HW 0

Oik

1

① $\frac{\partial}{\partial w}(Xw-y)^2 = 2X(Xw-y)$

set equal to 0

$2X(Xw-y)=0$

$2X^2w - 2Xy$

$2X^2w = 2Xy \rightarrow \boxed{w = \frac{Xy}{X^2}}$

② $(Xw-y)^2 + \lambda(w)^2$

$2X(Xw-y) + 2\lambda w = 0$

$X^2w - Xy + \lambda w = 0$

$w(X^2+\lambda) = Xy \rightarrow \boxed{w = \frac{Xy}{X^2+\lambda}}$

2

$P(H) = P$, $P(T) = 1-P$

HHTTH

① $(P)(P)(1-P)(1-P)(P) = \boxed{P^3(1-P)^2} \xrightarrow{\ln} \boxed{3\ln(P) + 2\ln(1-P)}$

② $P_1 = 1/2$ $P_2 = 2/3$ Bayes Rule $P(A|B) = \frac{P(B|A)\cdot P(A)}{P(B)}$

a)

$P(P_1 | HHTTH) = \frac{P(HHTTH|P_1)\cdot P(P_1)}{P(HHTTH)}$ $= .03 + \frac{1}{2} + .032$ $= \boxed{.487}$

$P(HHTTH|P_1)$ $P(P_1)$ $P(HHTTH)$ total prob of getting this from each coin

$(\frac{1}{2})^3(\frac{1}{2})^2 = (1/2)^5 = .03$ $1/2$ $\frac{1}{2}(\frac{1}{2})^5 + \frac{1}{2}((\frac{2}{3})^3(\frac{1}{3})^2) = .032$

