Thomas Kesselheim
Anna Heuser

October 29/30, 2025

Algorithms and Uncertainty

Winter Term 2025/26

Tutorial Session - Week 3

If you do not know each other yet, each of you could start with a very quick introduction: What's your name? Do you study Computer Science or maybe something else (Maths, Economics,...)? Do you have any prior knowledge in Algorithms and Uncertainty?
Afterwards, please discuss the exercises on this sheet. Note that you should see this also as a chance to talk about definitions, proof ideas and techniques used in the lecture in addition to only working out a formal solution for the tasks. If you do not know a definition or theorem by hard, feel free to open the lecture notes and have a look.

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.