

## Algorithms and Uncertainty

Winter Term 2023/24

Tutorial Session - Week 3

### Exercise 1:

Consider the following rounding algorithm for the Online Set Cover problem. In step  $t$ , as a new element  $e$  arrives, holding a solution to the fractional set cover problem, we pick all sets  $S \in \mathcal{S}$  for which  $x_S^{(t)} \geq 1/f$ . Again, let  $f = \max_{e \in U} |\{S \in \mathcal{S} \mid e \in S\}|$  denote the frequency of the set system, which is known beforehand.

- (a) Show that the rounded integral solution is feasible for the Online Set Cover problem.
- (b) Show that if we use an  $\alpha$ -competitive algorithm for the fractional problem, the algorithm for the integral problem is  $\alpha f$ -competitive.