.03

2

2b

Bayes Rule $= .0329$ $1/2$

$$\frac{P(HHTTH|p_2) \cdot P(p_2)}{P(HHTTH)} = .032$$

$= .513$

3) what should bias p be to maximize

$P(HHTTH) = p^3(1-p)^2$ max

derivative

$\frac{\partial}{\partial p} p^3(1-p)^2 = (p-1)p^2(5p-3) = 0$

$p^3 - p^2(5p-3)$

$5p^4 - 3p^3 - 5p^3 + 3p^2$

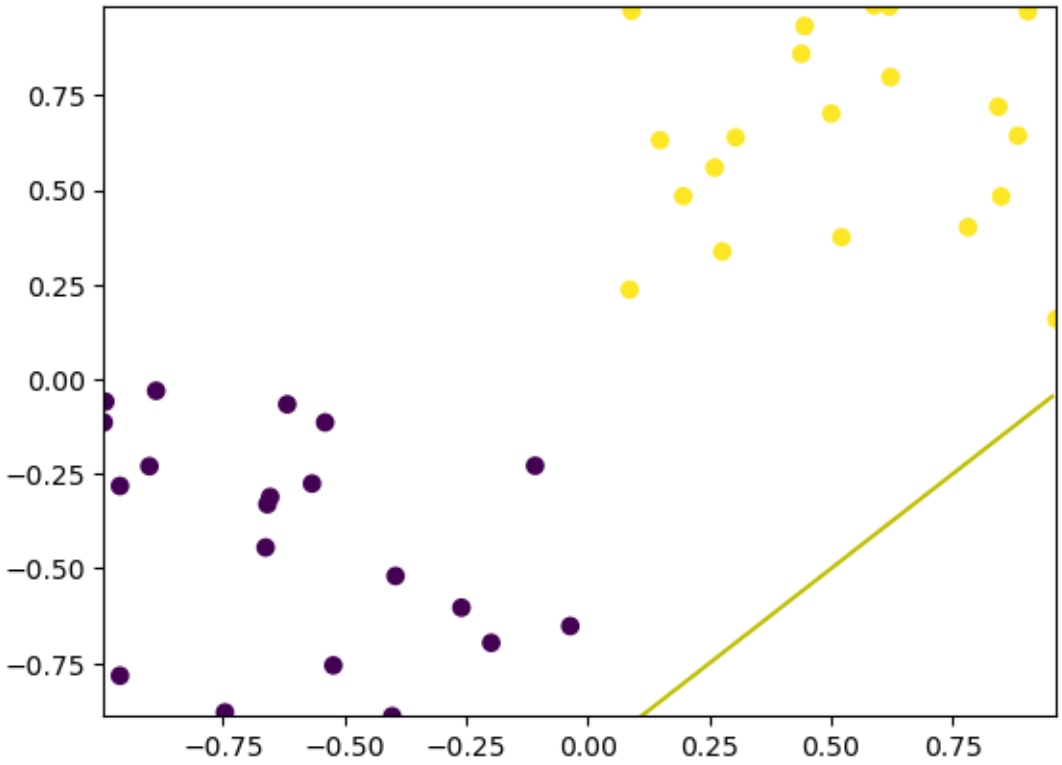
$5p^4 - 8p^3 + 3p^2 =$

$\div p^2$

$5p^2 - 8p + 3 \neq 0$

$p = 1$ → doesn't make sense

$p = 3/5$ ✓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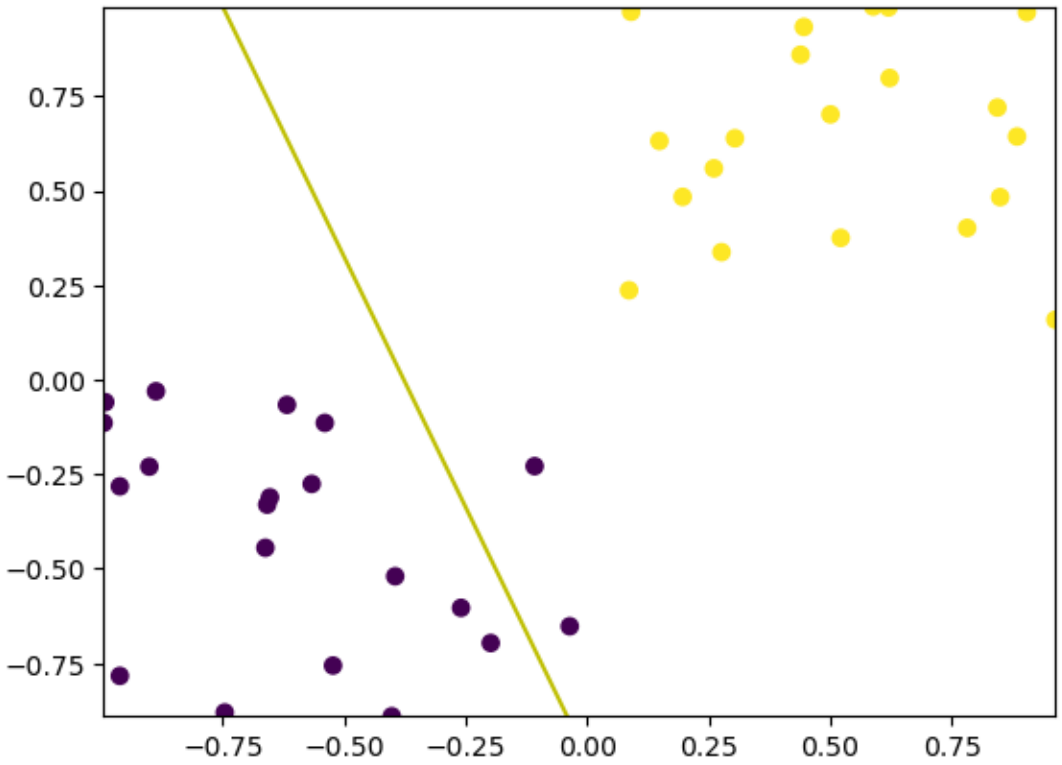
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