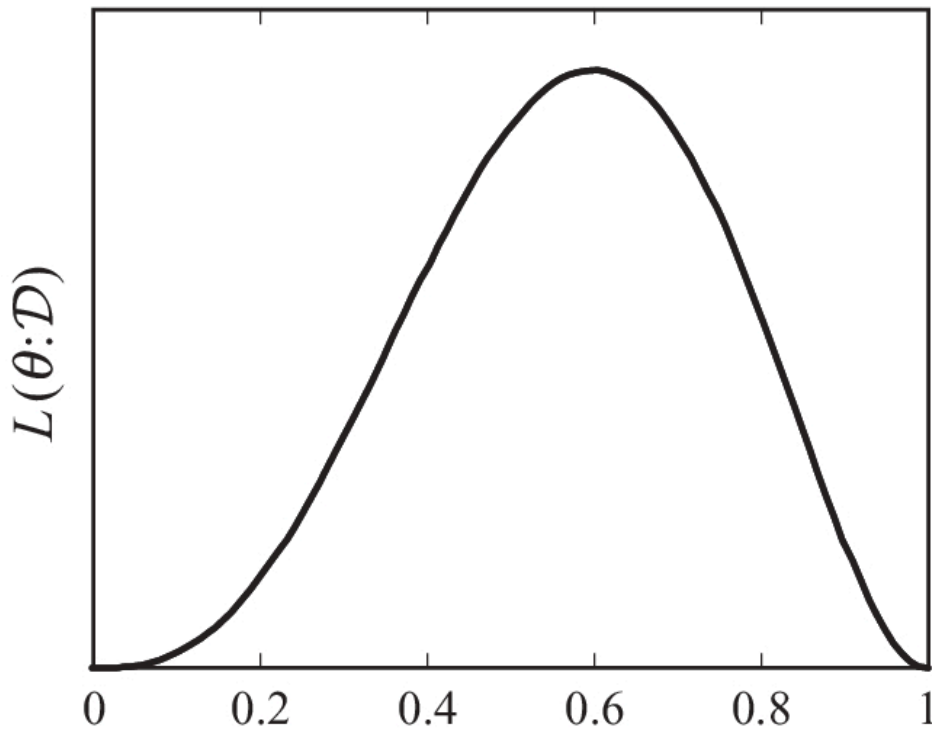


#### Information

## Parameter Learning

Consider the example of parameter learning for our thumbtack, from the lecture slides, where we had the following likelihood function, based on  $N = 5$  observations, of which  $k = 3$  were heads, and  $(N - k) = 2$  were tails:



#### Information

If instead of  $N = 5$  we had ten times as many observations ( $N = 50$ ), with  $k = 30$  heads, which of the following statements (if any) are correct?

#### Frage 18

Richtig

Erreichte Punkte 1,00 von 1,00

The likelihood function would keep its maximum at the same place, but become flatter / broader.

- ☐ Wahr
- ☒ Falsch ✓

Die richtige Antwort ist 'Falsch'.

**Frage 19**

Richtig

Erreichte Punkte 1,00 von 1,00

The function value at the maximum would be 10 times as high.

- ☐ Wahr
- ☒ Falsch ✓

Die richtige Antwort ist 'Falsch'.

**Frage 20**

Richtig

Erreichte Punkte 1,00 von 1,00

The likelihood function would now range (on the horizontal axis) from 0 to 10.

- ☐ Wahr
- ☒ Falsch ✓

Die richtige Antwort ist 'Falsch'.

**Frage 21**

Richtig

Erreichte Punkte 1,00 von 1,00

The maximum of the likelihood would shift to the left, towards the center value 0.5.

- ☐ Wahr
- ☒ Falsch ✓

Die richtige Antwort ist 'Falsch'.

**Information**

Back to the original example with  $N = 5$ . Now assume we perform **Bayesian** parameter estimation. We believe that thumbtacks behave like fair coins, which we model with a symmetric prior that has its maximum at  $\theta = 0.5$ .

**Frage 22**

Richtig

Erreichte Punkte 1,00 von 1,00

Will the resulting MAP estimate  $\hat{\theta}_{\text{MAP}}$  be ...

Wählen Sie eine Antwort:

- ☐ a. larger than  $\hat{\theta}_{\text{ML}}$
- ☐ b. the same as  $\hat{\theta}_{\text{ML}}$
- ☐ c. exactly at 0.5
- ☒ d. smaller than  $\hat{\theta}_{\text{ML}}$  ✓

Die richtige Antwort ist: smaller than  $\hat{\theta}_{\text{ML}}$

**Frage 23**

Richtig

Erreichte Punkte 1,00 von 1,00

If we now again increase the training data to ten times as many observations ( $N = 50$ ), with the same empirical distribution (30 heads, 20 tails), will the resulting MAP estimate ...

Wählen Sie eine Antwort:

- ☐ a. move farther away from  $\hat{\theta}_{\text{ML}}$
- ☐ b. stay the same, but with a higher probability
- ☒ c. move closer to  $\hat{\theta}_{\text{ML}}$  ✓

Die richtige Antwort ist: move closer to  $\hat{\theta}_{\text{ML}}$