In this exercise you will build a recommendation system for the Spotify app. The attachments contain recordings of plays by about 2,000 users and close to 20,000 artists. In order to build the recommendation system, one must use information from the social network that describes connections between users. Based on this data, you will need to predict the number of times a particular user will hear a particular artist.

The data are:

user\_artist : Contains some of the playback data. In each row, the first column

Contains a user ID, the second an artist ID and the third ("weight") the number of times

The same user heard the same artist.

Test: Contains pairs of users and artists for which you need to predict the number

The plays.

friends\_user: Describes the social network. Each row contains a pair of network neighbors.

The graph is unadjusted and unweighted. Each pair of neighbors appears in the file twice for convenience, however

It does not matter. As will be clarified below, the use of this file is optional only.

Note:  
For each pair of user and artist that do not appear in the same row in any of the above files, The number of plays is zero.

For each couple of user u and artist I in test file, denote the forecast and the real value which we don’t know.

The fine of such couple will be and the total fine will be

Our purpose is to minimize the total penalty L.

We have 2 missions:

1. Minimize the total fine L without using the social network at all. In this task, at your disposal

Use only past playback data.

2. Minimize the total fine L using past plays and also on the social network.

We have two missions

To minimize the total penalty of L (some of