(Refer to the referenced colab notebook to complete the assignment)

Suppose we had access to individual student ratings of professors from Bruinwalk and we wanted to recommend professors to take classes with for a particular student. Let this be the corresponding rating matrix:

$R =$

	P_1	P_2	P_3	P_4	P_5
U1	4	–	3.5	2	5
U2	4.5	–	–	3	5
U3	1	2	2	4	4.5
U4	–	3.5	4	4	–
U5	–	3	–	5	–

Let's focus on U5. We want to use user/user collaborative filtering to predict $r(U5, P1)$, $r(U5, P3)$, $r(U5, P5)$ by looking at the $K = 2$ most similar users to U5 that have rated the item

of interest.

In the colab notebook, we calculate a matrix of user similarities using centered cosine similarity.

Q1

Using the similarity values from this matrix, find the 2 most similar users that have rated the item of interest (professor) and calculate the following ratings as the average of those user's ratings:

$r(U5, P1) =$

$r(U5, P3) =$

$r(U5, P5) =$

Based on these ratings, what professor would you recommend to U5?

Q2

Refer to the matrix factorization section of the notebook and look at the computed factorization of $R = UV^T$ where U, V are the user, item embedding matrices respectively, where each row is a 3D embedding/representation of a user or item

Using this factorization, calculate

$r(U5, P1) =$

$r(U5, P3) =$

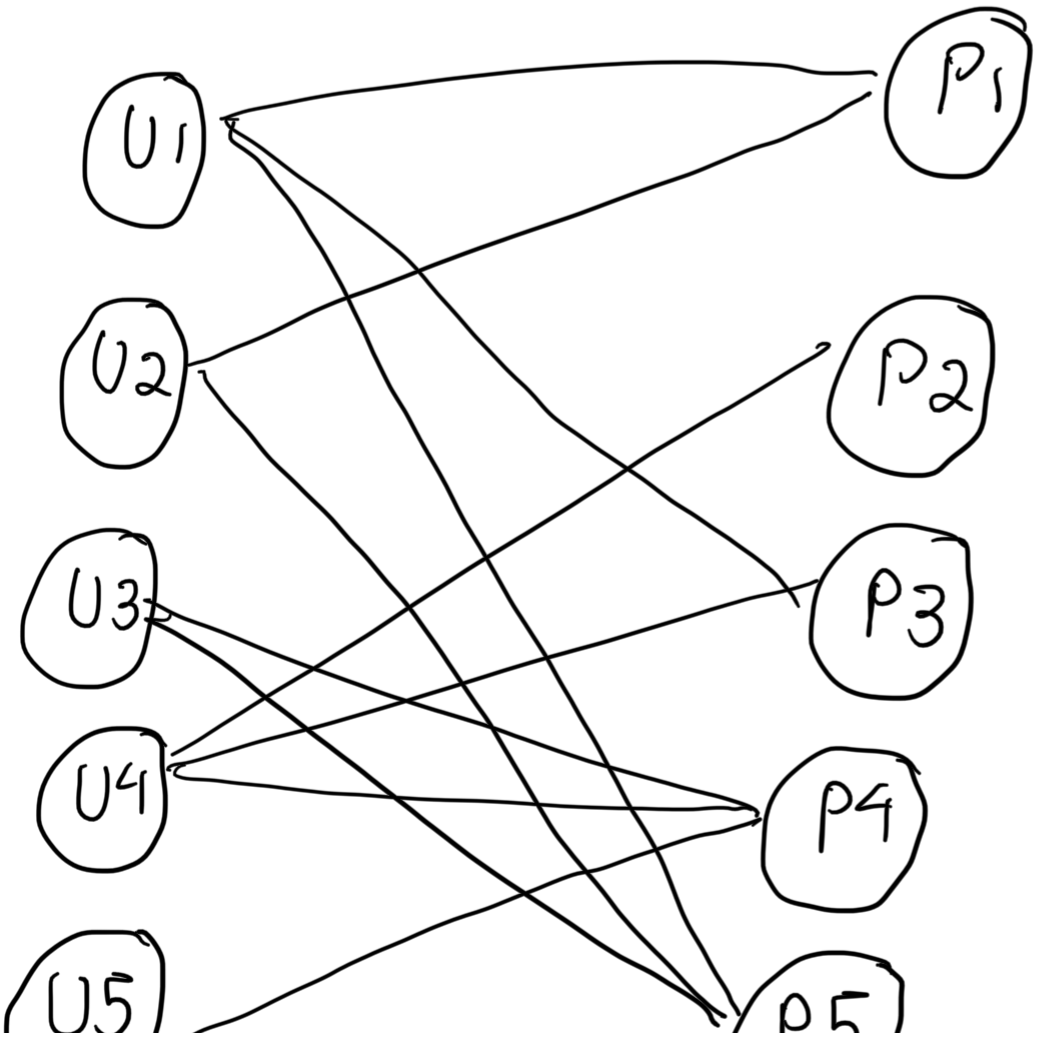
$r(U5, P5) =$

Based on these ratings, what professor would you recommend to U5?

(Hint: You don't need to multiply U and V^T.

Focus only on the entries you care about by taking the appropriate user/item embedding dot products)

Q3 Suppose we model our collected ratings as a knowledge graph where there is an undirected edge between a user and professor if the rating is > 3, like so:



Look at the output of the last cell corresponding to running random walks on this graph. Based on the item scoring map it returns, what professor would you recommend to us? Does this make sense to you?