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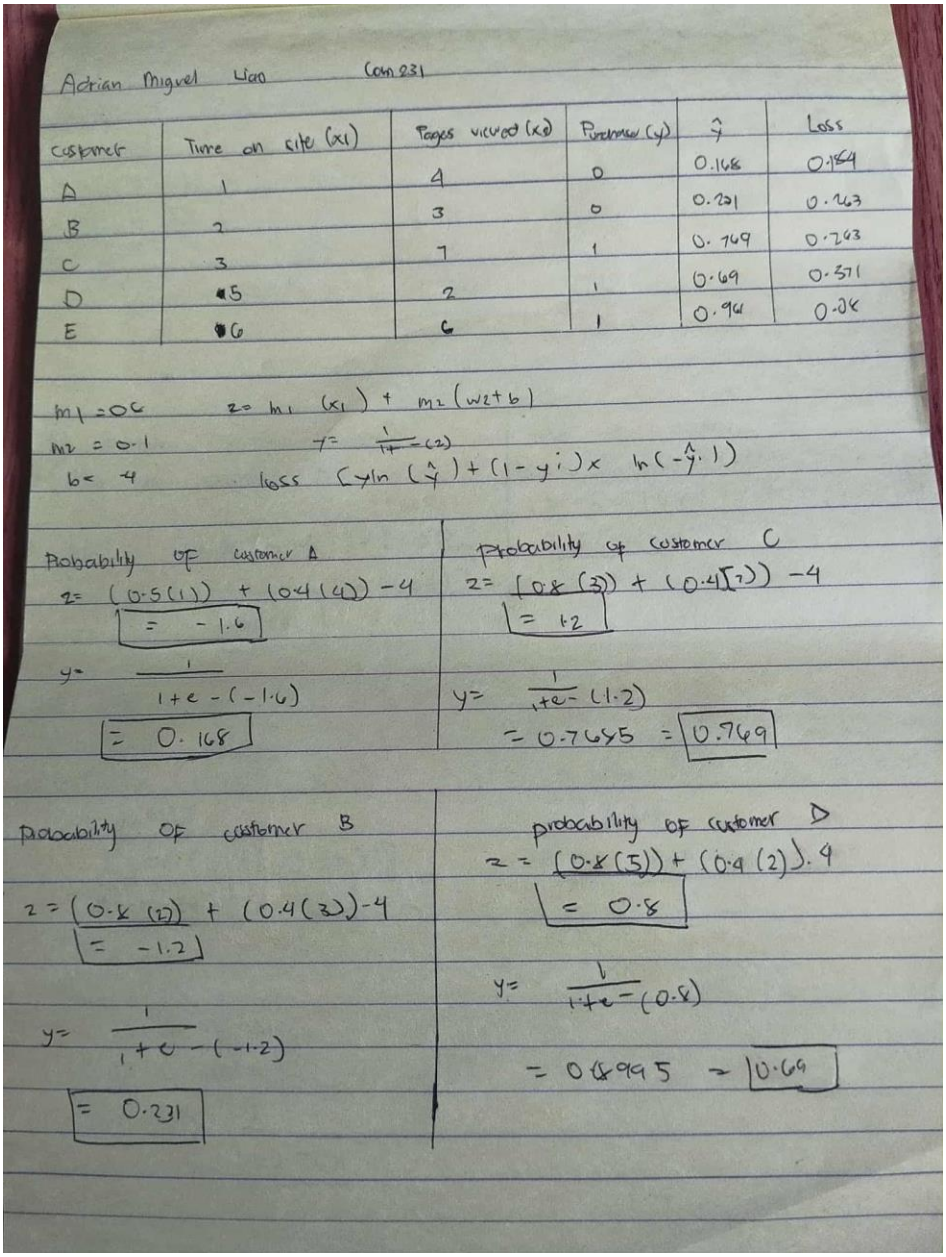
Com231



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Customer	Time on site (x1)	Pages viewed (x2)	Purchased (y)	$\hat{y}$	Loss
A	1	4	0	0.168	0.184
B	2	3	0	0.231	0.263
C	3	7	1	0.769	0.263
D	5	2	1	0.69	0.371
E	6	6	1	0.96	0.04

