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Q1 a) i) $P(\text{drama}, \text{female}) = P(\text{drama}) \cdot P(\text{female} \mid \text{drama})$

$= 21/120 \times 14/21$

$= \frac{7}{60} \approx 0.11667$

~~a) ii) P(action) = 25/120~~

$\cancel{= \frac{5}{24}}$

$\cancel{\approx 0.2083}$

a) ii) $P(\text{comedy}, \text{male}) = P(\text{comedy}) \cdot P(\text{male} \mid \text{comedy})$

$= 30/120 \times 7/30$

$= \frac{7}{120}$

≈ 0.0583

iii) $P(\text{action}) = 25/120$

$= \frac{5}{24}$

≈ 0.2083

iv) $P(\text{non-binary} \mid \text{comedy})$

$= 7/30$

$= 0.233$

b) $\because X \perp Z \mid Y \quad \therefore P(X, Z \mid Y) = P(X Y) \cdot P(Z Y)$

$P(X \mid Z Y) = P(X Y)$

Independene

$P(Y) \cdot P(Y|X)$

$\cancel{P(Y)} = P(XY)$

$P(XYZ) = P(X) \cdot P(YZ \mid X)$

$P(Z) \cdot P(XY \mid Z)$

$\cancel{P(XZY)}$

$= \cancel{P(X)\, P(ZY \mid X)}$

$P(ZY)\, P(X \mid ZY)$

cont.

Q1 b i) $P(X=0, Y=0, Z=1) = P(X=0, Z=1, Y=0)$

$= P(Z=1, Y=0) \cdot P(X=0 | Z=1, Y=0)$ Product Rule

$= P(Z=1, Y=0) \cdot P(X=0, Y=0)$ Independence

$= P(Y=0) \cdot P(Z=1 | Y=0) \cdot P(X=0) \cdot P(Y=0 | X=0)$ Product Rule

$= P(Y=0) \times 0.2 \times (1 - P(X=1)) \times (1 - P(Y=1 | X=0))$

substitue value into and use the sum rule

$= P(Y=0) \times (0.2 \times 0.8 \times 0.4)$

$\cancel{= 0.064 \times (P(X=0, Y=0, Z=0) + P(X=0, Y=0, Z=1) + P(X=1, Y=0, Z=0) + P(X=1, Y=0, Z=1)}$

$= 0.064 \times \cancel{\left(\frac{P(Y|X)}{P(X}\right.} \frac{P(Y=0 | X=0)}{P(X=0, Y=0)}$ Product Rule

$P(XY) = P(Y) P(X|Y)$

$P(Y) = \frac{P(XY)}{P(X|Y)}$

$= 0.064 \times \frac{0.4}{0.8 \times 0.4}$

$= 0.08$

b) ii) $P(Z=1 | X=1) = \frac{P(Z=1) P(X=1 | Z=1)}{P(X=1)}$ Bayes

$= \frac{P(X=1, Z=1)}{P(X=1)}$ Product

$= \frac{P(X=1, Y=0, Z=1) + P(X=1, Y=1, Z=1)}{P(X=1)}$ Sum

$= \frac{\cancel{0.8} \times 0.2 \times 0.2 \times 0.7 +}{0.2}$

Q2 a) i) Zero Prob can be addressed by adding 2 fake ~~instances~~ test instances, one instance is with value of all 0, the other is all one. ~~It's because~~ It's aiming for solving any ~~of~~ 0 occare among $P(f_1|C) \cdots P(f_n|C)$

ii) ~~It assumes~~ The Naive Bayes assumes that Features ~~are~~ are all conditionally ~~ind~~ independent.

iii) ~~Want to calculate: P(c~~

It's because $P(c|f_1, f_2 \cdots f_n)$ is equal to

$$\frac{P(C)\, P(f_1, f_2 \cdots f_n | C)}{P(f_1, f_2 \cdots f_n)}$$

And since features are independent, so

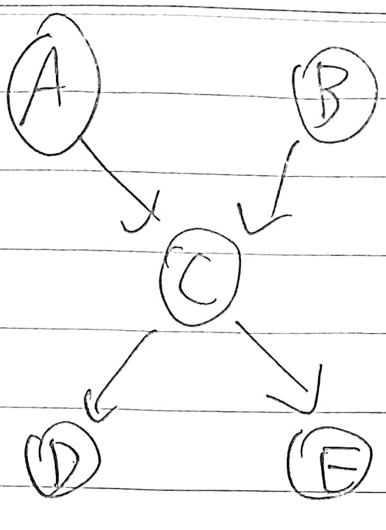
~~the nominator P(c~~

$$= \cancel{P(f_1,f} P(f_1|c) P(f_2|c) \cdots P(f_n|c) \cdot P(c)$$

thus can be ignore.

And the is the same, so that's why the posterior also has the largest.

Q.2 b) i)



$D \perp E$

b) ii) A is conditional independent on E given C

And B is conditional independent on E given C

And A is conditional independent on D given C

$A \perp E | C \quad A \perp D | C \quad B \perp E | C$

$A B \perp D | C$

b) iii) $P(a|d,e) = \dfrac{P(a) P(d,e|a)}{P(d,e)}$

$\rightarrow D \perp E \rightarrow \quad = \dfrac{P(a) \cancel{P(d|a)} \cancel{P(e|a)} P(d,e)}{P(d)}$

$D \perp E \rightarrow$ $\cancel{D \perp E}$

$= \dfrac{P(a) P(d) P(e)}{P(d)}$ $\quad d \perp E$, so $P(D,E) = P(d) P(e)$

Q3 a) Classial Planning do the plan does NOT consider the time taken, so it may take long time
Scheduling consider time to make sure the time consuming is low

b) Delivery from ~~node~~ depot to clients
Hospital ambulance find ~~patient~~ route to patient, and the Hospital is like the depot

c) i) At (A)

ii) At (c)

iii) Move (A , B) Move A to B Room
Carry (Obj)

iv) Pick (Obj)
Drop (OBj)

v)

Q4a) images, Robots, text

b) Volume: Size of data
Variety: different types of Data
Velocity: Speed of Data Moves and come in

c) It map into the high-dimentation space rather than the 2Dimentation. Everything can be linear Separable as long as the Dimensions is high enough.

D) Auto Encoder: ~~Non-classified~~ Non-supervised
CNN: ~~Classified~~ supervised

e) Deep Forest: supervised

GP: non-supervised