

MATRIX COMPUTATIONS WITH DATA IN MULTI-INDEX FORMATS

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Vectors and matrices are usually considered as arrays with one or two indices. However, the same data can be easily viewed as arrays with more (artificial) indices, e.g. a vector of size $n = 2^d$ can be considered as an d -index array of size $2 \times \dots \times 2$. When using recently proposed tensor-train decompositions one can design efficient algorithms for basic matrix operations of complexity linear in d . Thus, the well-known *curse of dimensionality* converts into the *blessing of dimensionality*. The new approach puts forth many wonderful perspectives and questions for future research. Applications include spectral problems of computational chemistry, stochastic differential equations, general parametric problems, fast interpolation methods for multivariate data etc. The purpose of this talk is to outline the new tensor representation techniques, related theoretical findings and efficient algorithms reducing multidimensional computations to matrix ones, applications, on-going works and perspectives.

References

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