Technical University of Moldova

Special Mathematics

Laboratory No.5

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The adjacent matrix for the friendship graph:

0	0	0	0	1	1	0	1	0	0	0	0	0	0	1	0	1	0	1	1
0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	1	0	1	1	0	1	1	0	1	0	0	1	1	0	1	0	1
0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	1	0	1	0	1
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	0	1	0	0	1	1	1	1	1	0	0	0	1	0	1
0	0	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0	1	0	1
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1
0	0	1	0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0
0	0	0	1	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0
0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0
0	1	0	0	0	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0
0	0	1	1	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0

Friends

Find the person with the most friends.

Solution

To find the number of friends each person from this graph has, we have to sum the connections this person has with other people.
Having the adjacent matrix, it is easily done.
Knowing that 1 in that matrix stands for the connection between 2 nodes and 0 for no connection between 2 nodes, we only take a line (or a column, it doesn't matter, since the adjacent matrix is symmetric) that is responsible for a node, look at the values it has and sum them, thus, we can obtain the number of edges of that node, in our case it's the number of friends that a person has.
By running the program (*ex1_friendly.py*), we notice that we have 2 people with the largest number of friends, these are:
• Corrin Tally
• Ellie Francese
They both have 11 friends.

Sort

Sort all the people by the number of friends.

Solution

In this problem we use the same approach as in the previous exercise.
Just summing the 1's, and sorting them descending.

The output:

Name	Friends
Ellie Francese	11
Corrin Tally	11
Augustine Golub	10
Leandro Eagan	7
Caleb Hobby	7
Clarence Stalker	6
Lili Houghton	6
Cruz Perna	6
Sammie Womac	6
Lorean Simcox	6
Pearlie Moffet	6
Angila Ellinger	5
Marita Tegeler	5
Monet Mccoy	5
Tiny Parkhurst	4
Alta Kennan	2
Otilia Laxson	2
Rebbecca Charlton	2
Elinore Orsborn	2
Jarred Marrow	1

Let's do ratings

For each person in the network, compute the ratings using Dijkstra's algorithm to find the shortest path from a node to another.

Solution

Solving this exercise wasn't particularly difficult, as Dijkstra's algorithm can be found on the Internet.
So, in order to solve this problem, we have to find the shortest distances for every node to every other nodes, substract 1 from each distance (the points) and sum them together for every node.
The resulting rating is as follows:

Name	**Rating**
Ellie Francese	8
Corrin Tally	11
Augustine Golub	12
Caleb Hobby	13
Lorean Simcox	13
Pearlie Moffet	13
Leandro Eagan	15
Cruz Perna	16
Lili Houghton	17
Sammie Womac	17
Angila Ellinger	17
Marita Tegeler	18
Clarence Stalker	18
Monet Mccoy	20
Tiny Parkhurst	21
Rebbecca Charlton	23
Alta Kennan	27
Elinore Orsborn	30
Otilia Laxson	30
Jarred Marrow	31

Influential people

Use the data from the previous exercise and find the new "Rating" for each person by multiplying it with 0.5 of the posting rate.
Please sort the people by the newly computed rating.

Solution

For this problem we have to use the data obtained in the problem No.2, where we found out the number of friends each person has.
Then, we will compute the new rating, using the new data found in the file *influence.txt*.
Finally, we sort the people by their new rating, obtaining this:

Name	**Rating**
Corrin Tally	47.163
Ellie Francese	44.825
Augustine Golub	28.250
Sammie Womac	25.500
Leandro Eagan	23.275
Lorean Simcox	20.700
Angila Ellinger	20.625
Marita Tegeler	18.812
Tiny Parkhurst	16.900
Lili Houghton	16.500
Cruz Perna	15.750
Monet Mccoy	13.875
Clarence Stalker	10.425
Alta Kennan	9.900
Pearlie Moffet	9.825
Caleb Hobby	9.713
Rebbecca Charlton	7.700
Otilia Laxson	4.525
Elinore Orsborn	4.400
Jarred Marrow	3.825

Analyze your content

You are publishing a book and would like to promote it through the use of social media.
The book's title is:

"From T-Rex to Justin Bieber: How Internet has changed the Politics, Art and cute Cats"

You have done some research in the world's most popular social network and have found that the range of interests is stored in *interests.txt* . Analyze your title and see what specter of interests is your book marketable to.

Solution

For this problem, we have to extract the *interests* from the file mentioned above, then, after splitting the title into words, finding the common interests.
That's all we need to find the specter of interests of this book.
The results are as follows:

- Internet
- Art
- T-Rex
- Politics
- Cats
- Bieber

DISCLAIMER: "Bieber" and "Music" are not related.

Promote it

We have provided you with a list of interests of each of these people.
You can find it in *interests.txt* .
Considering the set of interests you have chosen, who of them would you market the book to?
Provide us with a list of 5 people we should contact to make your book a best-seller!
Please use the names found in *people_interests.txt* .

Solution

In order to obtain our top 5 promoters, we need the rating found in the problem No.4 and the interests (of our book's title) from the previous exercise.
Then, using this data we compute the new rating.
Our top 5 promoters are:

Name	**Rating**
Ellie Francese	8.965
Marita Tegeler	7.525
Augustine Golub	5.650
Sammie Womac	5.100
Leandro Eagan	4.655