

TC1 Project: Know your customers

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Abstract

A collaborating filter problem is addressed with the following methods: NMF approach and autoencoders.

1 Introduction

In collaborative filtering, each item of a collection n_i is rated by several members of a population n_u . The aim is to predict the item ratings that a person would give. The usually final goal is to recommend items to a user that he would have rated with a high score.

In this setup, let R be a $(n * m)$ matrix where r_{ij} is the rating of the j^{th} item from the i^{th} user.

1.1 Non negative matrix factorization

In non negative factorizations the rating product matrix is factorized to $R = UV$ where coefficients of U and V are non negatives.

In order to find such matrix a reconstruction error is minimized by gradient descent :

$$\operatorname{argmin}_{U,V} (||R - UV||_{\text{nonnegativecoefficients}})$$

The reconstruction error is computed over all non negative coefficient of the R matrix. In other words, the algorithm try to recover the available ratings only.

Comment on est sur que les coefficients soient positifs ?

1.2 ALS-WR

The ALS-WR algorithm [2] differs from NMF for two main reasons: a regularization term and the fact that the gradient descent is done by alternatively updating U and fixing V then, updating V and fixing U .

1.3 Auto-encoders

Auto encoder is neural network (NN) approach used in unsupervised learning for dimensionality reduction. Used in the supervised classification task NN aims at lowering a prediction error over a training set. Auto encoder aims at lowering the reconstruction error, ie Lowering

$$||X - NN(X)||$$

We used the approach proposed by [1] to our collaborating filter problem.

2 Result

NMF	ALS-WR	AE
1.1	1.2	1.3

3 Conclusion

[1] Yunhong Zhou, Dennis Wilkinson, Robert Schreiber and Rong Pan - Large-scale Parallel Collaborative Filtering for the Netflix Prize.

References

- [1] Florian Strub, Jeremie Mary, and Romaric Gaudel. Hybrid collaborative filtering with autoencoders. *arXiv preprint arXiv:1603.00806*, 2016.
- [2] Yunhong Zhou, Dennis Wilkinson, Robert Schreiber, and Rong Pan. Large-scale parallel collaborative filtering for the netflix prize. In *International Conference on Algorithmic Applications in Management*, pages 337–348. Springer, 2008.