

## Algorithms and Uncertainty

Winter Term 2025/26

Tutorial Session - Week 14

### Exercise 1:

We consider Online Quadratic Optimization. That is, in each round, the function  $f_t$  has the form  $f_t(\mathbf{x}) = \frac{1}{2} \|\mathbf{x} - \mathbf{y}_t\|_2^2$  for some vector  $\mathbf{y}_t$ . Show that the regret of Follow-the-Leader is bounded by  $4 \cdot (\max_t \|\mathbf{y}_t\|)^2 \cdot (\log T + 1)$ .

**Hint:** Use Lemma 22.3 to bound the regret. In addition, note that for the  $k$ -th harmonic number  $H_k$ , we have  $H_k \leq \log k + 1$ .