PROJECT FORMULATION

Data and Variables

- $E = \{ e_1, e_2, \ldots\ldots, e_i \}$ $\quad \exists\, i = 1, \ldots, n$: set of exams, $i \in N$
- $S = \{ s_1, s_2, \ldots\ldots, s_i \}$ $\quad \exists\, i = 1, \ldots, n$: set of students, $i \in N$
- $T = \{ t_1, t_2, \ldots. t_i \}$ $\exists\, i = 1, \ldots, n \quad \exists\, t_1 < t_2 < \ldots. < t_i$: set of ordered timeslots, $i \in N$
- X_{ij} = student s_i is enrolled in exam e_j , $X_{ij} \in \{0, 1\}$, $\quad \exists\, s_i \in S, \quad e_j \in E$
- Y_{ij} = exam e_i takes place at timeslot t_j , $Y_{ij} \in \{0, 1\}$, $\quad \exists\, e_i \in E, \quad t_j \in T$
- $n_{e_j} = \sum_{i=1}^{n} X_{ij}$: number of students enrolled in exam e_j , $n_{e_j} \in \{0, \ldots, n\}$
- $W_{m,p} = [e_m, e_p]$: set of pairs of conflicting exams e_m and e_p
- If 2 exams e_m and e_p are conflicting, we have:
  $Y_{mj} = 1, \quad \exists\, m \in E$, for the first exam
  $Y_{p,j+k} = 1 \quad \exists\, p \in E \text{ and } p \neq m, \ \exists\, 1 \leq k < 5$, for the next exam and the penalty is: $Z_{m,p,j,j+k} = 2^{5-k} . \frac{n_{e_{m,p}}}{|S|}$

Constraints

- $\sum_{i=m,p} Y_{ij} = 1$: conflicting exams e_m and e_p can't take place in the same time-slots.
- $\sum_{i=1}^{n} \sum_{j=1}^{n} Y_{ij} = 1$: each exam is scheduled exactly once during the examination period (= sum of all the timeslots).

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Objective function

$$\text{Min} \sum_{j=0}^{n} \sum_{i=0}^{n} Z_{m,p,j,\,j+k}$$