Artificial Intelligence.

HW - 4

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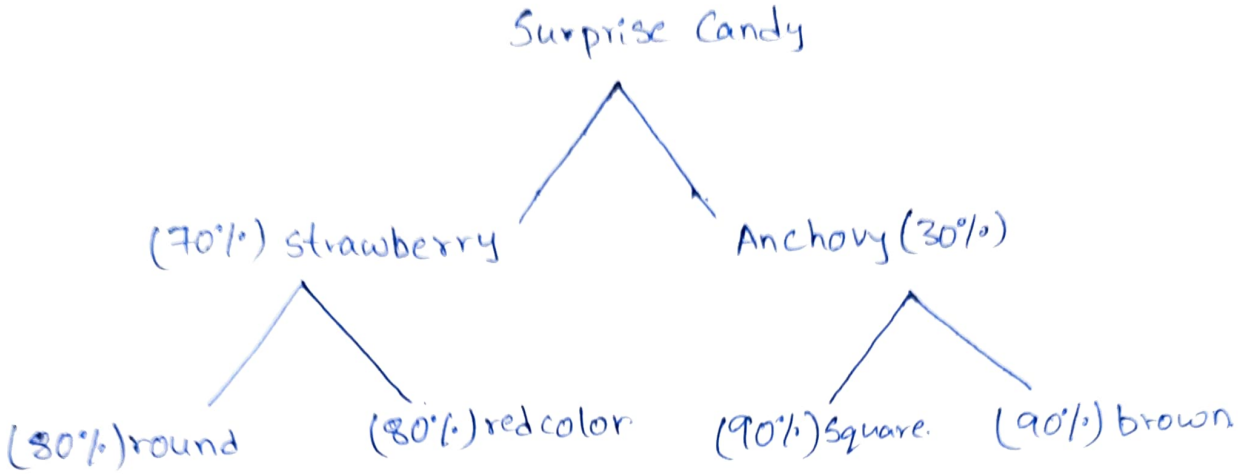
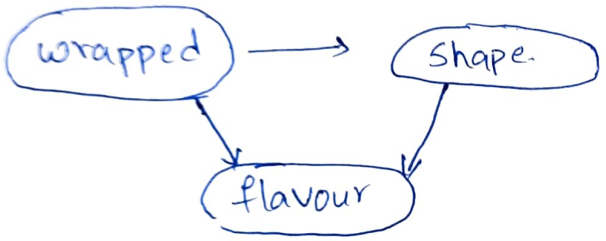
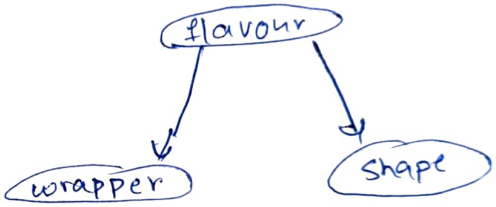
16.5)

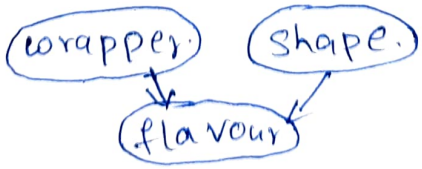


a) Which network can correctly represent P(flavour, wrapper, shape)





These two diagrams above represents the network i.e (ii) & (iii) not (i). (ii) is fully connected, so it can represent any joint distribution, where as (iii) follows the generative story, flavour is determined by which the candy is made by then the shape is randomly cut, & wrapper randomly choosen, the latter choice independently of the former one. where as. (i)



where wrapper & shape are marginally independent.

for ex

→ A square candy is to be Anchovy which is wrapped in brown colour.

b) which network is the best preparation for this problem?

A (iii) is the best preparation.

c) Does network (i) assert that P(wrapper/shape) = P(wrapper)

A There is no link between wrapper and shape, so they are independent to each other.

d) what is the probability that your candy has a red wrapper?

A) Once we know flavour, we know the candy will be. red or brown. so we marginalize flavour out.

$$P(\text{wrapper} = \text{red}) = \sum_f P(\text{wrapper} = \text{red}, \text{Flavour} = f)$$

$$= \sum_f P(\text{flavour} = f) P(\text{wrapper} = \text{red} \mid \text{flavour} = f)$$

$$= 0.70 \times 0.8 + 0.30 \times 0.1$$

$$= 0.59$$

e) In the box is a round candy with red wrapper. what is the probability that its flavour is strawberry?

A) we apply Bayes theorem together with conditional independence of shape & wrapper.

$$P(\text{flavour} = \text{strawberry} \mid \text{shape} = \text{round} \wedge \text{wrapper} = \text{red}) = (\text{Bayes})$$

$$= \alpha P(\text{shape} = \text{round} \mid \text{flavour} = \text{strawberry}) \times P(\text{wrapper} = \text{red} \mid \text{flavour} = \text{strawberry}) \times P(\text{flavour} = \text{strawberry})$$

$$= \alpha (0.8 \times 0.8 \times 0.7)$$

$$= \alpha (0.448)$$

To find out α, we also need joint Probability of

$P(\text{flavour} = \text{anchovy} \mid \text{shape} = \text{round} \wedge \text{wrapper} = \text{red})$

$= \alpha P(\text{shape} = \text{round} \mid \text{flavour} = \text{Anchovy}) \times P(\text{wrapper} = \text{red} \mid \text{flavour} = \text{Anchovy}) \times P(\text{flavour} = \text{Anchovy})$

$= \alpha \times 0.1 \times 0.1 \times 0.3$

$= \alpha (0.003)$

Since Sum of two probabilities is 1

$$\text{So } \alpha = \frac{1}{(0.448 + 0.003)}$$

The probability of round & red candy has a strawberry flavour is $\frac{0.448}{0.448 + 0.003} = 0.993$

f) A unwrapped strawberry candy is work "s" on the open market & an unwrapped Anchovy candy worth is 'a' write an expression for the value of an unopened candy box.

Ans) Probability that you have a strawberry up an unwrapping times the value of a strawberry, plus the probability that you have an anchovy up on unwrapping times the number of candies "n" in the box.

i.e $(0.70\ "s" + 0.30\ "a")\ xn.$

9) A new law prohibits trading of unwrapped candies but it is still legal to trade wrapped candies (out of the box) is an unopened candy box. now worth more than less than, (or) the same as before.

Ans. The value is the same, but packaging is just more complicated. (or) by the axiom of decomposability.