PREFACE

The aim of this volume is to advance the understanding of linear spaces of symmetric matrices. These seemingly simple objects play many different roles across several fields of mathematics.

For instance, in algebraic statistics these spaces appear as linear Gaussian covariance or concentration models, while in enumerative algebraic geometry they classically represent spaces of smooth quadrics satisfying certain tangency conditions. In semidefinite programming, linear spaces of symmetric matrices define the spectrahedra on which optimization problems are considered, and in nonlinear algebra they encode partially symmetric tensors.

It is often the case that one of the above-mentioned fields inspires or provides tools for the advancement of the others. In the articles that follow, the reader will find several examples where this has happened through the common link of linear spaces of symmetric matrices.

This volume is the culmination of a collaboration project with the same name, which began at MPI Leipzig in June 2020. Over the course of several months, about 40 researchers gathered on-line to work on the ideas and projects that eventually became the articles of this special issue.

We are grateful to Bernd Sturmfels for initiating the project and for being its driving force, in particular for presenting the list of open problems that served as a starting point for the working groups that formed. Many of his conjectures became theorems in this volume.

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