Preface

Jeffrey J. Hunter, Simo Puntanen, and George P. H. Styan

As was noted in the Preface to the First Special Issue on Linear Algebra and Statistics of *Linear Algebra and Its Applications* [Vols. 67 (June 1985), 70 (October 1985), 82 (October 1986, pp. 143–279), Ingram Olkin, C. Radhakrishna Rao, and George P. H. Styan, Eds.],

> the application of linear algebraic methods in statistics can be traced back to the work of Gauss on the optimality of the least squares estimator under a very general setup which is now known as the Gauss-Markov model. The next major applications in recent times were in the study of Markov chains involving properties of stochastic matrices and limits of their powers, and in deriving the distribution of quadratic forms of normal variables using the concepts of idempotent matrices and rank additivity of symmetric nonnegative definite matrices. But the major impact of the methods of linear algebra in statistics can be found in multivariate analysis and inference from linear models which exhibit singularities. We see heavy use of linear algebra in papers on factor analysis, multidimensional scaling, and in the pioneering work of R. A. Fisher on the roots of determinantal equations. Generalized inverses of matrices, separation theorems for singular values of matrices, generalizations of Chebychev type and Kantorovich inequalities, stochastic orderings, generalized projectors, limits of eigenvalues of random matrices, and Petrie matrices are some of the contributions to linear algebra which are motivated by problems of statistics. The impact of linear algebra on statistics has been so substantial, in fact, that there are now available at least five books devoted entirely to linear and matrix algebra for statistics, and a number of other statistical books in which linear and matrix algebra play a major role.

As with the Second and Third Special Issues [Vol. 127 (January 1990), Michael D. Perlman, Friedrich Pukelsheim, and George P. H. Styan, Eds.; Vol. 176 (November 1992), Jerzy K. Baksalary and Geroge P. H. Styan, Eds.], this Fourth Special Issue on Linear Algebra and Statistics of *Linear Algebra and Its Applications* contains papers on linear algebra and matrix theory and their applications to statistics and probability as well as papers on certain linear-algebraic and matrix-theoretic meth-

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ods associated with statistics and probability. In particular, the 13 research papers in this Fourth Special Issue involve the following topics: angles between subspaces, asymptotic methods, canonical correlations (restricted and unrestricted), EMS algorithm, generalized inverses, Hermite polynomials, inequalities, infinite products of matrices, Laguerre polynomials, linear regression, linear statistical models, Markov chains, matrix derivatives, multiple regression, multivariate statistical analysis, nonhomogeneous semi-Markov systems, numerical methods, perturbation analysis, pretest estimation, singular linear models, singular-value bounds, stochastic matrices, tensor products, and zonal polynomials.