

How to Use the Hungarian Algorithm

The Hungarian algorithm allows a "minimum matching" to be found. This can be used in instances where there are multiple quotes for a group of activities and each activity must be done by a different person, to find the minimum cost to complete all of the activities.

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Steps

edit

- 1 **Arrange your information in a matrix with the "people" on the left and the "activity" along the top, with the "cost" for each pair in the middle.**

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	W	X	Y	Z
A	10	19	8	15
B	10	18	7	17
C	13	16	9	14
D	12	19	8	18
E	14	17	10	19



- 2 **Ensure that the matrix is square by the addition of dummy rows/columns if necessary.** Conventionally, each element in the dummy row/column is the same as the largest number in the matrix.

10	19	8	15	19
10	18	7	17	19
13	16	9	14	19
12	19	8	18	19
14	17	10	19	19



- 3 **Reduce the rows by subtracting the minimum value of each row from that row.**

2	11	0	7	11
3	11	0	10	12
4	7	0	5	10
4	11	0	10	11
4	7	0	9	9



- 4 **Reduce the columns by subtracting the minimum value of each column from that column.**

0	4	0	2	2
1	4	0	5	3
2	0	0	0	1
2	4	0	5	2
2	0	0	4	0



- 5 **Cover the zero elements with the minimum number of lines it is possible to cover them with.** (If the number of lines is equal to the number of rows then go to step 9)

0	4	0	2	2
1	4	0	5	3
2	0	0	0	1
2	4	0	5	2
2	0	0	4	0



6 **Add the minimum uncovered element to every covered element.** If an element is covered twice, add the minimum element to it twice.

1	5	2	3	3
1	4	1	5	3
3	1	2	1	2
2	4	1	5	2
3	1	2	5	1



7 **Subtract the minimum element from every element in the matrix.**

0	4	1	2	2
0	3	0	4	2
2	0	1	0	1
1	3	0	4	1
2	0	1	4	0



8 **Cover the zero elements again.** If the number of lines covering the zero elements is not equal to the number of rows, return to step 6.

0	4	1	2	2
0	3	0	4	2
2	0	1	0	1
1	3	0	4	1
2	0	1	4	0

0	4	1	2	2
0	3	0	4	2
2	0	1	0	1
1	3	0	4	1
2	0	1	4	0

This example had to be reduced once more

9 **Select a matching by choosing a set of zeros so that each row or column has only one selected.**

0	3	1	1	1
0	2	0	3	1
3	0	1	0	1
1	2	0	3	0
3	0	1	4	0



10 **Apply the matching to the original matrix, disregarding dummy rows.** This shows who should do which activity, and adding the costs will give the total minimum cost.

	W	X	Y	Z
A	10	19	8	15
B	10	18	7	17
C	13	16	9	14
D	12	19	8	18
E	14	17	10	19

Notice that D has not been used

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Tips

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- If you wish to find a maximum matching rather than a minimum, multiply each number by -1 in step 1, then follow the steps as written.

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