

Nonnegative Matrix Factorization and Beyond

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Given a nonnegative matrix X and a factorization rank r , nonnegative matrix factorization (NMF) approximates the matrix X as the product of a nonnegative matrix W with r columns and a nonnegative matrix H with r rows; see [1]. NMF has become a standard linear dimensionality reduction technique in data mining and machine learning. In this talk, we first introduce NMF and show how it can be used as an interpretable unsupervised data analysis tool in various applications, including hyperspectral image unmixing, image feature extraction, and document classification. Then we discuss how NMFs can be computed, and also discuss the issue of non-uniqueness of NMF decompositions, also known as the identifiability issue, which is crucial in many applications. Finally, we present how we can go beyond NMF by considering non-linear and deep extensions which are useful in real-world applications and offer many venues for future research.

References

- [1] Nicolas Gillis *Nonnegative Matrix Factorization*, SIAM, Philadelphia, 2020.