

# Machine Learning 1 – Exercise 2

Machine Learning for Computer Vision  
TU Dresden

Solutions to any part of any exercise will be accepted as separate postings in the thread entitled **Exercise 1: Solution** of the lecture forum<sup>1</sup> until **Nov 27th, 18:00**. The solutions will not be graded. At the end of this term, the most highly voted solution will be awarded with a book prize.

## 1 Deciding with linear functions

1. In the lecture notes<sup>2</sup>, derive (3.42) from (3.40) using (3.41), (3.35) and (3.36)
2. Prove that the objective function  $\varphi$  of the  $l_2$ -regularized logistic regression problem (3.42) in the lecture notes<sup>2</sup> is convex in  $\theta$ .

$$\varphi(\theta) = \sum_{s \in S} \left( -y_s \langle \theta, x_s \rangle + \log \left( 1 + 2^{\langle \theta, x_s \rangle} \right) \right) + \frac{\log e}{2\sigma^2} \|\theta\|_2^2 \quad (1)$$

---

<sup>1</sup><https://bildungsportal.sachsen.de/opal/auth/RepositoryEntry/26617479170/CourseNode/102502724177602>

<sup>2</sup><https://mlcv.inf.tu-dresden.de/courses/wt20/ml1/ml1-lecture-notes.pdf>