2020 INFORMS Demo Formulation

Rob Randall, PhD Princeton Consultants

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1 Data

1.1 Sets

- Let $\mathcal{T}$ be the set of tasks that need to be completed.
- Let $\mathcal{R}$ be the set of resources that can complete the tasks.
- Let $\mathcal{Q}_r$ be the set of tasks that resource $r \in \mathcal{R}$ can perform.

1.2 Data Inputs

- Let η_t be the number of hours for a task $t \in \mathcal{T}$.
- Let λ_r be the cost per hour for a resource $r \in \mathcal{R}$.
- Let γ_r be the number of hours that a resource $r \in \mathcal{R}$ can work in one day.

1.3 Data Transformations

- Let θ_{rt} be the cost for a resource $r \in \mathcal{R}$ performing a task $t \in \mathcal{T}$.

$$\theta_{rt} = \eta_t \cdot \lambda_r \qquad \forall r \in \mathcal{R},\, t \in \mathcal{T}$$

2 Decision Variables

- Let $x_{rt} \in \{0, 1\}$ be one if the resource $r \in \mathcal{R}$ is assigned to perform task $t \in \mathcal{T}$, 0 otherwise.

3 Objective

The objective function for the model is to minimize the cost of assigning the resources to tasks.

$$\text{Minimize} \sum_{r \in \mathcal{R}} \sum_{t \in \mathcal{T}} \theta_{rt} \cdot x_{rt}$$

4 Constraints

4.1 Ensure Each Resource Stays within their Allowed Hours

Each resource can only be assigned tasks whose total time must be no more than their maximum hours for a day.

$$\sum_{t \in \mathcal{T}} \eta_t \cdot x_{rt} \leq \gamma_r \qquad \forall r \in \mathcal{R}$$

4.2 Assign Each Task to only One Resource

Each task can only be assigned to be performed one task in the model.

$$\sum_{r \in \mathcal{R}} x_{rt} = 1 \qquad \forall t \in \mathcal{T}$$