

Assignment5

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March 12, 2019

Problem 1. Probability

1.

(a) $P(X, Y|Z)$ apply Bayer's rule $= \frac{P(Z|X,Y)P(X,Y)}{\sum P(X,Y|Z=z)P(Z=z)} = \frac{P(Z|X,Y)P(X,Y)}{P(Z)}$

(b) X is conditional independent of Y and Z vice versa if $P(X, Y, Z) = P(X|Z)P(Y|Z)P(Z) = P(X|Y, Z)P(Y|X, Z)P(Z)$

(c) X, Y independent, $P(X|Y) = P(X) = \frac{P(X,Y)}{P(Y)}$, $P(X|Y, Z) = \frac{P(X,Y,Z)}{P(Y,Z)} = P(X|Z) = \frac{P(X,Z)}{P(Z)}$ and $P(Z|Y) = \frac{P(Z,Y)}{P(Y)}$ now, we can get $P(Z)$

(d) $P(Y|X, Z) * P(X|Z) = \frac{P(X,Y,Z)}{P(X,Z)} * \frac{P(X,Z)}{P(Z)} = \frac{P(X,Y,Z)}{P(Z)} = P(X, Y|Z)$ same as $P(X|Y, Z) * P(Y|Z) = \frac{P(X,Y,Z)}{P(Y,Z)} * \frac{P(Y,Z)}{P(Z)} = P(X, Y, Z)/P(Z) = P(X, Y|Z)$ and $P(Y|X) = P(Y)$ because of conditional dependent, then $P(X|Z) = P(X)$

2.

(a) in z condition x have union to y $X \perp\!\!\!\perp Y$

(b) no $\perp\!\!\!\perp$ because left equations means in y condition probability of x, then in right equation, there is in x condition probability of y, that's mean x, and y are dependent.

(c) $X \perp\!\!\!\perp Y$

(d) no $\perp\!\!\!\perp$ this is chain rule

3.

(a) $P(X|Y, Z) = \frac{P(X,Y|Z)}{P(Y|Z)} = \text{chain rule } P(Z, Y, X) = P(Z) * P(Y|Z) * P(X|Y, Z) = \frac{\sum_{X,Y,Z,w} X,Y,Z,w}{\sum_{Y,Z,w}}$

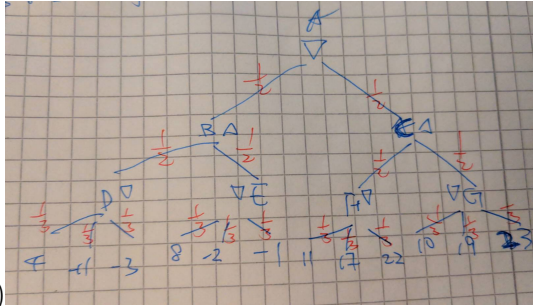
(b) $P(X|Z) * P(Y|Z) = P(X, Y|Z) \Rightarrow P(X|Z) = \frac{P(X,Y|Z)}{P(Y|Z)}$

Problem 2. Game Tree Search

(1) D:-11 E:-2 F:11 G:10, B:-2 C: 11 A:-2

(2) round1: D:-11, B:-11, A:-11, round2: E:-2, B:-2, A:-2 no pruned, because -2 > -11
round3: F:11, C:11 (pruned C) because of -2 < 11.

(3) no, if no pruned we have to exam b^d leaf nodes, where each node has b children, and d-play search if performed



(4)

(5) D:-3.3 E:-0.6 F:3.3, G:3.33, B:-1.65 C:1.65 A:0.83

Problem 3. Heuristic

(1) evaluate cost of cheapest path, h_1 not admissible $h(B)=14 > c(b,G)=12$, h_2 :yes, all smaller or equal to h^* .

(2) h_1 :ABCEDFG, h_2 :ABCDFEG, yes, they return different path. we sort all nodes to get the path order in forth step h_1 and h_2 chose E and D separately.

(3) $10 \leq h(D) \leq 5.5$

(4) $10 \leq h(D) \leq 5.5$ B and C not in sequential order, $h_3(B) < h_3(C)$ therefore C will be in front of B.