(5) $y = ax^2 + bx + c$

y	x
0	0
0.25	0.5
1	1
2.25	1.5
4	2
6.25	2.5

OLS

$\Rightarrow \sum (y_a - y_p)^2$

$= (0 - (0 - 0 + c))^2 +$

$(0.25 - (0.5^2 a + 0.5b + c))^2$

$+ (1 - (a + b + c)) +$

$+ (2.25 - (1.5^2 a + 1.5b + c))^2 +$

$$= \sum_{i=1}^{6} \left[y_a - (ax^2 + bx + c) \right]^2$$

$$= \sum_{i=1}^{6} (y_a - ax^2 - bx - c)^2$$

$$= \cancel{\sum_{i=1}^{6} y_a^2}$$

y				

Q6: Let X be a continuous random variable with PDF given as

$$f_X(x) = \frac{1}{\sqrt{2\pi}} \exp^{-\frac{x^2}{2}}, \qquad \text{for all } x \in \mathcal{R}$$

And let $Y = X^2$. Find $f_Y(y)$.

$\underline{\underline{i=1}}$

$$P(A_1|B) = \frac{P(B|A_1) \times P(A_1)}{P(B)}$$

$$= \frac{(1-\alpha_1) \times 1/3}{\frac{(1-\alpha_1)}{3} + \frac{2}{3}}$$

$$P(A_1|B) = \frac{1-\alpha_1}{3-\alpha_1}$$

$\underline{\underline{i=2}}$

$$P(A_2|B) = \frac{P(B|A_2) * P(A_2)}{PB}$$

$$= \frac{1 \times 1/3}{\frac{(1-\alpha_1)}{3} + \frac{2}{3}} =$$

$$P(A_2|B) = \frac{1}{3-\alpha_1} = P(A_3|B)$$

classmate

Date
Page

Pervious Mid Exam

(1)

$P(B)$ = probability that a search of region 1 is unsuccessful

$P(A_i) \Rightarrow$ as prior probability that the plane is in that region

Now we need $P(A_i|B)$

$$P(A_i|B) = \frac{P(B|A_i) + P(A_i)}{P(B)}$$

$i=1 \Rightarrow P(B) = P(A_1)\,P(B|A_1) + P(A_2)\,P(B|A_2)$

$P(A_3) \times P(B|A_3)$

$P(B) = \frac{1}{3} \; P(A) = 1/3$ All region equal probab for plane is there

$$P(B) = \frac{1}{3}(1-\alpha_1) + \frac{1}{3}(1) + \frac{1}{3}(1)$$

$P(B/A_2)$ is 1 because of your search plane in first region but plane is in (2)

Hence $P(B|A_2) = 1$

$\underline{\underline{i=1}}$

$$P(A_1|B) = \frac{P(B|A_1) \times P(A_1)}{P(B)}$$

$$= \frac{(1-\alpha_1) \times 1/3}{\frac{(1-\alpha_1)}{3} + \frac{2}{3}}$$

$$P(A_1|B) = \frac{1-\alpha_1}{3-\alpha_1}$$

$\underline{\underline{i=2}}$

$$P(A_2|B) = \frac{P(B|A_2) * P(A_2)}{PB}$$

$$= \frac{1 \times 1/3}{\frac{(1-\alpha_1)}{3} + \frac{2}{3}} =$$

$$P(A_2|B) = \frac{1}{3-\alpha_1} = P(A_3|B)$$

$$\mu_{y_2} - \mu_{y_1} \geq 3$$

~~[illegible]~~

$$\mu_{diff} = \mu_{y_2} - \mu_{y_1} = 0$$

$$\sigma^2_{dif} = \sigma_{y_1}^2 + \sigma_{y_2}^2 =$$

$$= 2(3.1)^2$$

$$\sigma_{dif} = \sqrt{2} \times 3.1 = 4.38$$

$$z = \frac{y_2 - y_1}{\sigma} = \frac{3}{4.38}$$

$$P(z > 0.6849) = 1 - 0.7517$$

$$P = 0.2483$$

classmate

Date

Page

$y = \begin{bmatrix} \cancel{7} \\ 6 \end{bmatrix} \quad v = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$

Orthogonal projection of y into v

$proj_v y = \left(\frac{y \cdot v}{v \cdot v}\right) v$

$y \cdot \cancel{v} = \begin{bmatrix} 7 \\ 6 \end{bmatrix}\begin{bmatrix} 4 \\ 2 \end{bmatrix} = 7 \times 4 + 6 + 2$

