Evidencia ecuaciones en LaTex

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1 Matrix.

Incidence matrix 1:

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 1 & -1 & 0 & 0 & 0 \\ 0 & -1 & -1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 & 1 \end{bmatrix} \tag{1}$$

2 Several Models.

$$min \sum_{s \in N: s \neq t} \sum_{t \in N: t \neq s} \sum_{(ij) \in P} = c_{ij}\ x_{ij}^{st} \tag{2}$$

S.t.

$$\sum_{(ij) \in P} x_{ij}^{st} - \sum_{(ij) \in P} x_{ji}^{st} = \begin{cases} 1, & i = s \quad \forall i \in N; s \in N : s \neq t \\ -1, & i \neq s, t \quad \forall i \in N; s \in N : s \neq t; t \in N : t \neq s \\ -1, & i = t \quad \forall i \in N; t \in N : t \neq s \end{cases} \tag{3}$$

Domain:

$$x_{ij}^{st} \in \{0, 1\} \quad \forall (ij) \in P; i \neq j; (st) \in N; s \neq t \tag{4}$$

$$f(tik) = \sum_{t \in \mathbf{T}} \sum_{i \in \mathbf{PL}} \sum_{k \in \mathbf{NP}} (cm_f\ h_{im}^t + cm_r\ h_{im}^{t-1} + cm_n\ h_{im}^{t-2})\ a_{km}^i\ x_{ki}^t \tag{5}$$

$$g(trk) = \sum_{t \in \mathbf{T}} \sum_{r \in \mathbf{CD}} \sum_{k \in \mathbf{NP}} h_{kr}^t\ y_{kr}^t \tag{6}$$

$$h(tik) = \sum_{t \in \mathbf{T}} \sum_{i \in \mathbf{PL}} \sum_{k \in \mathbf{NP}} pr_{ki}^i\ cc_{il}\ u_{kil}^t + pr_{ki}^i\ cc_{ir}\ v_{kir}^t \tag{7}$$

$$p(trk) = \sum_{t \in \mathbf{T}} \sum_{r \in \mathbf{CD}} \sum_{k \in \mathbf{NP}} pr_{kr}^r\ cc_{rl}\ w_{krl}^t \tag{8}$$

The model is given by;

$$min \;\; f(tik) + g(trk) + h(tik) + p(trk) \tag{9}$$

S.t

$$\sum_{i \in \mathbf{PL}} \sum_{l \in \mathbf{CL}} u^t_{kil} + \sum_{r \in \mathbf{CD}} \sum_{l \in \mathbf{CL}} w^t_{krl} = \sum_{l \in \mathbf{CL}} d^t_{kl} \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP} \tag{10}$$

$$\sum_{r \in \mathbf{CD}} y^t_{kr} \leq \sum_{r \in \mathbf{CD}} p^t_r \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP} \tag{11}$$

$$\sum_{i \in \mathbf{PL}} x^t_{ki} \leq \sum_{i \in \mathbf{PL}} Q^t_i q^k_i \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP} \tag{12}$$

$$\sum_{i \in \mathbf{PL}} x^t_{ki} - \sum_{i \in \mathbf{PL}} u^t_{kil} - \sum_{i \in \mathbf{PL}} v^t_{kir} = 0 \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP}; r \in \mathbf{CD} \tag{13}$$

Domain:

$$0 \leq Q^t_i \leq 1 \tag{14}$$

$$a^i_{km}, d^t_{kl}, q^k_i, p^t_r, Q^t_i \geq 0 \; integer \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP}; r \in \mathbf{CD}; i \in \mathbf{PL} \tag{15}$$

$$x^t_{ki}, y^t_{kr}, u^t_{kil}, v^t_{kir}, w^t_{krl} \geq 0 \; integer \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP}; r \in \mathbf{CD}; i \in \mathbf{PL}; l \in \mathbf{CL} \tag{16}$$

$$h^t_{kr}, pr^i_{ki}, pr^r_{kr}, cc_{il}, cc_{rl}, cc_{ir} h^t_{im}, cm_f, cm_r, cm_n \geq 0 \qquad \forall\, t \in \mathbf{T}; k \in \mathbf{NP}; r \in \mathbf{CD}; i \in \mathbf{PL}; l \in \mathbf{CL} \tag{17}$$

3 Diff eq.

$$c \frac{\partial C_{mt}}{\partial t} = \frac{\partial (\frac{\partial C_{mcr}}{\partial t} + \frac{\partial C_{mpr}}{\partial t} + \frac{\partial C_{mpv}}{\partial t})}{\partial E} + S \tag{18}$$