

Figure S1. The correlation of the objects' degree and users' degree in Movielens. The (a), (b) are the scatterplots of the objects' degree in the case of Ratio = 0.9. The (c), (d) are the correlation of objects' degree and users' degree changes by the ratio of the training set. NP and NT are the number of objects' degree in the probe set and the training set. C – Item and C – User are the value of objects' correlation and the users' correlation.

Figure S2. The number of objects in different age's range both in the whole data set and the probe set of Movielens. The (a), (b) are the number of objects and objects' degree change with the age's range in the whole data set. In the probe set, there exist two condition: division of data sets by random and the time. The (c), (d) are the number of objects and objects' degree change with the age's range in the probe set. NI is the number of objects. ND is the number of objects' degree. RA is the range of the objects' age.

Figure S3. Comparisons of average Ranking Score, Precision, Popularity and Diversity between different algorithms in different ratio of training data sets which divided by the random and time. Here we set the recommendation list $L = 10$.

Figure S4. Comparisons of average Ranking Score, Precision, Popularity and Diversity between the different algorithms in different sizes of training set on the Movielens. Here we set the recommendation list $L = 10$.







