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Sparse Inverse Covariance Estimation Using Sparse Matrices

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A well-known task in statistics is the estimation of the (inverse) covariance matrix when only certain samples of random variables are given. In particular, big data problems often lead to a high-dimensional regime where the number of samples is significant less than the dimension. To compute an inverse covariance often requires additional constraints such as sparsity. This is why one usually reguluarizes the log-likelihood function with the 1-norm of the inverse covariance matrix. In [1], a promising quadratic approximation called QUIC algorithm is presented to estimate the sparse inverse covariance matrix for dense matrices. This method has been generalized in [2] using the notion of hierarchical matrices. In this talk we present a sparse version of this algorithm which uses up-to-date sparse matrix computations to deal with large-scale data and to handle sparse matrices and their approximate inverses.

[1] Cho-Jui Hsieh, Mtys A. Sustik, Inderjit S. Dhillon, Pradeep Ravikumar. Sparse Inverse Covariance Matrix Estimation Using Quadratic Approximation, Advances in Neural Information Processing Systems, vol. 24, 2011.

[2] Jonas Ballani, Daniel Kressner. Sparse Inverse Covariance Estimation with Hierarchical Matrices. Technical report, EPFL, October 2014.