Estimating matrix inverse forms for some large scale computation problems

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Abstract

A spectrum of applications arising from Statistics, Machine Learning, Network Analysis require computation of bilinear inverse forms (BIF) $x^T A^{-1} y$, where A is a symmetric positive definite matrix and x, y are given vectors. In this work, we are interested in efficiently computing BIFs primarily due to their importance in several contexts. For large scale computation problems it is preferable to achieve approximations of BIFs without exploiting the whole matrix inverse. For this purpose an extrapolation procedure has been developed, attaining the approximation of BIF's with one, two or three term estimates in a complexity of square order. Furthermore, a prediction approach based on Aitken's acceleration scheme has also been developed computing alternative estimates again in a square complexity. Both schemes are characterized by easy applicable formulae of low complexity that can be implemented in vectorized form. Several numerical examples involiving useful matrices such as the covariance and the precision matrix will be presented.

References

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