

Q1.1)

$$P(D|\theta) = \prod_{i=1}^m \theta^{x^{(i)}} (1-\theta)^{(1-x^{(i)})}$$

~~$$\log P(D|\theta) = \sum_{i=1}^m x^{(i)} \log \theta + (1-x^{(i)}) \log (1-\theta) = LL$$~~

~~$$\frac{\partial(LL)}{\partial \theta} = 0 \Rightarrow \sum_{i=1}^m (x^{(i)} \frac{1}{\theta} - (1-x^{(i)}) \frac{1}{1-\theta}) = 0$$~~

$$\log(P(D|\theta)) = \sum_{i=1}^m x^{(i)} \log \theta + (1-x^{(i)}) \log (1-\theta) = LL$$

$$\frac{\partial(LL)}{\partial \theta} = 0 \Rightarrow \sum_{i=1}^m \left( \frac{x^{(i)}}{\theta} + (1-x^{(i)}) \cdot \frac{-1}{1-\theta} \right) = 0$$

$$\sum_{i=1}^m \left( \frac{x^{(i)}(1-\theta)}{\theta(1-\theta)} + \frac{(x^{(i)}-1)\theta}{\theta(1-\theta)} \right) = 0$$

$$\sum_{i=1}^m \left( \frac{x^{(i)} - x^{(i)}\theta + x^{(i)}\theta - \theta}{\theta(1-\theta)} \right) = 0$$

$$m\theta_{MLE} = \sum_{i=1}^m x^{(i)}$$

$$\theta_{MLE} = \frac{\sum_{i=1}^m x^{(i)}}{m}$$

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