

Parent-Teacher conferences

Knowledge and Data Mining Project

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- Schedule parent-teacher conferences
- Each meeting between parent(s) and a teacher lasts for the same fixed amount of time for convenience, we want to find a schedule so that every person's conferences occur in consecutive time slots
- Input: n teachers, m parents, and a $m \times n$ matrix S_{ij} :
 $S_{ij} = 1$ if teacher j has a student whose parent is i otherwise is equal to 0

- Matrix S generated randomly, $T = 4$ and $P = 5$
($P > T$ since students have more than one teacher)
- The maximum number of slots available per teacher is given by the max number of parent a teacher should meet w.r.t. S . This variable is saved as *spots*.
- Use variable $m_{t,p,s}$ with 3 different indices return a single variable following the rule:

$$m_{t,p,s} = 1 + p \cdot T \cdot spots + s \cdot T + t$$

- Example: $(0, 0, 0)$ is encoded in 1, $(1, 0, 0)$ is encoded in 2.

Encoding

- Only one meeting for each pair teacher-parent

$$\forall s' \neq s \quad m_{t,p,s} \rightarrow \neg m_{t,p,s'} \quad \text{CNF: } \neg m_{t,p,s} \vee \neg m_{t,p,s'}$$

- A parent cannot meet more than one teacher per slot

$$\forall t' \neq t \quad m_{t,p,s} \rightarrow \neg m_{t',p,s} \quad \text{CNF: } \neg m_{t,p,s} \vee \neg m_{t',p,s}$$

- A Teacher cannot meet more than one parent per slot

$$\forall p' \neq p \quad m_{t,p,s} \rightarrow \neg m_{t,p',s} \quad \text{CNF: } \neg m_{t,p,s} \vee \neg m_{t,p',s}$$

- Choose 1 $m_{t,p,s}$ w.r.t to the 1 in $S[p, t]$:

$$\forall t, p \quad \text{AtMost}(\bigvee_{s=1}^{\text{spots}} m_{t,p,s}; S[p, t])$$

- With Pysat implemetation of RC2 algorithm
- WCNFPlus support cardinality constraints

First Result

	Teacher 0	Teacher 1	Teacher 2	Teacher 3
Slot 0	Parent 1	Parent 2		Parent 0
Slot 1	Parent 2	Parent 0	Parent 4	Parent 1
Slot 2		Parent 4	Parent 0	Parent 2
Slot 3		Parent 1		Parent 4
Slot 4	Parent 4		Parent 1	Parent 3

Encoding the preference as a soft constraint

Encoding

- If a slot s is occupied then the slot $s + 1$ should be occupied

$$\forall t, p \quad m_{t,p,s} \rightarrow m_{t,p,s+1}$$

- The CNF in this case is:

$$\neg m_{t,p,s} \vee m_{t,p,s+1} \quad \text{with positive weight}$$

Consecutive time-slots

	Teacher 0	Teacher 1	Teacher 2	Teacher 3
Slot 0				Parent 0
Slot 1		Parent 4		Parent 1
Slot 2	Parent 2	Parent 1	Parent 0	Parent 4
Slot 3	Parent 4	Parent 0	Parent 1	Parent 2
Slot 4	Parent 1	Parent 2	Parent 4	Parent 3

