Optimization methods and algorithms

Examination Timetabling Problem

Group 18 (AA-LZ)

Students:

Enrico Cecchetti s253823

Matteo D'Ospina s252973

Federico Gianno s214525

Salvatore Giordano s252811

Carlo Maria Negri s 214809

- **Variables**

ST	$ST_1 , ST_2 , \dots , ST_n$	Students	$ST \in N^+$	n = # of total students
E	$E_1 , E_2 , \dots , E_m$	Exams	$E \in N^+$	m = # of total exams
T	$T_1 , T_2 , \dots , T_{max}$	Time slots	$T \in N^+$	T_{max} = # of time slot

C = E x E Conflict matrix [symmetric]
It contains the number of students for conflicting exams.
The size of the matrix is m x m.
$C_{ij} \in N \; \forall \; i,j$

X = E x E x 5 Conflict tensor
It is a boolean tensor that contains a 1 if two conflicting exams are scheduled at k distance (with k=1,..,5), 0 otherwise.
The size of the matrix is m x m x 5.
$X_{ijk} \in \{0,1\} \; \forall \; i,j,k$

S = E x T Schedule matrix
It is a boolean matrix that contains a 1 if an exam E_i is scheduled in a timeslot T_j , 0 otherwise.
The size of the matrix is m x z.
$S_{ij} \in \{0,1\} \; \forall \; i,j$

- **Logical constrains about X**

$$i \in \{1, 5\}$$

$$i = t - t'$$

$$S_{et} + S_{e't'} \leq 1 + X_{ee'i} \qquad S_{et} + S_{e't'} \geq 2X_{ee'i}$$

U

$$S_{et'} + S_{e't} \leq 1 + X_{ee'i} \qquad S_{et'} + S_{e't} \geq 2X_{ee'i}$$

- **Objective Function**

$$min \sum_{i=1}^{5} \sum_{j=1}^{m} \sum_{k=1}^{m} X_{ijk} \frac{2^{5-i}}{n} C_{jk}$$

- **Constrains**

Each exam is scheduled once during the period.

∀ j ∈ 1, … , m

$$\sum_{t=1}^{T_{max}} S_{jt} = 1$$

Two conflicting exams are not scheduled in the same time slot.

$$\sum_{j=1}^{m} \sum_{k=1}^{m} X_{0jk} C_{jk} = 0 \qquad k \neq j$$