

ML

$$2) a) \beta_0^* = -6, \beta_1 = 0.05, \beta_2 = 1$$

$$40h \quad 3.5 \text{ gpg} \quad X = [40, 3.5]$$

$$\begin{aligned} \log\left(\frac{p(X)}{1-p(X)}\right) &= \beta_0 + \beta_1 x_1 + \beta_2 x_2 \\ &= -6 + (0.05 \cdot 40) + 3.5 \\ &= \cancel{0.24} - \underline{0.5} \end{aligned}$$

$$b) \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2}}{1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2}} = 0.5$$

$$\Rightarrow \frac{e^z}{1 + e^z} = 0.5$$

$$\Rightarrow 0.5e^z = 0.5$$

$$\Rightarrow e^z = 1$$

\Rightarrow taking log both sides

$$z = 0$$

$$\Rightarrow \beta_0 + \beta_1 x_1 + \beta_2 x_2 = 0$$

$$\text{as } x_2 = 3.5 \text{ gpg} \quad x_1 = ?$$

$$\Rightarrow -6 + (0.05 \cdot x_1) + 3.5 = 0$$

$$\Rightarrow 0.05x_1 = 2.5$$

$$\Rightarrow x_1 = \frac{2.5}{0.05} = \underline{\underline{50 \text{ hours}}}$$

$$1a) f(\omega) = (C^T \omega)^2$$

$$\begin{aligned} \nabla f(\omega) &= 2(C^T \omega) \nabla(C^T \omega) \\ &= 2(C^T \omega) C^T \end{aligned}$$

~~juste def func(C, w):~~

$f(\omega) = \text{def func}(C, \omega):$

return np.matmul(np.transpose(C),
w)

$\nabla f(\omega) = \text{def func}(C, \omega):$

z = np.matmul(np.transpose(C), w)

r = np.matmul(z, np.transpose(C))

r = 2 * r

return r

$$b) \quad \because \|z\|_2^2 = z^T z$$

$$\Rightarrow \|Aw\|_2^2 = [Aw]^T [Aw]$$

$$\because f(w) = \|Aw\|_2^2$$

$$\nabla f(w) = \nabla \|Aw\|_2^2$$

$$\Rightarrow \nabla f(w) = \nabla [CAw]^T [CAw]$$

$$= \nabla [w^T A^T C A w]$$

$$= 2 A^T A w$$

$$f(w) = \text{def func}(A, w):$$

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z = np.matmul(A, w)
s = np.linalg.norm(z, ord=2)
s = np.power(s, 2)
return s

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$$\nabla f(w) = \text{def func}(A, w):$$

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z = np.matmul(np.transpose(A), w)
s = np.matmul(z, w)
s = s * 2
return s

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$$c) \quad f(\omega) = \|A\omega\|_1^2$$

$$f(\omega) = \|A\omega\|_1^2$$

$$\begin{aligned} \nabla f(\omega) &= \nabla \|A\omega\|_1^2 \\ &= \nabla \sum_{i=1}^m |A_i \omega|^2 \\ &= \sum_{i=1}^m \nabla (A_i \omega)^2 \\ &= \sum_{i=1}^m 2 A_i \omega A_i \\ &= 2 A \omega A \end{aligned}$$

$$f(\omega) =$$

def func(A, w):

z = np.linalg.norm(np.matmul(A, w), 1)

return z

$$\nabla f(\omega) =$$

def func(A, w):

z = 2 * np.matmul(np.matmul(A, w), A)

return z