Professor Heinz Neudecker and matrix differential calculus

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Abstract

The late Professor Heinz Neudecker is regarded as the founding father of matrix differential calculus. He laid the foundation for the theory and practice of matrix differential calculus and his contributions were compiled in the standard work Magnus and Neudecker [1]. The methods developed in his work are still used by contemporary econometricians and statisticians today in analysing multivariate models.

In this talk, we present the fundamental idea and notation in matrix differential calculus based on differentials (rather than derivatives). We discuss some results, with a focus on its applications to topics in deep learning, predictive modelling, sensitivity analysis and statistical diagnostics.

Keywords

Matrix inequalities, Matrix products, Jacobian, Hessian, Optimisation

References

[1] Magnus, J., H. Neudecker (1988, 1999, 2019). *Matrix Differential Calculus with Applications in Statistics and Econometrics.* Chichester: Wiley.