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**HW 4 – Written**

**Honor Code:** All group members were present and contributing during all work on this. We have neither given nor received unauthorized aid on this assignment.

1. **Bayesian Inference**
2. **What is the probability that Alice stole the Cheetos? Show all work for full credit.**

A: Probability that Alice stole the Cheetos

B: Probability that Bob stole the Cheetos

SA: Probability that the neighbor saw Alice

SB: Probability that the neighbor saw Bob

P(A | SA) =

=

=

**= 0.958**

1. **If your neighbor thought she saw Bob, what would be the probability that Alice stole the Cheetos? Show all work for full credit.**

P(A | SB) =

=

=

**= 0.586**

1. **Bayesian Networks**
2. **Draw the Bayesian network corresponding to this situation and give the values in the conditional probability tables (CPTs).**

**Probability Table:**

|  |  |  |
| --- | --- | --- |
| **Coin** | **P(Getting Coin)** | **P(Coin getting Heads)** |
| a | 1/3 | 0.2 (1/5) |
| b | 1/3 | 0.6 (3/5) |
| c | 1/3 | 0.8 (4/5) |

**Bayesian Network:**

No matter which coin gets chosen from the bag, each can generate X1, X2, and X3

1. **For each coin, calculate the probability that the coin was drawn if the observed flips came out to heads twice and tails once (not necessarily in that order). Show all work for full credit.**

**Sequences** = 2 H’s and 1 T - 3 different combinations (HHT, HTH, THH)

**The Numerator:**

P(2 H, 1 T) **=**  P(2 H, 1T | a) \* P(a) + P(2 H, 1T | b) \* P(b) + P(2 H, 1T | c) \* P(c)

**= (**

**=** .032 + .144 + .128

= .304

**For a:**

P(a | 2 H, 1 T ) *=*

=

P(a | 2 H, 1 T )  **= .105**

**For b:**

P(b | 2 H, 1 T ) *=*

=

P(b | 2 H, 1 T )  **= 0.4736**

**For c:**

P(c | 2 H, 1 T ) *=*

=

P(c | 2 H, 1 T )  **= 0.421**