$m_1 = 0.5$ $z = m_1(x_1) + m_2(w_2 + b)$

$m_2 = 0.1$ $y = \frac{1}{1+e^{-(z)}}$

$b = -4$ loss $(y \ln(\hat{y}) + (1 - y_i) \times \ln(-\hat{y}.1)$

Probability of customer A

$z = (0.5(1)) + (0.4(4)) - 4$

$= -1.6$

$y = \frac{1}{1 + e^{-(-1.6)}}$

$= 0.168$

probability of customer C

$z = [0.5(3)] + (0.4[7]) - 4$

$= 1.2$

$y = \frac{1}{1+e^{-(1.2)}}$

$= 0.7685 = 0.769$

probability of customer B

$z = (0.5(2)) + (0.4(3)) - 4$

$= -1.2$

$y = \frac{1}{1 + e^{-(-1.2)}}$

$= 0.231$

probability of customer D

$z = [0.5(5)] + (0.4(2)) . 4$

$= 0.5$

$y = \frac{1}{1+e^{-(0.5)}}$

$= 0.8995 \rightarrow 0.69$

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probability of customer F

$z = [0.8(6)] + [0.4(6)] - 4$

$= 3.2$

$y = \frac{1}{1+e^{-(3.2)}}$

$= 0.4608 = 0.961$

2.) compute average loss

loss of customer A

$loss = [0(\ln(0.168))] + (1-0)(\ln$

$= [0 + 1(\ln(1.0[601)]$

$= 0.1641$

loss of customer D

$loss = -[1(\ln(0.4)) + (1-1)(\ln(1-0.69))]$

$= -[\ln(0.69) + (0)(\ln(1-0.4))]$

$= -[\ln(0.69)]$

$= 0.371$

loss of customer B

$loss = [0(\ln(0.231))] + [1-0)(1-0.231)]$

$= [0+1(\ln(1-0.231))]$

$= 0.263$

loss of customer E

$loss = -[1(\ln(0.964)) + (1-1)(\ln(1-0.961))]$

$= -[\ln(0.961) + (0)(\ln(1-0.961))]$

$= \frac{1}{n} E\ loss$

$\frac{0.189 + 0.263 + 0.263 + 0.371 + 0.04}{5}$

0.22492

loss customer C

$loss = [1(\ln(0.769)) + (1-1)(\ln(1-0.769))]$

$= -[\ln(0.769) + (0)(\ln(1-1769))]$

$= [\ln(0.769)]$

$= 0.2625 = 0.263$

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3. Derivatives for Gradient Descent formula

$$\frac{d\ loss}{db} \frac{1}{n} \sum_{=1} (\hat{y} - y_i)$$

$$d.\ loss = \frac{1}{n} \sum_{=1} (\hat{y} - y_i)x$$

$$d\ loss = \frac{1}{n} \sum_{=1} (\hat{y}_i - y)x^2$$

Compute gradient

$$\frac{\partial}{dm} = \frac{1}{5} [0.168(1) + 0.231(2)) + (0.31(5)] + (0.56(6))]$$

$$= \frac{1}{5}(-1.847)$$

$$\frac{1.847}{5} \quad \boxed{-0.3694}$$

$$\frac{x^2}{dm} = \frac{1}{5}[(0.168(9)) + (0.231)(3)) + (0.31(1)) + (-0.31(2)) + (-0.051)(6))]$$

$$= \frac{1}{5}(-1.106$$

$$= \frac{1.106}{5}$$

$$\boxed{-0.2212}$$

$$\frac{d}{db} = \frac{1}{5}[(0.168) + (0.231) + (-0.23) + (0.31) + (-0.051)]$$

$$= \frac{1}{5}(-0.161)$$

$$= \frac{0.161}{c} = \boxed{-0.0362}$$

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new m1 = 0.83694
new m2 = 0.42212
newb = -3.9464

5-) new Average loss

Customer	Time on site (x1)	pages viewed (x2)	purchase (y)	ŷ	new loss
A	1	4	0	0.187	0.207
B	2	3	0	0.258	0.298
C	3	7	1	0.813	0.207
D	5	2	1	0.737	0.305
E	6	1	1	0.972	0.028

new average loss :

$$\frac{0.207 + 0.298 + 0.207 + 0.305 + 0.028}{5}$$

new average loss = 0.209 Improved from 0.2292