



# Multivariate Statistics: High-Dimensional and Large-Sample Approximations

By Yasunori Fujikoshi, Vladimir V. Ulyanov, Ryoichi Shimizu

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## Multivariate Statistics: High-Dimensional and Large-Sample Approximations By Yasunori Fujikoshi, Vladimir V. Ulyanov, Ryoichi Shimizu

**A comprehensive examination of high-dimensional analysis of multivariate methods and their real-world applications**

*Multivariate Statistics: High-Dimensional and Large-Sample Approximations* is the first book of its kind to explore how classical multivariate methods can be revised and used in place of conventional statistical tools. Written by prominent researchers in the field, the book focuses on high-dimensional and large-scale approximations and details the many basic multivariate methods used to achieve high levels of accuracy.

The authors begin with a fundamental presentation of the basic tools and exact distributional results of multivariate statistics, and, in addition, the derivations of most distributional results are provided. Statistical methods for high-dimensional data, such as curve data, spectra, images, and DNA microarrays, are discussed. Bootstrap approximations from a methodological point of view, theoretical accuracies in MANOVA tests, and model selection criteria are also presented. Subsequent chapters feature additional topical coverage including:

- High-dimensional approximations of various statistics
- High-dimensional statistical methods
- Approximations with computable error bound
- Selection of variables based on model selection approach
- Statistics with error bounds and their appearance in discriminant analysis, growth curve models, generalized linear models, profile analysis, and multiple comparison

Each chapter provides real-world applications and thorough analyses of the real data. In addition, approximation formulas found throughout the book are a useful tool for both practical and theoretical statisticians, and basic results on exact distributions in multivariate analysis are included in a comprehensive, yet accessible, format.

*Multivariate Statistics* is an excellent book for courses on probability theory in statistics at the graduate level. It is also an essential reference for both practical

and theoretical statisticians who are interested in multivariate analysis and who would benefit from learning the applications of analytical probabilistic methods in statistics.

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### **Editorial Review**

#### **Review**

"The book is designed for readers interested in multivariate analysis with a good background in matrix algebra, mathematical statistical inference and probability theory. Its contents are, in general, well organised and the intuitive ideas behind the different multivariate methods, the asymptotic expansion techniques and the calculation of error bounds using scale mixtures, are well expressed. The mathematical proofs are well presented and selected and I have found the mathematical appendices to be very useful as guides to following the proofs." (Mathematical Reviews, 2011)

#### **About the Author**

**Yasunori Fujikoshi**, DSc, is Professor Emeritus at Hiroshima University (Japan) and Visiting Professor in the Department of Mathematics at Chuo University (Japan). He has authored over 150 journal articles in the area of multivariate analysis.

**Vladimir V. Ulyanov**, DSc, is Professor in the Department of Mathematical Statistics at Moscow State University (Russia) and is the author of nearly fifty journal articles in his areas of research interest, which include weak limit theorems, probability measures on topological spaces, and Gaussian processes.

**Ryoichi Shimizu**, DSc, is Professor Emeritus at the Institute of Statistical Mathematics (Japan) and is the author of numerous journal articles on probability distributions.

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