Maximizing the Guarded Boundary of a Dynamic Art Gallery

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A reminder on art gallery

flipping what we optimize

A weighted case

Stating the problem

How can we add edges to a graph to make the ratio of the closeness centrality of two vertices as close to 1 as possible?

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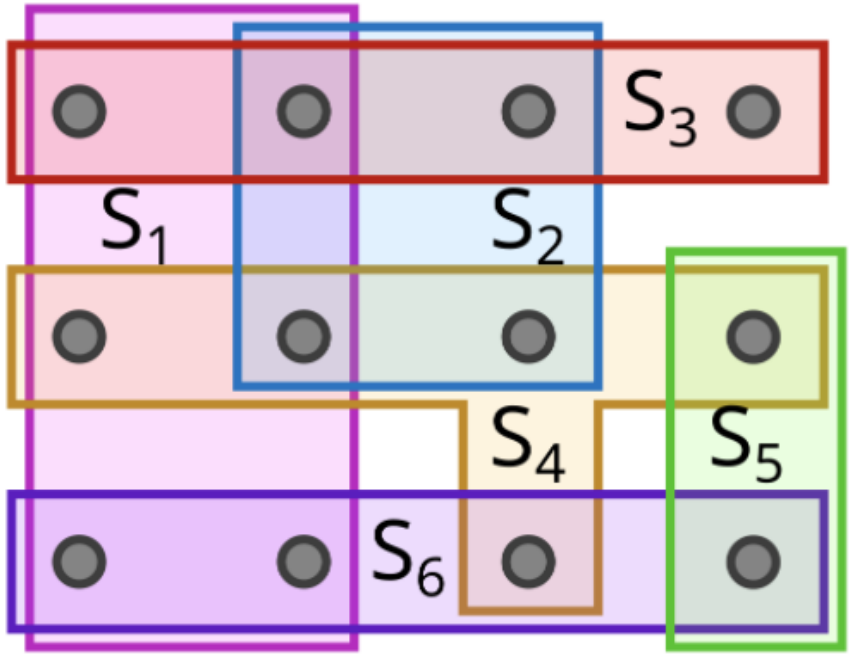
Closeness Ratio Improvement

Input: A graph $G = (V, E)$, $a, b \in V$, and $k \in \mathbb{N}$.

Problem: Find a set of edges $T \subseteq V^2 - E$ of size at most k which maximizes the value of $\frac{\min(c_{G+T}(a), c_{G+T}(b))}{\max(c_{G+T}(a), c_{G+T}(b))}$.

Set Cover (a known NP-hard problem)



Set Cover

Input: A universe U of n elements, m subsets of U, $k \in \mathbb{N}$.

Problem: Are there k subsets such that their union covers all of U?

Monotonicity

Submodularity

A basic approach

A dynamic version

Thank You!

Questions?