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Algorithms and Uncertainty

Summer Term 2021

Tutorial Session - Live Tasks 6

Exercise 1:
Show that Stochastic Set Cover can be reduced to the deterministic problem. To this end, define a different universe of elements U', family of subsets $\mathcal{S}'$, and costs $(c'_{S'})_{S' \in \mathcal{S}'}$ appropriately. Any solution of this Set Cover instance then corresponds to a policy of the same cost.

Exercise 2:
We consider the Stochastic Vertex Cover problem which is a special case of the Stochastic Set Cover problem from the lecture. The edge set $A \subseteq E$ is uncertain, but drawn from a known probability distribution. The probability that the edge set is $A \subseteq E$ is given by p_A. Our goal is to compute a Vertex Cover of minimum cost for the graph $G = (V, A)$. Before A is revealed, we have to pay c_v^{I} for v, afterwards $c_v^{\mathrm{II}} \geq c_v^{\mathrm{I}}$.

Derive an LP such that every policy corresponds to a feasible solution. Consider variables x_v denoting if v is picked in the first stage and $y_{A,v}$ if the edge set is A and v is picked in the second stage.