

Intern_Roster

March 4, 2019

1 Intern Roster

1.1 Introduction

We have 11 interns. Let each intern be i .

We have 13 rotations. Let each rotation be j . There are also three annual leave rotations. These shall be j values 14, 15, 16. Therefore the total is 16.

We have 54 weeks for the whole period of the roster. Let each week be k .

j	Rotation Label	Duration	Maximum Interns per week
1	CPD-G	8	2
2	CPD-V	4	1
3	AP	4	1
4	MIC	4	1
5	MCH	2	1
6	CPCa	3	1
7	CPM	3	no limit
8	CPK	2	no limit
9	IP	4	2
10	DISP	3	no limit
11	CPC	5	no limit
12	QUM	1	1
13	H	1	1
14	A/L_1	1	11
15	A/L_2.1	1	6
16	A/L_2.2	1	5

1.2 Decision Variables

$$\begin{array}{l} x_{jk}^i \\ C_{ij} \\ y_{j,k+\alpha}^i \\ z_k \end{array} \quad \text{where} \quad \alpha \in \mathbb{Z}$$

1.3 Objective Function

$$\max \sum_i \sum_j \sum_k C_{ij} x_{jk}^i$$

1.4 Constraints

Intern Rotation Completion Constraint

Let $x_{jk}^i = 1$ if person i is doing rotation j for week k .

$$\sum_k x_{jk}^i \geq 1 \quad \forall i, \quad \forall j$$

$$x_{1,1}^1 + x_{1,2}^1 + \cdots + x_{1,54}^1 \geq 1$$

$$x_{1,1}^2 + x_{1,2}^2 + \cdots + x_{1,54}^2 \geq 1$$

\vdots

$$x_{1,1}^{11} + x_{1,2}^{11} + \cdots + x_{1,54}^{11} \geq 1$$

\vdots

\vdots

$$x_{16,1}^{11} + x_{16,2}^{11} + \cdots + x_{16,54}^{11} \geq 1$$

Intern Rotation Capacity Constraint

$$\sum_i x_{1,k}^i \leq 2 \quad \forall k$$

$$\sum_i x_{2,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{3,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{4,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{5,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{6,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{7,k}^i \geq 0 \quad \forall k$$

$$\sum_i x_{8,k}^i \geq 0 \quad \forall k$$

$$\sum_i x_{9,k}^i \leq 2 \quad \forall k$$

$$\sum_i x_{10,k}^i \geq 0 \quad \forall k$$

$$\sum_i x_{11,k}^i \geq 0 \quad \forall k$$

$$\sum_i x_{12,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{13,k}^i \leq 1 \quad \forall k$$

$$\sum_i x_{14,k}^i = 11 \quad \forall k$$

$$\sum_{i=1}^6 x_{15,k}^i = 6 \quad \forall k$$

$$\sum_{i=7}^{11} x_{16,k}^i = 5 \quad \forall k$$

Intern Rotation Duration Constraint

$$\sum_{\alpha=0}^7 y_{1,k+\alpha}^i = 8 \text{ if } x_{1,k}^i = 1$$

$$\sum_{\alpha=0}^3 y_{2,k+\alpha}^i = 4 \text{ if } x_{2,k}^i = 1$$

$$\sum_{\alpha=0}^3 y_{3,k+\alpha}^i = 4 \text{ if } x_{3,k}^i = 1$$

$$\sum_{\alpha=0}^3 y_{4,k+\alpha}^i = 4 \text{ if } x_{4,k}^i = 1$$

$$\sum_{\alpha=0}^1 y_{5,k+\alpha}^i = 2 \text{ if } x_{5,k}^i = 1$$

$$\sum_{\alpha=0}^2 y_{6,k+\alpha}^i = 3 \text{ if } x_{6,k}^i = 1$$

$$\sum_{\alpha=0}^2 y_{7,k+\alpha}^i = 3 \text{ if } x_{7,k}^i = 1$$

$$\sum_{\alpha=0}^1 y_{8,k+\alpha}^i = 2 \text{ if } x_{8,k}^i = 1$$

$$\sum_{\alpha=0}^3 y_{9,k+\alpha}^i = 4 \text{ if } x_{9,k}^i = 1$$

$$\sum_{\alpha=0}^2 y_{10,k+\alpha}^i = 3 \text{ if } x_{10,k}^i = 1$$

$$\sum_{\alpha=0}^4 y_{11,k+\alpha}^i = 5 \text{ if } x_{11,k}^i = 1$$

$$y_{12,k}^i = 1 \text{ if } x_{12,k}^i = 1$$

$$y_{13,k}^i = 1 \text{ if } x_{13,k}^i = 1$$

$$y_{14,k}^i = 1 \text{ if } x_{14,k}^i = 1$$

$$y_{15,k}^i = 1 \text{ if } x_{15,k}^i = 1$$

$$y_{16,k}^i = 1 \text{ if } x_{16,k}^i = 1$$

Intern Leave Constraint

$$\sum_i x_{14,k}^i = 11z_k \text{ if } \sum_k z_k = 1$$

$$\sum_i x_{15,k}^i = 6z_k \text{ if } \sum_k z_k = 1$$

$$\sum_i x_{16,k}^i = 5z_k \text{ if } \sum_k z_k = 1$$