DD | MM | AA

- De la distribución normal tenemos $N(\mu, \sigma^2)$ la densidad de probabilidad normal

$$f(x; \mu, \sigma) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

Diferenciando con respecto a μ ....

- $$\log(L(\mu, \sigma^2)) = -\frac{n}{2}\log(2\pi\sigma^2) - \frac{1}{2\sigma^2}\sum_{i=1}^{n}(x_i - \mu)^2$$

- $$\frac{\partial}{\partial\mu}\log(L(\mu, \sigma^2)) = 0 - \frac{-2n(\bar{x}-\mu)}{2\sigma^2}$$

$$\bar{x} = \hat{\mu} = \sum_{i=1}^{n}\frac{x_i}{n}$$

Diferenciando con respecto a σ ....

$$0 = \frac{\partial}{\partial\sigma}\log(L(\mu, \sigma^2)) = \frac{-n}{\sigma} + \frac{1}{\sigma^3}\sum_{i=1}^{n}(x_i - \mu)^2.$$

$$\hat{\sigma}^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2. = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2.$$

Ahora en el contexto de.

$$f(x,y) = \begin{cases} \frac{2}{3}(x+2y) & 0 \le x \le 1 \; ; \; 0 \le y \le 1 \\ 0 & \text{otro caso} \end{cases}$$

a). Como tanto x como y son cantidades positivas $\frac{2}{3}(x+2y)$ siempre es $\geq \emptyset$ para todo $x \in \mathbb{R}$

$$\cancel{\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \frac{2}{3}(x+2y)\,dx\,dy = \int_{-\infty}^{\infty} \frac{2x}{3}\,dx \int_{-\infty}^{\infty} \frac{4y}{3}\,dy}$$

$$\cancel{= \left[\frac{x^2}{3} \cdot \frac{2y^2}{3}\right] =}$$

$$\int_0^1\int_0^1 \left(\frac{2x}{3} + \frac{4y}{3}\right) dx\,dy = \int_0^1 \frac{2x}{3}\,dx + \int_0^1 \frac{4y}{3}\,dy$$

$$= \frac{2x^2}{2\cdot 3}\Big]_0^1 + \frac{2y^2}{3}\Big]_0^1 = \left(\frac{1}{3} - 0\right) + \left(\frac{2}{3}\right) = \frac{1}{3} + \frac{2}{3} = \frac{3}{3} = 1.$$

b)

$$g(x) = \int_0^1 \frac{2x}{3} + \frac{4y}{3}\,dy$$

$$= \frac{2xy}{3} + \frac{4y^2}{2\cdot 3}$$

$$= \frac{2xy}{3} + \frac{4y^2}{6}$$

$$= \left[\left(\frac{2x}{3} + \frac{4}{6}\right) - 0\right]$$

$$g(x) = \frac{2x}{3} + \frac{2}{3}$$

$$h(y) = \int_0^1 \frac{2x}{3} + \frac{4y}{3}\,dx.$$

$$= \frac{2x^2}{2\cdot 3} + \frac{4yx}{3}$$

$$= \left[\left(\frac{2}{6} + \frac{4y}{3}\right) - \emptyset\right]$$

$$h(y) = \frac{1}{3} + \frac{4y}{3}$$

Areas para:

c) $E(x) = \frac{10}{18}$

$E(y) = \frac{11}{18}$

$$E(x) = \int_0^1 x\left(\frac{2x}{3} + \frac{2}{3}\right) dx$$

$$E(y) = \int_0^1 y\left(\frac{1}{3} + \frac{4y}{3}\right) dy$$

c) $$E(x) = \int_0^1 \frac{2x^2}{3} + \frac{2x}{3}\,dx = \Big|_0^1 \frac{2x^3}{9} + \frac{x^2}{3} = \frac{2}{9} + \frac{1}{3} = \frac{6+9}{27} = \frac{2+3}{9} = \frac{5}{9}.$$

d) $$E(y) = \int_0^1 \frac{y}{3} + \frac{4y^2}{3}\,dy = \Big|_0^1 \frac{y^2}{6} + \frac{4y^3}{9} = \frac{1}{6} + \frac{4}{9} = \frac{9+24}{54} = \frac{33}{54} = \frac{11}{18}.$$

e)

$\sigma_{xy} = E(xy) - E(x)E(y) \to$

$$E(x,y) = \int_0^1\int_0^1 xy\left(\frac{2x}{3} + \frac{4}{3}y\right) dy\,dy.$$

$$= \int_0^1\int_0^1 \frac{2x^2y}{3} + \frac{4y^2x}{3}\,dy\,dx$$

$$= \int_0^1 \frac{2x^2y^2}{3} + \frac{4y^3x}{9}\,dx$$

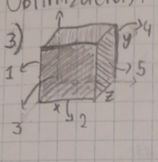
$$= \frac{x^3y^2}{9} + \frac{2y^3x^2}{9}\Big|_0^1 = \frac{1}{9} + \frac{2}{9} = \frac{3}{9} = \frac{1}{3}.$$

$$E(x,y) = \frac{1}{3} - \left(\frac{5}{9} \cdot \frac{11}{18}\right) = -0.00617.$$

f

Obtimización:

3)



Areas para:

A1: zy
A2: xz
A3: xy
A4: xy
A5: zy

$\to$ Total $= zy + xz + xy + xy + zy$

$A_{Total} = 2zy + 2xy + xz = 12$

$F = xyz$

$g \equiv 12 = 2zy + 2xy + xz$ $\quad = \quad \Delta F = \lambda \Delta g \Rightarrow \begin{bmatrix} yz \\ xz \\ xy \end{bmatrix} = \lambda \begin{bmatrix} 2y+z \\ 2z+2x \\ 2y+x \end{bmatrix}$

Este sistema de ecuacion sera:

1 $yz = \lambda(2y+z)$
2 $xz = \lambda(2z+2x)$
3 $xy = \lambda(2y+x)$
4 $12 = 2xy + 2zy + xz$

$\rightarrow$ Con metodos computacionales $\rightarrow$ $x = 2$, $y = 1$, $z = 2$

1) Calculo de Probabilidad:

1-a. $P(A) = \frac{11}{50} \cdot \frac{10}{49} \cdot \frac{9}{48} = 0.00847$

b. $P(B) = \frac{10}{49} \cdot \frac{9}{48} = 0.0382$

c. $P(C) = \frac{9}{48} = 0.187$

2) $P(T) = 1 - P(\text{Ninguno se enferme})$

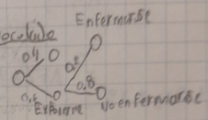
$= 1 - P(A)P(B)$

El primero no se enferme $\quad \rightarrow$ El Primero no se enferme

$P(A) = 0.4 + 0.6 \cdot 0.8 = 0.88$
$P(B) = 0.4 + 0.6 \cdot 0.7 = 0.46$

$P(T) = 1 - 0.4048 = 0.5952$

Inoculado



No Inoculado