Low Rank Nonnegative Matrix Factorizations:
Some Theory, Algorithms, and Applications

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The notion of low rank approximations arises from many important applications. When the low rank data are further required to have nonnegative values only, the approach by nonnegative matrix factorization is particularly appealing. For example, space activities require accurate information about orbiting objects for space situational awareness and safety. This aspect of our work introduces novel analysis methodology for spectral sensor data by learning the parts of objects (hidden components) by using sparse independent component analysis techniques - a new approach for scientific data mining and unsupervised hyperspectral unmixing. The methodology preserves natural data nonnegativity and thus avoids subtractive basis vector and encoding interactions present in approaches such as PCA.
Document clustering for text mining is also briefly discussed. Numerical experiments are reported. This talk represents recent collaborative work with several co-authors, including Paul Pauca, Mike Berry, Moody Chu, Miki Neumann, and industrial collaborators. See the web page: http://www.wfu.edu/~plemmons for recent papers related to this talk.