The LP-rounding plus Greed Approach for Partial Optimization Revisited

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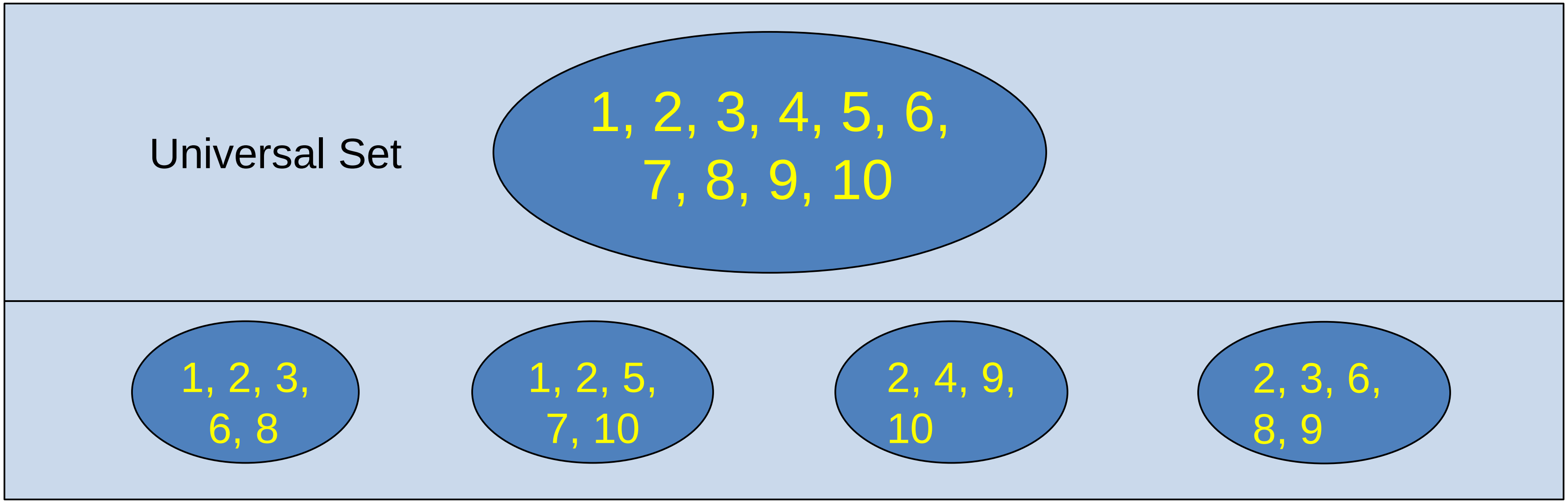
Partial Optimization Problems

- There are many optimization problems having the following common property: Given a total task consisting of many subtasks, the problem asks to find a solution to complete only part of these subtasks.
- Examples include k-Forest, k-Multicut, Set k-Cover, etc.



Set k-Cover: select the smallest number of subsets to cover >= k elements.

Main Contributions

- We propose the LP-rounding plus greed approach to design approximation algorithms for partial optimization problems.
- The approach is simple, powerful and versatile.

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\begin{aligned}
\min \quad & \sum_{e \in E(G)} c_e x_e & & \text{(LP}_k\text{-F)} \\
\text{s.t.} \quad & \sum_{e \in \delta(S)} x_e + z_i \geq 1, & \forall i \in [q], \forall S \in \mathcal{S}_i & \quad (1) \\
& \sum_{1 \leq i \leq q} z_i \leq q - k & & \quad (2) \\
& x_e \geq 0, & \forall e \in E(G) & \\
& z_i \geq 0, & \forall i \in [q] &
\end{aligned}
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Solved Problmes
k-Forest k-Multicut k-Connectivity k-SBaB …