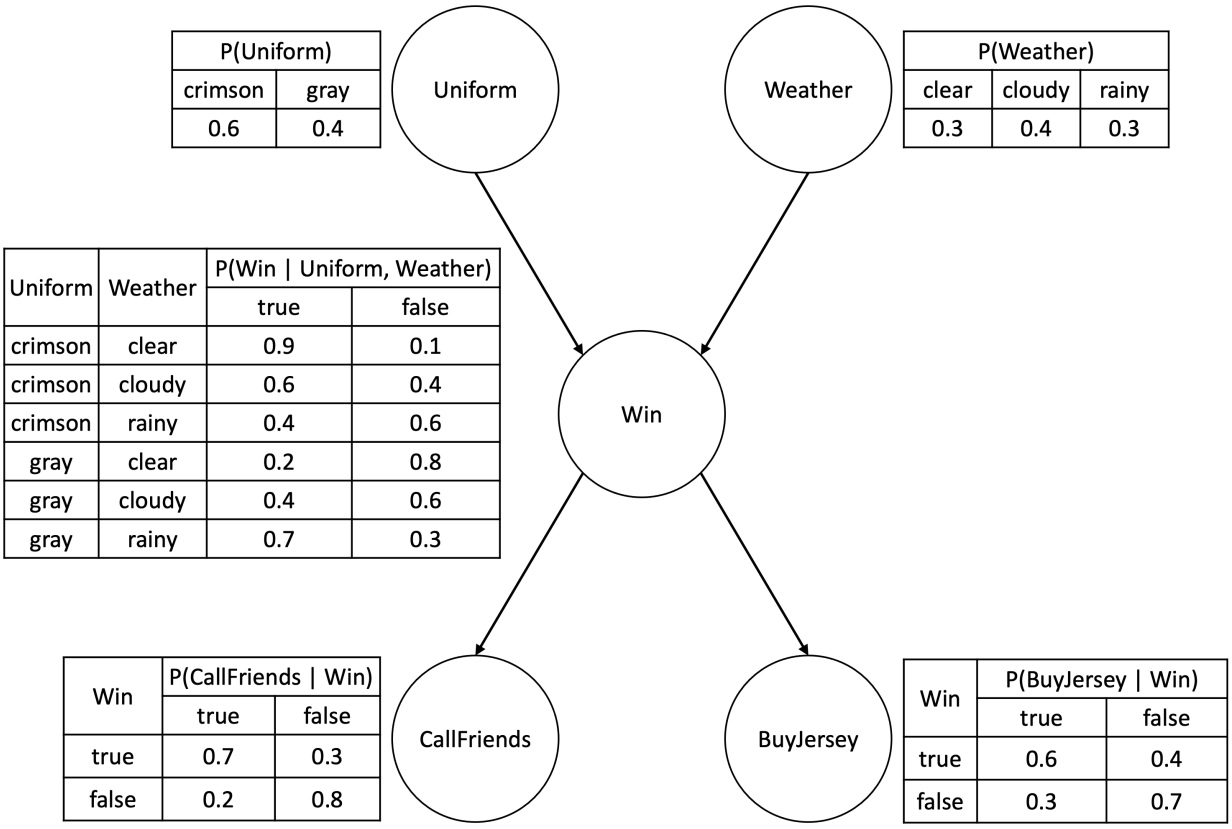
1. Recall the full joint probability distribution from HW7 (reproduced below). Suppose we are told that Uniform and Weather are independent of each other, and that Win depends on both Uniform and Weather. Show a Bayesian network consistent with this information. Be sure to show all nodes, links, and conditional probability tables (CPTs). Use the full joint probability distribution below to compute the CPT entries.

Win		true		false	
Uniform		crimson	gray	crimson	gray
Weather	clear	0.18	0.08	0.06	0.08
	cloudy	0.08	0.10	0.07	0.09
	rainy	0.05	0.09	0.08	0.04

2. Using the Bayesian network on the next page, compute the following probabilities. Show your work.
    a. P(Uniform=crimson, Weather=clear, Win=true, CallFriends=true, BuyJersey=true)
    b. P(CallFriends=true | Uniform=gray, Weather=cloudy)
    c. P(Uniform=crimson | CallFriends=true, BuyJersey=true)

3. What would be the most likely sample from applying direct sampling to the Bayesian network in Problem 2? What is this sample's probability?

4. *CptS 540 Students Only*. In Problem 1 above, we are told that Uniform and Weather are independent of each other. Is that information consistent with the full joint probability distribution? Justify your answer.



P(Uniform)	
crimson	gray
0.6	0.4

P(Weather)		
clear	cloudy	rainy
0.3	0.4	0.3

Uniform	Weather	P(Win | Uniform, Weather)	
		true	false
crimson	clear	0.9	0.1
crimson	cloudy	0.6	0.4
crimson	rainy	0.4	0.6
gray	clear	0.2	0.8
gray	cloudy	0.4	0.6
gray	rainy	0.7	0.3

Win	P(CallFriends | Win)	
	true	false
true	0.7	0.3
false	0.2	0.8

Win	P(BuyJersey | Win)	
	true	false
true	0.6	0.4
false	0.3	0.7