Tutorial 1

Paradigm

1) Binary Classification - Supervised

2) Clustering - Unsupervised

3) Regression - Supervised

4) Clustering - Unsupervised

5) Regression - Supervised

6) Binary Classification - Supervised

7) Clustering - Unsupervised

Problems

1) $P(\text{Football} / \text{Man}) = \dfrac{5}{100} = 0.05$

$P(\text{Football} / \text{Woman}) = \dfrac{10}{250} = 0.04$

For equal Man and Woman, $P(\text{Man}) = P(\text{Woman}) = \dfrac{1}{2}$

$P(\text{Football}) = P(\text{Foot}/\text{Man}) P(\text{Man}) + P(\text{Foot}/\text{Woman}) P(\text{Woman})$

$= \dfrac{1}{2} \times \dfrac{5}{100} + \dfrac{1}{2} \times \dfrac{10}{250} = 0.025 + 0.02 = \underline{0.045}$

2) $P(\text{liver dis}) = \dfrac{1}{10} \qquad P(\text{alcohol}) = \dfrac{1}{20}$

$P(\text{alcohol} / \text{liver dis}) = 7/100$

$P(\text{liver dis} / \text{alcohol}) = \dfrac{P(\text{alcohol} / \text{liver dis}) \, P(\text{liver dis})}{P(\text{alcohol})}$

$= \dfrac{\frac{7}{100} \times \frac{1}{10}}{\frac{1}{20}} = \dfrac{14}{100} = 0.14$

3) a) $P(x > 2, y \leq 3)$

~~$= P(x=1, y=2) + P(x=1, y=3) + P(x=1, y=4)$~~

$= P(x=3, y=2) + P(x=3, y=3)$

$= \frac{1}{4} + \frac{1}{8} = \boxed{\frac{3}{8}}$

b) Marginal PMF of,

(Row Sum)

$\quad X \Rightarrow P_X(x=1) = \frac{1}{12} + \frac{1}{24} + \frac{1}{24} = \boxed{\frac{1}{6}}$

$\quad P_X(x=2) = \frac{1}{6} + \frac{1}{12} + \frac{1}{8} = \boxed{\frac{3}{8}}$

$\quad P_X(x=3) = \frac{1}{4} + \frac{1}{8} + \frac{1}{12} = \boxed{\frac{11}{24}}$

(Column Sum)

$\quad Y \Rightarrow P_Y(Y=2) = \frac{1}{12} + \frac{1}{6} + \frac{1}{4} = \boxed{\frac{1}{2}}$

$\quad P_Y(Y=3) = \frac{1}{24} + \frac{1}{12} + \frac{1}{8} = \boxed{\frac{1}{4}}$

$\quad P_Y(Y=4) = \frac{1}{24} + \frac{1}{8} + \frac{1}{12} = \boxed{\frac{1}{4}}$

c) $P(Y=2 \mid X=1) = \dfrac{P(Y=2, X=1)}{P(x=1)}$

$= \dfrac{\frac{1}{12}}{\frac{1}{6}} = \frac{1}{2}$ ⫽

d) For x, y to be independent, $P(x, y) = P(x)\, P(y)$

$P(x=2, Y=2) = \frac{1}{6}$

$P(x=2)\, P(Y=2) = \frac{3}{8} \cdot \frac{1}{2} = \frac{3}{16} \neq \frac{1}{6}$

∴ NOT Independent