Problem Set 1

Probabilistic Foundations of Artificial Intelligence

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1 Conditional Probabilities

(a) **If** $P(a|b,c) = P(b|a,c)$**, then** $P(a|c) = P(b|c)$

$$P(a|b,c) = P(b|a,c) \tag{1.1a}$$
$$\frac{P(a,b,c)}{P(b,c)} = \frac{P(a,b,c)}{P(a,c)} \tag{1.1b}$$
$$P(b,c) = P(a,c) \tag{1.1c}$$
$$P(b|c) \cdot P(c) = P(a|c) \cdot P(c) \tag{1.1d}$$
$$P(b|c) = P(a|c) \tag{1.1e}$$

(b) **If** $P(a|b,c) = P(a)$**, then** $P(b|c) = P(b)$

(c) **If** $P(a|b) = P(a)$**, then** $P(a|b,c) = P(a|c)$

2 Finding the Fake Coin

3 Naive Bayes