Modello Tesi HCP

1 Version 1

1.1 Constants

- θ visit percentage threshold;
- τ time slot duration;
- σ minimum level of skill;
- Σ maximum level of skill.

1.2 Sets and properties

- O set of operators;
  - s_o operator skill level;
  - h_o operator contract time;
  - c_o operator wage;
- V set of visits;
  - s_v visit skill level;
  - h_v visit duration;
- P set of patients;
- T set of time slots.

1.3 Parameters

- $r_{p,t,v} \in \{0, 1\}$ request from patient p for visit v at time t;

1.4 Precomputation parameters

- μ_p (`minGlobalContinuity[Patients]`) - support parameter for care continuity.

1.5 Variables

- $a_{p,t,v,o} \in \{0,1\}$: 1 if operator o is assigned to patient p for visit v at time slot t.

1.6 Objective function

Minimize total wage expense:

$$\sum_{p,t,v,o} a_{p,t,v,o} \cdot c_o \cdot h_v$$

1.7 Constraints

- each visit must be handled:

$$\forall p,t,v \quad \sum_{o} a_{p,t,v,o} = r_{p,t,v}$$

- for each patient, time slot, and visit, the skill of the operator must be greater than or equal to the skill of the visit they are assigned to:

$$\forall p,t,v \quad \sum_{o} a_{p,t,v,o} \cdot s_o \geq r_{p,t,v} \cdot s_v$$

- for each time slot, the sum of visit times for all patients, visits, and operators should be less than or equal to the time slot duration:

$$\forall o \quad \sum_{p,t,v} a_{p,t,v,o} \cdot h_v \leq \tau$$

- the operators must work at most as much as their contract states:

$$\forall p,t,v \quad \sum_{o} a_{p,t,v,o} \cdot h_v \leq h_o$$

- *care continuity* - for each patient, the same operator should handle all the requests for visits with the same skill level:

$$\forall p \quad \sum_{t_1,t_2,v_1,v_2,o_1,o_2} a_{p,t_1,v_1,o_1} \cdot a_{p,t_1,v_1,o_1} = 0$$

  The formula has some constraints on the indexes: in particular, $o_1 \neq o_2$, $t_1 \neq t_2$, and at least one of $s_{v_1} \neq s_{v_2}$ and $\mu_p > \min(s_{v_1}, s_{v_2})$ holds. The equation makes it impossible for two different operators to handle visits

with the same skill level and also enforces the *minimum global continuity* constraint - if a patient has more than θ requests, in percentage, for visits of a skill level $s > \sigma$, an operator with skill level s should also handle lower requests.