Thomas Kesselheim
Johanna Luz

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Algorithms and Uncertainty

Winter Term 2026/27

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, using 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 α-competitive algorithm for the fractional problem, the algorithm for the integral problem is αf-competitive.