

Set
Covering
Problem



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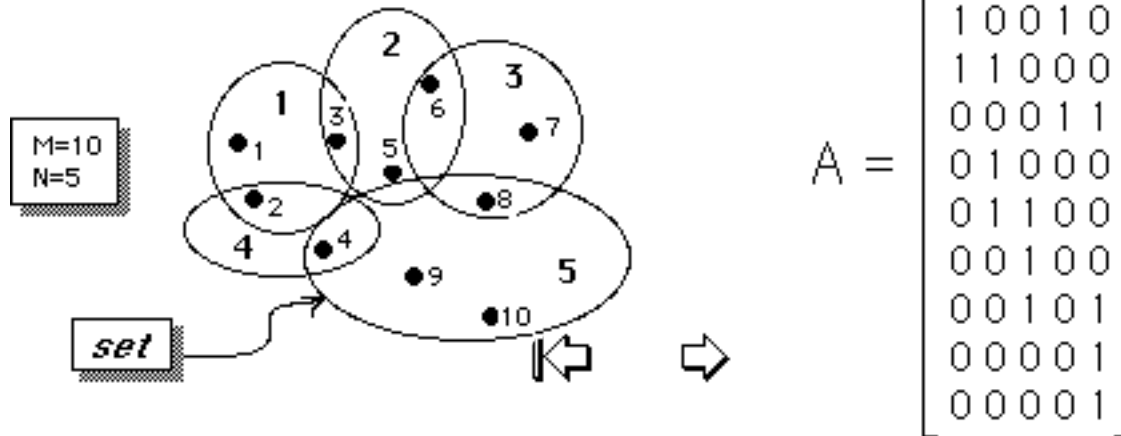
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Given M points, and N sets each containing one or more points:

Let C_j = cost of set # j

$$a_{ij} = \begin{cases} 1 & \text{if point } i \text{ is an element of set } j \\ 0 & \text{otherwise} \end{cases}$$



Define variables $X_j = \begin{cases} 1 & \text{if set \#j is selected} \\ 0 & \text{otherwise} \end{cases}$

Set Covering Problem

Minimize $\sum_{j=1}^N C_j X_j$

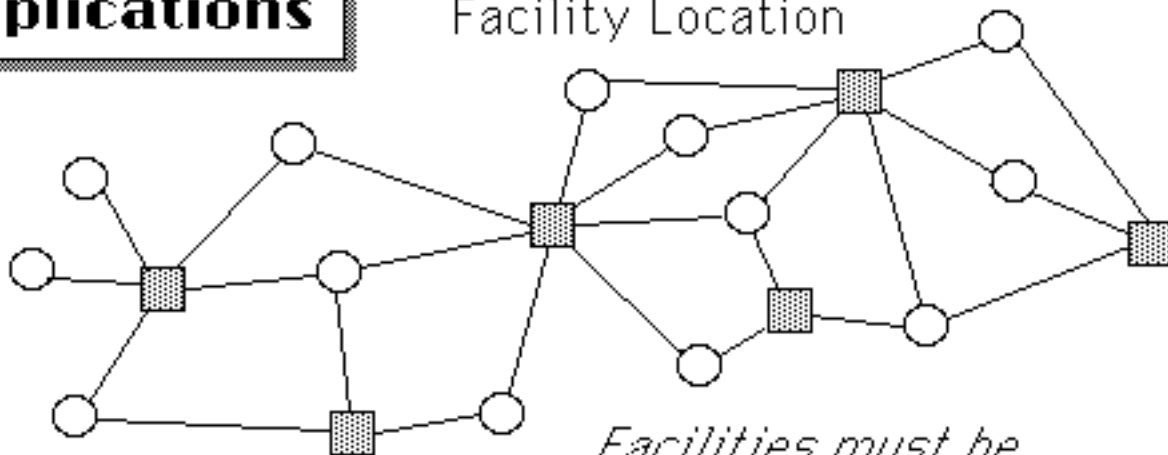
subject to $\sum_{j=1}^N a_{ij} X_j \geq 1$ for each $i=1, 2, \dots, M$

$X_j \in \{0,1\}$ for each $j=1, 2, \dots, N$



Applications

Facility Location



■ = potential facility site

○ = customer location

C_j = cost of building
facility j

Facilities must be selected to serve every customer. Possible links are indicated.



(customers are "points", facilities are "sets")

Applications

Information Retrieval

Retrieve a given set of m requests for information from a set of n files so that the length of the search is minimized.

C_j = length of file j

$a_{ij} = 1$ if the i^{th} information requested is in file j ,
0 otherwise

(information requests are "points", and the files are the "sets")

