cpt_s 540 Artificial Intelligence

Homework 7

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1. Joint:
    a. 0.06
    b. 0.06+0.06+0.04 = 0.16
    c. 0.06+0.03+0.06+0.04+0.04+0.1=0.33
    d. 0.03+0.08+0.04+0.1+0.06+0.12+0.1+0.05+0.08+0.06=0.72
    e. 0.01/(0.01+0.02+0.12)=0.01/0.15=0.0666666
    f. (0.01+0.06+0.02)/

        (0.01+0.06+0.02+0.08+0.06+0.04+0.03+0.04+0.06)=0.09/0.4=0.225

2. Coronavirus :

Test\Infected	Yes(0.05)	No(0.095)
Postive	0.85*0.05=0.045	0.05*0.95=0.0475
Negative	0.15*0.05=0.0075	0.95*0.95=0.9025

    1. $P(Infected = Yes | Test = Postive) = 0.0425/(0.0425 + 0.0475) = 0.472$

3. Wumpus:
    a. Define the sets:
        i. Breeze: $Breeze_{1,1} = False, Breeze_{2,1} = True.$
        ii. Know: $know1,1 = True, know2,1 = True, know1,3 = True.$
        iii. Frontier: (2,2)

iv. Other: (3,1), (3,2), (3,3), (2,3), (1,3).

b. $P(Pit_{3,1} \mid breeze, know)$

$$= \alpha \mathrm{P}(P_{3,1})P(know) \sum_{F} \mathrm{P}(breeze \mid P_{3,1}, know, F)P(F)$$

$$= \alpha' \mathrm{P}(P_{3,1}) \sum_{F} \mathrm{P}(breeze \mid P_{3,1}, know, F)P(F)$$

$$= \alpha' < 0.2(0.2 + 0.8), 0.8(0.2) >$$

$$P(Pit_{3,1}) = 0.56$$

$$P(\neg Pit_{3,1}) = 0.44$$

4. Coronavirus:

$$P(Infected = Yes \mid Test = Postive) \geq 0.5$$

Assume the new false positive rate is F.

$$0.0425/(0.0425 + 0.95F) \geq 0.5$$

$$0.0425 \geq 0.5(0.0425 + 0.95F)$$

$$0.02125 \geq 0.475F$$

$$0.0447368 \geq F$$

The rate should smaller than 0.0447368.