

ML: Algo and Theory

SS 18

Tutor:

1	2	3	4	$\Sigma$

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## Assignment 2

(Due 24. April 2018)

### Exercise 1

siehe Code.

### Exercise 2

siehe Code.

### Exercise 3

(a)

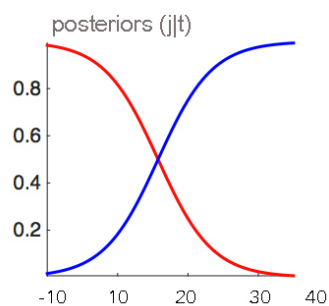
Maximum Likelihood Principle decision rule: look for the curve that has the highest likelihood.

Formal rule:

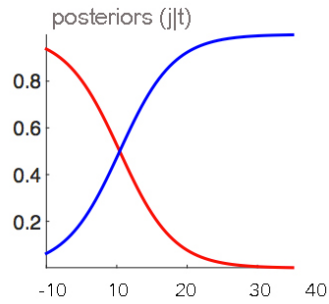
$$f_{ML}(t) = \begin{cases} \textit{winter} & \text{if } P(\textit{temp} = t | j = \textit{summer}) < P(\textit{temp} = t | j = \textit{winter}) \\ \textit{summer} & \text{otherwise} \end{cases}$$

(b)

Posterior probabilities for  $P(\textit{winter})=P(\textit{summer})=0.5$ . The temperature is on the x-axis and the probability on the y-axis. The red line is winter and the blue line is summer.



Posterior Probabilities for  $P(\text{summer})=0.8$  and  $P(\text{winter})=0.2$ . The temperature is on the x-axis and the probability on the y-axis. The red line is winter and the blue line is summer.



## Exercise 4

(a)  $R(n) = \frac{1}{n} \sum_{i=1}^n l(x_i, y_i, h_s(x_i))$ .

with

$$l(x_i, y_i, h_s(x_i)) = \begin{cases} 0 & \text{if } y_i = h_s(i) \\ 1 & \text{otherwise} \end{cases} \quad (1)$$

$\forall i \in \{1, \dots, n\}$  s.t.

$$l(x_i, y_i, h_s(x_i)) = 0 \Rightarrow R(n) = \frac{1}{n} \sum_{i=1}^n 0 = 0$$

Therefore the empirical Risk is 0 for any given set of examples.