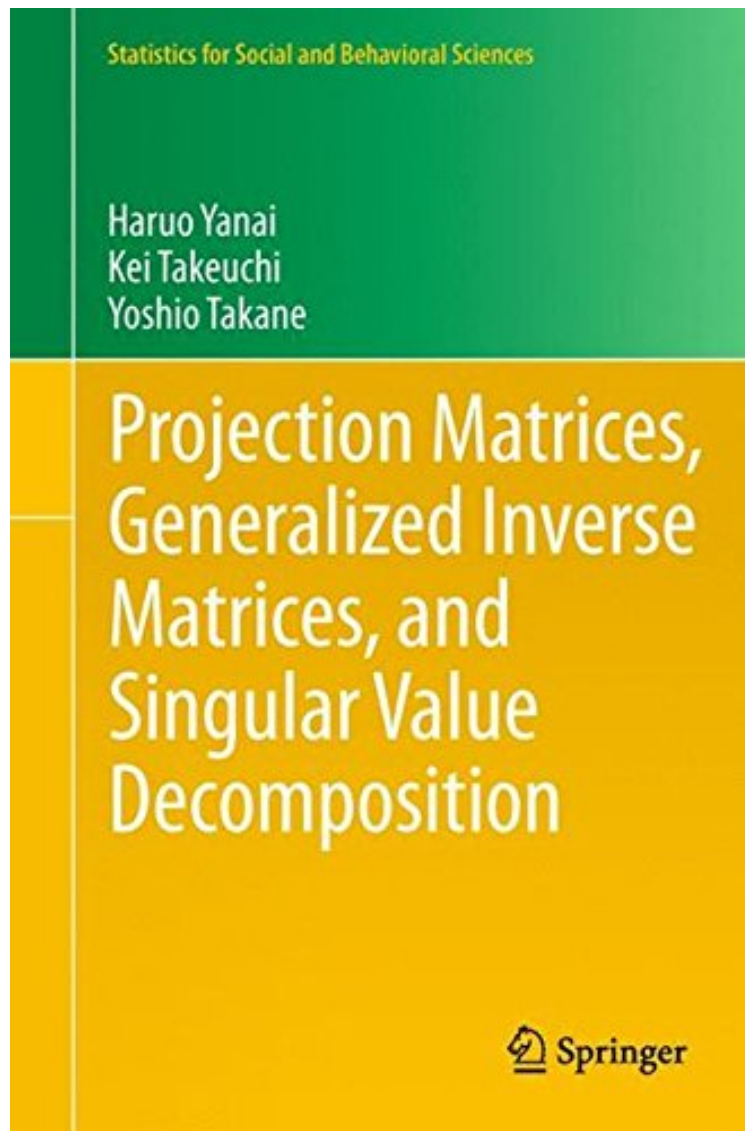


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# Projection Matrices, Generalized Inverse Matrices, and Singular Value Decomposition (Statistics for Social and Behavioral Sciences)

*Haruo Yanai, Kei Takeuchi, Yoshio Takane*  
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**Haruo Yanai, Kei Takeuchi, Yoshio Takane : Projection Matrices, Generalized Inverse Matrices, and Singular Value Decomposition (Statistics for Social and Behavioral Sciences)** before purchasing it in order to gage whether or not it would be worth my time, and all praised Projection Matrices, Generalized Inverse Matrices, and Singular

## Value Decomposition (Statistics for Social and Behavioral Sciences):

Aside from distribution theory, projections and the singular value decomposition (SVD) are the two most important concepts for understanding the basic mechanism of multivariate analysis. The former underlies the least squares estimation in regression analysis, which is essentially a projection of one subspace onto another, and the latter underlies principal component analysis, which seeks to find a subspace that captures the largest variability in the original space. This book is about projections and SVD. A thorough discussion of generalized inverse (g-inverse) matrices is also given because it is closely related to the former. The book provides systematic and in-depth accounts of these concepts from a unified viewpoint of linear transformations finite dimensional vector spaces. More specially, it shows that projection matrices (projectors) and g-inverse matrices can be defined in various ways so that a vector space is decomposed into a direct-sum of (disjoint) subspaces. Projection Matrices, Generalized Inverse Matrices, and Singular Value Decomposition will be useful for researchers, practitioners, and students in applied mathematics, statistics, engineering, behaviormetrics, and other fields.

