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Abstract

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1 Problem statement

We have to solve a schedule problem in an hospital. We need to design the nurses' schedule of a single day (24 hours). We have available a set of nurses, we need to minimize the number of nurses required by following some constraints.

We introduce the following parameters :

- $numNurses$: Number of nurses available
- $hours$: Number of total hours in one working day
- $demand$: Vector representing the number of nurses who are supposed to work at each hours
- $minHours$: Minimal number of working hours
- $maxHours$: Maximal number of working hours
- $maxConsec$: Maximal allowed number of consecutive working hours
- $maxPresence$: Maximal number of hours the nurses can spend at the hospital

Now we introduce the different constraints :

C1 : For each hour h, at least, $demand[h]$ nurses should be working

C2 : Each nurse should work at least $minHours$ hours

C3 : Each nurse should work at most $maxHours$ hours

C4 : Each nurse should work at most $maxConsec$ consecutive hours

C5 : No nurse can stay at the hospital for more than $maxPresence$ hours

C6 : No nurse can rest for more than one consecutive hour

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2 Linear model for optimization in OPL

In order to solve this optimization problem in OPL we used the aforementioned parameters but we also had to add new parameters :

- range N : Range between 1 and $numNurses$
- range H : Range between 1 and $hours$
- works[numNurses][hours] : Boolean matrix of size $numNurses * hours$. Tells for each nurse if he/she is working for each hour. i.e, if $works[i][j] = 1$ then the nurse i is working during the hour j
- used[numNurses] : Boolean vector telling if a nurse is working at least one hour (value 1) or not (value 0).