$= 46$

$v \cdot v = \begin{bmatrix} 4 \\ 2 \end{bmatrix}\begin{bmatrix} 4 \\ 2 \end{bmatrix} = 20$

$proj_v y = \left(\frac{40}{20}\right) v = 2v = \begin{bmatrix} 8 \\ 4 \end{bmatrix}$

write y as sum of orthogonal vectors

One in Span{v} and one is Orthogonal to v

$y = \text{span}\{v\} + proj_v y$

$y - proj_v y = \begin{bmatrix} 7 \\ 6 \end{bmatrix} - \begin{bmatrix} 8 \\ 4 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$

$y = \begin{bmatrix} 8 \\ 4 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix}$

$y = \text{span of } v \begin{bmatrix} 8 \\ 4 \end{bmatrix} +$

vector is ~~otheg~~ othogonal to $v \begin{bmatrix} -1 \\ 2 \end{bmatrix}$

$\begin{bmatrix} -1 \\ 2 \end{bmatrix} \cdot \begin{bmatrix} 8 \\ 4 \end{bmatrix} = -8 + 8 = 0$

~~other~~ orthogonal to v.

classmate

Date
Page

(4) Subspace properties (H is Subspace of V)

→ The zero vector of V is in H

→ Closed under addition (vector)

→ Closed under scalar multiplication

(1) Zero vector

$$0 \cdot v_1 + 0 \cdot v_2 = 0$$

(2) $a_1 = c_1 v_1 + c_2 v_2$

$a_2 = d_1 v_1 + d_2 v_2$

$a_1 + a_2 = c_1 v_1 + c_2 v_2 + d_1 v_1 + d_2 v_2$

$= (c_1 + d_1) v_1 + (c_2 + d_2) v_2$

(3) $a = c_1 v_1 + c_2 v_2$

$k \cdot a = k(c_1 v_1 + c_2 v_2)$

$= k c_1 v_1 + k c_2 v_2$

classmate

Date

Page

$\Sigma x = 75$

$\Sigma x^2 = 13.75$

$x^3 = 28.125$

$x^4 = 61.187$

$6c + 7.5b + 13.75a - 13.75 = 0$

$7.5c + 13.75b + 28.125a - 28.125 = 0$

$13.75c + 28.125b + 61.1875 - 78.0625 = 0$

$c = -1325/112 = -11.83$

$b = 3975/112 = 35.49$

$a = \frac{-739}{56} = -13.196$

Some mistake there

Do calculation correct

classmate

Date
Page

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$$

$$y = x^2$$

$$x = \pm\sqrt{y}$$

Jacobian transformation

$$\left|\frac{dx}{dy}\right| = \frac{1}{2\sqrt{y}}$$

$$f_y(y) = f_x(\sqrt{y}) \left|\frac{dx}{dy}\right| +$$

$$f_x(-\sqrt{y}) \left|\frac{dx}{dy}\right|$$

$$= \frac{1}{\sqrt{2\pi}} \times e^{-y/2} \times \frac{1}{2\sqrt{y}} + \frac{1}{2\pi} \times e^{-\frac{y}{2}} \frac{1}{2\sqrt{y}}$$

$$= \frac{1}{\sqrt{2\pi}} \times e^{-\frac{y}{2}} \times \frac{1}{\sqrt{y}}.$$

$$y = x^2$$

classmate

Date

Page

Pervious Mid Exam

$P(B)$ = probability that a search of region 1 is unsuccessful

$P(A_i) \Rightarrow$ as prior probability that the plane is in that region

Now we need $P(A_i|B)$

$$P(A_i|B) = \frac{P(B|A_i) + P(A_i)}{P(B)}$$

$i=1 \Rightarrow P(B) = P(A_i)\ P(B|A_i) + P(A_2)\ P(B|A_2)$

$P(A_3) \times P(B|A_3)$

$P(B) = \frac{1}{3} \times P(A) = 1/3$ All region equal probability for plane is there

$$P(B) = \frac{1}{3}(1-\alpha_i) + \frac{1}{3}(1) + \frac{1}{3}(1)$$

$P(B/A_2)$ is 1 because of your search plane in first region but plane is in 2

Hence $P(B|A_2) = 1$