Information Retrieval

CS F469

RECOMMENDER SYSTEMS

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| Recommender System Technique | Root Mean Square Error (RMSE) | Precision on top K | Spearman Rank Correlation | Time taken for prediction |
| Collaborative | 1.3148252976119994 | 0.18 | 1.0 | 10.322446346282959 |
| Collaborative along with Baseline approach | 1.1871084131410243 | 0.19999999999999998 | 1.0 | 10.802618265151978 |
| SVD | 1.5063897757661466 | 0.0 | 0.9999999973380127 | 13.14290452003479 |
| SVD with 90% retained energy | 1.3356535289310079 | 0.31601272534464564 | 0.9999999976542991 | 12.858148574829102 |
| CUR | 1.9441721805205012 | 0.31601272534464564 | 0.9999901897861724 | 1.030273199081421 |
| CUR with 90% retained energy | 0.9306987573701898 | 0.31601272534464564 | 0.999999998626103 | 2.4870684146881104 |

**Collaborative Filtering**

It is a technique used by recommender systems to filter out the items by analysing the reaction of similar users. The basis for its working is that it search a large group of people and narrow it to a smaller set of users with interest similar to a particular user. It has two senses a narrow one and more general one.

**Singular Value Decomposition(SVD)**

It is factorization of a matrix into product of three matrices i.e. A=U∑(V^T) (where V^T is transpose of V). Columns of U and V are orthonormal and ∑ is a diagonal matrix with positive entries .

* A is m x n matrix
* U is m x r matrix
* ∑ is r x r matrix
* V is n x r matrix

**CUR Matrix Approximation**

This is a low rank approximation of SVD. In CUR Approximation we have three matrices and we multiply them to get approximate to matrix A. CUR has a slight edge over SVD due to two key advantages although it is not as accurate as SVD. CUR has methods to calculate with lower asymptotic time complexity as compared to SVD. In CUR matrices are more interpretable.

In CUR matrix approximation of A we have three matrices C,U,R where C is made from columns of A, R is made from rows of A, and product CUR give us a value to a close approximation to A. CUR is a rank k approximation , means C contains k columns of A and R contains k rows of A. There are many possible CUR matrix approximations, and many CUR matrix approximations for a given rank.