Assignment 4

Due Date: April 20, 2021, 1:00pm

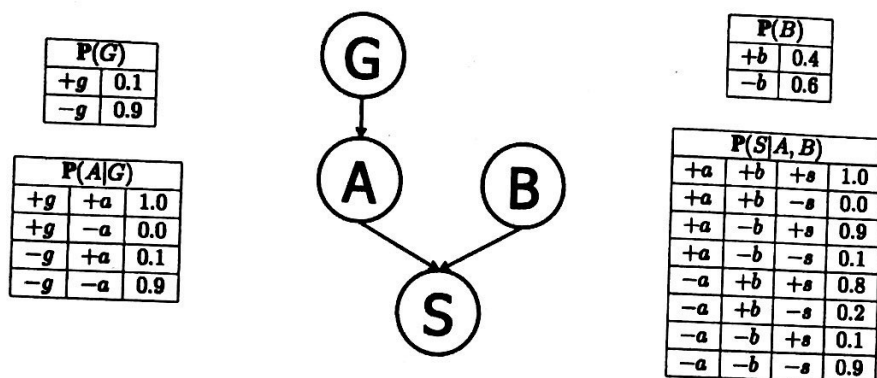| Name and SFSU ID	Jair Gonzalez

Submission via iLearn

Submit your answers online via iLearn as a *single pdf file* with the name csc665-assign4-lastname-sfsuid. Write your Name and SFSU ID at the top.

Academic Honesty

Plagiarism is a serious offense and will be dealt with harshly. I consider plagiarism to be the unattributed use of an external source (e.g., another student, a web site, a book) in work for which a student takes credit, or the inappropriate use of an external source whether or not attribution is made. The seriousness of the offense depends on the extent to which the student relied upon the external source. All written responses must be your own. All work ideas and quotes that originate from elsewhere must be cited according to standard academic practice. Students caught cheating will <u>automatically</u> fail the course.

1   [20 points] Bayes Net Inference

P(G)	
+g	0.1
−g	0.9

P(A|G)		
+g	+a	1.0
+g	−a	0.0
−g	+a	0.1
−g	−a	0.9

P(B)	
+b	0.4
−b	0.6

P(S|A, B)			
+a	+b	+s	1.0
+a	+b	−s	0.0
+a	−b	+s	0.9
+a	−b	−s	0.1
−a	+b	+s	0.8
−a	+b	−s	0.2
−a	−b	+s	0.1
−a	−b	−s	0.9

Compute the values of the following probabilities:

1. **[3 points]** $P(+g, +a, +b, +s) =$

$P(+g)\ P(+a|+g)\ P(+b)\ P(+s|+a,+b)$

$\downarrow \qquad \downarrow \qquad \downarrow$

$(0.1) \quad (1.0) \quad (0.4) \qquad (1.0) = \boxed{0.04}$

$\dfrac{P(A|G)}{}$

+g	+a	1.0
−g	+a	0.1

2. **[3 points]** $P(+a) = \quad P(x|y)(Py)$

$P(+a|+g)\ P(+g) + P(+a|-g)\ P(-g)$

$(1.0)(0.1) + (0.1)(0.9) = \quad 0.1 + 0.09 = \boxed{0.19}$

3. **[3 points]** $P(+a| + b) =$

+a is independent of +b, so the probability
of +a given +b would just be the probability of +a which
is $\boxed{0.19}$

4. **[5 points]** $P(+a| + s, +b) =$

$P(+a, +s, +b) = \dfrac{P(+a)\cdot P(+b)\cdot P(+s|+a,+b)}{P(+a)\cdot P(+b)\cdot P(+s|+a,+b) + P(-a)\cdot P(+b)\cdot P(+s|-a,+b)} =$

$\dfrac{(0.19)(0.4)(1.0)}{(0.19)(0.4)(1.0) + (0.81)(0.4)(0.8)} = \dfrac{0.076}{0.076 + 0.2592} = \boxed{0.22673031}$

5. **[3 points]** $P(+g| + a) =$

$\dfrac{P(B|A)\cdot P(A)}{P(B)} = \dfrac{P(+a|+g)\cdot P(+g)}{P(+a)} = \dfrac{P(+a|+g)\cdot P(+g)}{P(+a|+g)\cdot P(+g) + P(+a|-g)\cdot P(+g)}$

$\dfrac{(0.1)(1.0)}{0.19} = \boxed{0.52631579}$

6. **[3 points]** $P(+g| + b) =$

+g is independent of +b so the $P(+g)$ is $\boxed{0.1}$