

Assignment Problem

Suppose there come n jobs to be scheduled on n machines.

We want to assign these jobs to the machines in such a way:

- The assignment should be strictly one-to-one.
- The total cost should be minimum.

Mathematical formulation

Suppose there are n jobs to be performed by n people.

If a person i does j^{th} job, the cost is C_{ij} .

Minimize $\sum_{i=1}^n \sum_{j=1}^n C_{ij} \cdot x_{ij}$

where $x_{ij} = 1$, if person i does j^{th} job, otherwise 0.

subject to:

$\sum_{i=1}^n x_{ij} = 1$ means one job can be assigned to only one person.

$\sum_{j=1}^n x_{ij} = 1$ means one person will do only one job.

Applications

1. Job assignment.
2. To assign vehicles to routes.
3. To assign sales representatives to territories.
4. To minimize the time between arrival and departure in airports.

Hungarian or Reduced Matrix Method

1. Create the cost effectiveness matrix.
2. Row reduction

Select the minimum of each row and subtract from all the elements in the corresponding row.

3. Column reduction

Select the minimum of each column and subtract from all the elements in the corresponding column.

4. Starting with the first row of the matrix obtained in Step 3, examine all rows and find rows with exactly one unmarked zero. Mark that zero and strike out all the other zeroes in the corresponding column to show that those zeroes can not be used to make other assignments.
5. Repeat Step 4 but column wise.