

# 2020 INFORMS Demo Formulation

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

### 1.3 Data Transformations

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

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

## 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.

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

#### 4.2 Assign Each Task to only One Resource

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

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