

Final Year Projects

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April 19, 2024

Project 2. Multiplicative update method for nonnegative matrix factorization:

Nonnegative matrix factorization (NMF) is a widely used technique in data science for dimensionality reduction. The task of NMF is to approximate a given data matrix by the production of two low-rank nonnegative matrices. Among the array of algorithms available for solving NMF, the multiplicative update (MU) method stands out as one of the most widely employed techniques. Its popularity can be attributed to its simple update structure and straightforward implementation. However, despite its widespread use, there remains a dearth of exploration into the underlying rationale and deeper understanding of the efficacy of this method. Moreover, issues such as zero-locking, which can adversely affect the performance of MU under certain circumstances, continue to pose challenges and warrant further investigation.

This project seeks to undertake a comprehensive review of existing research on the MU method and propose practical approaches aimed at enhancing its implementation. Proficiency in basic programming using MATLAB is essential for participation in this project.

Key References:

- N. Gillis, Nonnegative matrix factorization. SIAM, 2020.
- J. J. Burred. Detailed derivation of multiplicative update rules for NMF. Paris, France, 2014.
- C.-J. Lin. On the convergence of multiplicative update algorithms for nonnegative matrix factorization. IEEE Transactions on Neural Networks, 18(6):1589–1596, 2007.