likelihood 
$$\leftarrow p(x; \theta)$$
 $\chi_{1}, \chi_{2}, \dots, \chi_{N}$ 
 $Q = arg \max \chi(\theta) = arg \max Q(\chi_{1}, \chi_{2}, \chi_{3}, \dots, \chi_{N}; \theta)$ 

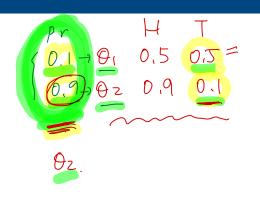
## Inclass 21: Maximum A Posteriori Estimate

[SCS4049] Machine Learning and Data Science

Seongsik Park (s.park@dgu.edu)

School of AI Convergence & Department of Artificial Intelligence, Dongguk University

$$\mathcal{L}(\varphi) = \Pr(\chi_1, \chi_2 \cdots , \chi_N; \varphi)$$





$$\frac{0.1 \to 0_{1}}{0.9 \to 0_{2}} \quad 0.5 \quad 0.5$$

$$\frac{0.9 \to 0_{2}}{0.9 \to 0_{2}} \quad 0.9 \quad 0.1$$

$$\frac{0.9 \to 0_{2}}{0.9 \to 0_{2}} \quad 0.9 \quad 0.1$$

$$\frac{0.9 \to 0_{2}}{0.9 \to 0_{2}} \quad 0.9 \quad 0.1$$

$$\frac{0.025}{0.009}$$

$$\frac{0.009}{0.009}$$

$$\frac{1}{9} \frac{1}{9} = \frac{1}{9} \frac{1}{1}$$

$$\frac{1}{9} \frac{1}{9} \frac{1}{9} = \frac{1}{9} \frac{1}{1}$$

Bayes' theorem

$$\frac{P(B|A)}{P(A)} = \frac{P(A,B)}{P(A)} = \frac{P(A,B)}{P(A,B)}$$

P(O| D)

D= X1, Z2, …, Xル

つ ひきの そのそのきの

のでしています。

 $\mathcal{L} P(D|\theta) P(\theta)$   $= P(X_1, X_2, ..., X_N | \theta) P(\theta)$ Prior  $\mathcal{L}_{1,2}^{2,0}$ 

POTICHISH OFFICELY THEFE

0/1

ろの201

## Maximum a posteriori estimate

## Maximum likelihood estimate

$$\hat{\theta}_{\text{MLE}} = \arg\max_{p(x_1, x_2, ..., x_N)} \underbrace{\mathcal{L}(\theta)}_{\text{MLE}} \tag{1}$$

· Maximum a posteriori estimate (MAP estimate)

Dikelihood 
$$\leftarrow p(x; \theta)$$

MLE

Posterior  $\leftarrow p(x; \theta), p(\theta)$ 

MAP.

 $\leftarrow p(x; \theta), p(\theta)$ 
 $\leftarrow p(x; \theta), p(\theta)$ 

$$0.5 \rightarrow \theta_{1} \quad 0.5 \quad 0.5$$

$$0.5 \rightarrow \theta_{2} \quad 0.9 \quad 0.1$$

$$0.5 \quad p(\theta_{1}) \times \mathcal{L}(\theta_{1}) = 0.25 \quad & p(\theta_{1}|TT)$$

$$0.5 \quad p(\theta_{2}) \times \mathcal{L}(\theta_{2}) = 0.01 \quad & p(\theta_{2}|TT)$$

$$0 = argmax \mathcal{L}(\theta) \stackrel{?}{=} 0 = argmax P(\theta|D)$$