Quiz 1

CSE 437

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sec : 1

① $\hat{y} = m_1 cx + m_2 \, skill + c$

② $CEL = \sum\limits_{1}^{n} -\left(y_i \log \hat{y}_i + (1-y_i) \log(1-\hat{y}_i)\right)$

$CEL = -\left(120 \log(3m_1 + 2m_2 + c) + (1-120) \log\right.$
$\left.(1 - 3m_1 - 2m_2 - c)\right) +$

$-\left(80 \log(4m_1 + m_2 + c) + (1-80) \log\right.$
$\left.(1 - 4m_1 - m_2 - c)\right) +$

$-\left(90 \log(2m_1 + 2m_2 + c) + (1-90) \log\right.$
$\left.(1 - 2m_1 - 2m_2 - c)\right)$

③ $\dfrac{dCEL}{dc} = -\left(\dfrac{120}{3m_1 + 2m_2 + c} - \dfrac{119}{1 - 3m_1 - 2m_2 - c} \times (-1)\right) \ldots$

$= -\dfrac{120}{3m_1 + 2m_2 + c} - \dfrac{119}{1 - 3m_1 - 2m_2 - c} \qquad -$

$\dfrac{80}{4m_1 + m_2 + c} - \dfrac{79}{1 - 4m_1 - m_2 - c} \qquad -$

$\dfrac{90}{2m_1 + 2m_2 + c} - \dfrac{89}{1 - 2m_1 - 2m_2 - c}$

④
$$\frac{dCEL}{dm_1} = -\left(\frac{120 \times 3}{3m_1 + 2m_2 + c} + \frac{-119}{1 - 3m_1 - 2m_2 - c}\right) \times -3$$

$$= -\frac{120 \times 3}{3m_1 + 2m_2 + c} - \frac{119 \times 3}{1 - 3m_1 - 2m_2 - c} \quad -$$

$$\frac{80 \times 4}{4m_1 + m_2 + c} - \frac{79 \times 4}{1 - 4m_1 - m_2 - c} \quad -$$

$$\frac{90 \times 2}{2m_1 + 2m_2 + c} - \frac{89 \times 2}{1 - 2m_1 - 2m_2 - c}$$

⑤
$$\frac{dCEL}{dm_2} = -\frac{120 \times 2}{3m_1 + 2m_2 + c} - \frac{119 \times 2}{1 - 3m_1 - 2m_2 - c} \quad -$$

$$\frac{80}{4m_1 + m_2 + c} - \frac{79}{1 - 4m_1 - m_2 - c} \quad -$$

$$\frac{90 \times 2}{2m_1 + 2m_2 + c} - \frac{89 \times 2}{1 - 2m_1 - 2m_2 - c}$$

⑥

initialize $\quad c = 0, \; m_1, m_2 = 1$

setting values:

$$\frac{dCEL}{dc} = \frac{50}{3} = 16.67$$

$$\therefore \text{stepsize} = 16.67 \times 0.01 = 0.16$$

∴ New $c = (0 - (-0.16))$

$= -0.16$

⑦ Using $c=0, m_1=1, m_2=1$;

Now,

$$\frac{d c \mathcal{E} L}{d m_1} = \frac{559}{12} = 46.58$$

stepsize $= 46.58 \times 0.01 = 0.465$

New $m_1 = 1 - (0.465)$

$= 0.535$

⑧ Now,

$$\frac{d c \mathcal{E} L}{d m_2} = \frac{355}{12} = 29.58$$

stepsize $= 29.58 \times 0.01$

$= 0.295$

New $m_2 = 1 - 0.295$

$= 0.704$

⑨ New parameters after iteration 1 =

$\boxed{c = -0.16, \quad m_1 = 0.535, \\ m_2 = 0.704}$

Predict : skill = 2
          exp = 4

Parameters : $c = -0.16$, $m_1 = 0.535$
                                $m_2 = 0.704$

$\hat{y} = m_1 exp + m_2 \times skill + c$

$= 0.535 \times 4 + 0.704 \times 2 - 0.16$

$= 3.388$

initialize $c = 0, m_1 = 1, m_2 = 1$

Plotting values:

$$\frac{dcE}{dc} = \frac{-120}{3+2} - \frac{119}{1-3-2} - \frac{80}{4+1} - \frac{79}{1-4-1}$$

$$- \frac{90}{2+2} - \frac{89}{1-2-2} = \frac{50}{3} = 16.67$$

$$\frac{dcE}{dm_1} = \frac{-120 \times 3}{3+2} - \frac{119 \times 3}{1-3-2} - \frac{80 \times 4}{4+1} - \frac{79 \times 4}{1-4-1}$$

$$- \frac{90 \times 2}{2+2} - \frac{89 \times 2}{1-2-2} = \frac{559}{12} = 46.58$$

$$\frac{dcE}{dm_2} = \frac{-120 \times 2}{3+2} - \frac{119 \times 2}{1-3-2} - \frac{80}{4+1} - \frac{79}{1-4-1}$$

$$- \frac{90 \times 2}{2+2} - \frac{89 \times 2}{1-2-2}$$

$$= \frac{355}{12} = 29.58$$