TA Works - Formulation Information

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Decision Variable

X_{ij}	Student to course assignment, where student i is assigned to course j if $X_{ij} = 1$

Parameters

S_{ij}	Student i ranking for course j. $S_{ij}\ \varepsilon\ \{1, 2, 3\}$
C_{ij}	Course j ranking for student i. $C_{ij}\ \varepsilon\ \{1, 2, 3, 4, 5\}$
O_j	Number of TA openings for course j
β	Trade-off between the "coverage" term $(\sum_i \sum_j X_{ij})$ and "quality penalty" term $(\sum_i \sum_j X_{ij}(C_{ij} + S_{ij}),$ $a\ penalty\ for\ poor\ quality)$ in the objective function. β is assigned to the quality penalty term. Based on three user interviews with current/former associate chairs, it was determined that the coverage term is *always* favoured over the quality penalty term: $\sum_i \sum_j X_{ij} \geq \beta(\sum_i \sum_j X_{ij}(C_{ij} + S_{ij}))$ $max(C_{ij} + S_{ij}) = max(S_{ij}) + max(C_{ij})$ $max(C_{ij} + S_{ij}) = 3 + 5 = 8$ $\beta \leq 1/8$, to favour coverage over quality penalty

Formulation

$Max\ z = \sum_i \sum_j X_{ij} - \beta(\sum_i \sum_j X_{ij}(C_{ij} + S_{ij}))$	Maximize the number of student i to course j assignments and minimize the quality penalty associated with each assignment.
$s.t. \quad \sum_i X_{ij} \leq O_j \quad \forall j$	Students can be assigned to a course until all openings for the course are filled.
$X_{ij} \leq C_{ij} \quad \forall i,j$	Courses can only be assigned students they rank.
$X_{ij} \leq S_{ij} \quad \forall i,j$	Students can only be assigned to courses they rank.
$\sum_j X_{ij} \leq 1 \quad \forall i$	Students can only be assigned to one TA position.
$X_{ij}\ \varepsilon\ \{0, 1\}$	Students are either assigned to a course or not.