From the reviews: The book under review is devoted, mainly, to projections and singular value decomposition (SVD). Each chapter has some exercises. Many examples illustrate the presented material very well. The book should serve as a useful reference on projectors, general inverses and SVD, it is of interest to those working in matrix analysis, it can be recommended for graduate students as well as for professionals. (Edward L. Pekarev, *zbMATH*, Vol. 1279, 2014) Projection Matrices, Generalized Inverse Matrices, and Singular Value Decomposition is more suitable for readers who enjoy mathematics for its beauty. this book has been prepared with great care. It was meant to serve as a useful reference on projectors for researchers, practitioners and students in applied mathematics, engineering, and behaviormetrics. I expect it to succeed in this respect. (Jos M. F. ten Berge, *Psychometrika*, Vol. 77 (3), July, 2012) This book is devoted to projectors (projection matrices) and singular value decomposition (SVD). A complete discussion of the closely related topic of generalized inverses (g-inverses) is provided. should be of interest and serve as a reference to researchers and students in applied mathematics, statistics, engineering, and other related fields. The central properties of projections and singular value decomposition are presented in full detail and an excellent bibliography is provided. (Ronald L. Smith, *Mathematical s*, Issue 2012 c) Researchers, practitioners, and students in applied mathematics, statistics, engineering, behaviour metrics, and other fields. this book is a very useful collection of very important matrix results related to statistical multivariate analysis. The authors earn congratulations for careful and clear writing, nice-looking format, and especially for numerous figures that illustrate the geometry of the concepts. Moreover, the exercises with their solutions are warmly welcome. (Simo Puntanen, *International Statistical* , Vol. 79 (3), 2011) From the Back Cover Aside from distribution theory, projections and the singular value decomposition (SVD) are the two most important concepts for understanding the basic mechanism of multivariate analysis. The former underlies the least squares estimation in regression analysis, which is essentially a projection of one subspace onto another, and the latter underlies principal component analysis, which seeks to find a subspace that captures the largest variability in the original space. This book is about projections and SVD. A thorough discussion of generalized inverse (g-inverse) matrices is also given because it is closely related to the former. The book provides systematic and in-depth accounts of these concepts from a unified viewpoint of linear transformations finite dimensional vector spaces. More specially, it shows that projection matrices (projectors) and g-inverse matrices can be defined in various ways so that a vector space is decomposed into a direct-sum of (disjoint) subspaces. Projection Matrices, Generalized Inverse Matrices, and Singular Value Decomposition will be useful for researchers, practitioners, and students in applied mathematics, statistics, engineering, behaviormetrics, and other fields. About the Author Haruo Yanai is an educational psychologist and epidemiologist specialized in educational assessment and statistics. While he was developing an aptitude test as part of his doctoral dissertation at the University of Tokyo, he began his pioneering work on unifying various methods of multivariate analysis using projectors. This work has culminated in his widely acclaimed book *The Foundations of Multivariate Analysis* (Wiley Eastern, 1982) with Takeuchi and Mukherjee. He has held a professorial position in the Research Division at the National Center for University Entrance Examinations and is currently a Professor of Statistics at St. Luke College of Nursing in Tokyo. He is a former President of the Behaviormetric Society and is currently President of the Japan Testing Society. Kei Takeuchi is a mathematical statistician with a strong background in economics. He was a Professor of Statistics in the Faculty of Economics at the University of Tokyo, and after retirement in the Faculty of International Studies at Meiji Gakuin University (now emeritus at both universities). The main fields of his research include the theory of mathematical statistics, especially asymptotic theory of estimation, multivariate analysis, and so on. He has published many papers and books on these subjects in both Japanese and English. He has also published articles on the Japanese economy, impact of science and technology on economy, etc. He is a former President of the Japan Statistical Society and Chairman of the Statistical Commission of Japan. Yoshio Takane earned his Ph.D in quantitative psychology from the University of North

Carolina in 1977. Since then he has been a Professor of Psychology at McGill University, specializing in quantitative methodology. He has developed a number of techniques for data analysis such as nonlinear multivariate analysis (MVA), maximum likelihood multidimensional scaling, latent variable models, methods for contingency table analysis, constrained principal component analysis and other structured MVA, and matrix theory associated with these developments. He has published widely in such journals as *Psychometrika* and *Linear Algebra and Its Applications*. He is a former President of the Psychometric Society.