Details of the Model

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Decision Variables (Found by Optimizer)

- Courses: c_i for $i \in \{1, \dots, m\}$
  - $$c_i = \begin{cases} 1, & \text{if course } i \text{ should be offered} \\ 0, & \text{otherwise} \end{cases}$$
- Student Assignments: s_{ij} for $i \in \{1, \dots, n\}, j \in \{1, \dots, m\}$
  - $$s_{ij} = \begin{cases} 1, & \text{if student } i \text{ is assigned course } j \\ 0, & \text{otherwise} \end{cases}$$

Other Variables (Fixed before Running Optimizer)

- Course Ratings: r_{ij}
  - r_{ij} = student i's rating for course j
- Course Timings: t_{ij}
  - $$t_{ij} = \begin{cases} 1, & \text{if course } i \text{ takes place at time-step } j \\ 0, & \text{otherwise} \end{cases}$$

Objective Function

$$\max \sum_{i \in n} \sum_{j \in m} (s_{ij} \cdot c_j) \cdot r_{ij}$$

Constraints:

Constraint 1: Time Conflict Constraint

Constraint 2: Bounds on Number of Courses Assigned to a Student

Constraint 3: Cap on Number of Students in a Course

Constraint 4: Each Prof Offers Exactly 1 Course

Constraints Represented Mathematically:

Constraint 1: Time Conflict Constraint

For each time-step k:

For each student i

$$\sum_{j \in m} c_j \cdot s_{ij} \cdot t_{jk} \leq 1$$

Constraint 2: Bounds on Number of Courses Assigned to a Student

For each student i:

$$1 \leq \sum_{j \in m} c_j \cdot s_{ij} \leq 2$$

Constraint 3: Cap on Number of Students in a Course

For each course j:

$$\sum_{i \in n} c_j \cdot s_{ij} \leq 15$$

Assumption: The cap on each course is 15 students.

Constraint 4: Each Prof Offers Exactly 1 Course

For each Prof p

$$1 \leq \sum_{i \in \text{Prof } p\text{'s courses}} c_i \leq 1$$