

# CS188 Fall 2017 Section 7: Probability + Bayes Nets

## 1 Probability

Use the probability table to calculate the following values:

$X_1$	$X_2$	$X_3$	$P(X_1, X_2, X_3)$
0	0	0	0.05
1	0	0	0.1
0	1	0	0.4
1	1	0	0.1
0	0	1	0.1
1	0	1	0.05
0	1	1	0.2
1	1	1	0.0

1.  $P(X_1 = 1, X_2 = 0)$

2.  $P(X_3 = 0)$

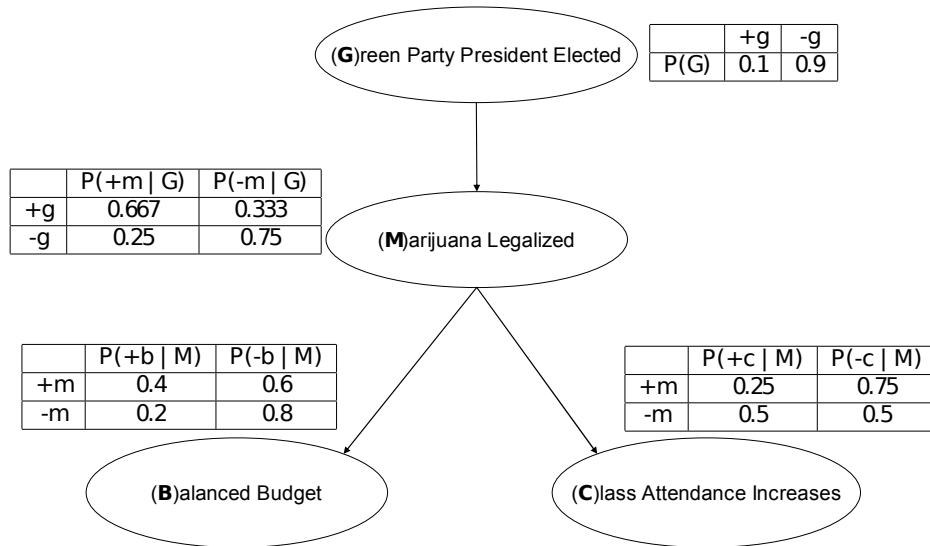
3.  $P(X_2 = 1|X_3 = 1)$

4.  $P(X_1 = 0|X_2 = 1, X_3 = 1)$

5.  $P(X_1 = 0, X_2 = 1|X_3 = 1)$

## 2 Green Party President

In a parallel universe the Green Party is running for presidency. Whether a Green Party President is elected (G) will have an effect on whether marijuana is legalized (M), which then influences whether the budget is balanced (B), and whether class attendance increases (C). Armed with the power of probability, the analysts model the situation with the Bayes Net below.



1. The full joint distribution is given below. Fill in the missing values.

$G$	$M$	$B$	$C$	$P(G, M, B, C)$	$G$	$M$	$B$	$C$	$P(G, M, B, C)$
+	+	+	+	1/150	-	+	+	+	
+	+	+	-		-	+	+	-	27/400
+	+	-	+	1/100	-	+	-	+	
+	+	-	-		-	+	-	-	81/800
+	-	+	+	1/300	-	-	+	+	27/400
+	-	+	-	1/300	-	-	+	-	27/400
+	-	-	+		-	-	-	+	
+	-	-	-	1/75	-	-	-	-	27/100

2. Now, add a node  $S$  to the Bayes net that reflects the possibility that a new scientific study could influence the probability that marijuana is legalized. Assume that the study does not directly influence B or C. Draw the new Bayes net below. Which CPT or CPT's need to be modified?