

Mathematical Model

Objective function.

$$\min_x \left\{ z := \sum_{(i,j) \in E} \frac{\omega_{ij}}{2} x_{ij} + \sum_{(i,j) \in E} \omega_{ij} (1 - x_{ij}) \right\}$$

Subject to the following constraints:

$$\begin{aligned} x_{ij} \sum_{k \in n(i) \cap n(j)} (x_{ik} + x_{jk}) &= x_{ij} \left(\sum_{k \in n(i)} x_{ik} + \sum_{k \in n(j)} x_{jk} - 2 \right) & \forall (i, j) \in E \\ x_{ij} \sum_{k \in n(i) \cap n(j)} x_{ik} &= x_{ij} \sum_{k \in n(i) \cap n(j)} x_{jk} & \forall (i, j) \in E \\ x_{ij} \sum_{k \in n(i)} x_{ik} &= x_{ij} \sum_{k \in n(j)} x_{jk} & \forall (i, j) \in E \\ x_{ij} &\in \{0, 1\} & \forall (i, j) \in E \end{aligned}$$

Linearizing the product $x_{ij}x_{ik}$

$$\xi_{ijk} = x_{ij}x_{ik}$$

$$\xi_{ijk} \leq x_{ij}$$

$$\xi_{ijk} \leq x_{ik}$$

$$\xi_{ijk} \geq x_{ij} + x_{ik} - 1$$

$$\xi_{ijk} \in \{0, 1\}$$