Preface

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) and 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 set-up 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 in 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–Fifth 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 George P. H. Styan, eds.; vol. 210 (October 1994), Jeffrey J. Hunter, Simo Puntanen, and George P. H. Styan, eds.; vol. 237/238 (April 1996), R. B. Bapat, George P. H. Styan, and Hans Joachim Werner, eds.], this Sixth 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 on certain linear-algebraic and matrix-theoretic methods associated with statistics and probability.

The 33 research papers in this Sixth Special Issue start with a paper on Alexander Craig Aitken (1895–1967) and the consolidation of matrix theory and then continue with papers which involve the following topics: admissibility of linear estimators, angles between subspaces, arithmatic-geometric-harmonic means inequalities, asymptotic methods, BLUE and BLUP, bounds for eigenvalues, Boyle-Handelman conjecture, Brownian bridges, canonical analysis, canonical correlations, Cassels inequality, Cauchy-Schwarz inequality, comparison of linear experiments, copositive matrices, Craig-Sakamoto theorem, density estimation, distance-based regression, factor analysis, Frucht-Kantorovich inequality, Galton-Watson process, generalized inverses, generalized orthogonal projectors, Greub-Rheinboldt inequality, Hadamard products, independence of quadratic forms, inefficiency of ordinary least squares, inequalities, invariance of statistical tests, invariant quadratics, Kantorovich inequality, Krasnosel'skiĭ-Kreĭn inequality, least-squares estimation, linear statistical models, Mahalanobis norms, Markov chains, matrix derivatives, matrix theory, mixed linear models, multiple regression, multivariate statistical analysis, nonlinear eigenvector algorithms, numerical methods, operator versions of classical inequalities, orthogonal projectors, partial orderings, partitioned linear models, potential theory, Pólya-Szegö inequality, quadratic forms, regression models, Schweitzer inequality, semi-star related matrices, shorted operators, Simpson's paradox, singular linear models, singular value bounds, stochastic matrices, stochastic processes, unified least squares, and zonal polynomials.

The Seventh Special Issue on Linear Algebra and Statistics of *Linear Algebra and Its Applications* is in progress [Simo Puntanen, George P. H. Styan, and Hans Joachim Werner, eds.], and publication is expected in 1998.

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