CS170 — Fall 2020 — Project

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1. Constraints

(a) let $g_{v,k}$ denote an indicator variable that is either $\{0,1\}$ if vertex v is in group k.

(b) no vertex can be in more than one group, and every vertex must be in a group

$$\forall v \in V : \sum_k g_{v,k} = 1$$

(c) let $e_{u,v}$ denote an indicator variable that is either $\{0,1\}$ if edge (u,v) denotes an edge between two edges in the same group. In other words, $\forall k : e_{u,v} \geq g_{u,k} * g_{v,k}$.

(d) The sum of all stress in a given group must be less than S_{max}/k. In other words,

$$\forall u, v \in V : \sum_k (e_{u,v} * s_{uv}) < \frac{S_{max}}{k}$$

(e) Objective: maximize total happiness:

$$\forall u, v \in V : \max \sum_k (e_{u,v} * h_{uv})$$

Total Constraints: $|V|k + |V|k + |E|k + |E|k = 2|V|k + 2|E|k = |V|k(1 + |V|)$
Objective Variables: $O(|E|k)$

2. Guarantees

(a) Prune any edge where $s_{uv} > \frac{S_{max}}{k}$

(b) Max Happiness: $\frac{n(n-1)}{2}(\max h_{uv})$ (though this probably won't happen)

(c) Minimum Number of Rooms k must satisfy: $\frac{S_{max}}{k} \geq (\frac{(\frac{n}{k})^2 - (\frac{n}{k})}{2}) \min s_{uv}$