Vector Generalized Linear and Additive Models: With an Implementation in R (Springer Series in Statistics)

By Thomas W. Yee

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This book presents a greatly enlarged statistical framework compared to generalized linear models (GLMs) with which to approach regression modelling. Comprising of about half-a-dozen major classes of statistical models, and fortified with necessary infrastructure to make the models more fully operable, the framework allows analyses based on many semi-traditional applied statistics models to be performed as a coherent whole.

Since their advent in 1972, GLMs have unified important distributions under a single umbrella with enormous implications. However, GLMs are not flexible enough to cope with the demands of practical data analysis. And data-driven GLMs, in the form of generalized additive models (GAMs), are also largely confined to the exponential family. The methodology here and accompanying software (the extensive VGAM R package) are directed at these limitations and are described comprehensively for the first time in one volume. This book treats distributions and classical models as generalized regression models, and the result is a much broader application base for GLMs and GAMs.

The book can be used in senior undergraduate or first-year postgraduate courses on GLMs or categorical data analysis and as a methodology resource for VGAM users. In the second part of the book, the R package VGAM allows readers to grasp immediately applications of the methodology. R code is integrated in the text, and datasets are used throughout. Potential applications include ecology, finance, biostatistics, and social sciences. The methodological contribution of this book stands alone and does not require use of the VGAM package.

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Editorial Review

Review

"The book unifies seemingly unrelated areas such as univariate distributions, categorical data analysis, quantile regression, and extremes. The underlying idea is to treat almost all distributions and classical models as generalized regression models. … The book may be used in senior undergraduate and first-year graduate courses on GLMs and regression modeling. It may serve as a methodology resource for users of VGAMs." (Alexander G. Kukush, Mathematical Reviews, May, 2016)

From the Back Cover

This book presents a statistical framework that expands generalized linear models (GLMs) for regression modelling. The framework shared in this book allows analyses based on many semi-traditional applied statistics models to be performed as a coherent whole. This is possible through the approximately half-a-dozen major classes of statistical models included in the book and the software infrastructure component, which makes the models easily operable.

The book's methodology and accompanying software (the extensive VGAM R package) are directed at these limitations, and this is the first time the methodology and software are covered comprehensively in one volume. Since their advent in 1972, GLMs have unified important distributions under a single umbrella with enormous implications. The demands of practical data analysis, however, require a flexibility that GLMs do not have. Data-driven GLMs, in the form of generalized additive models (GAMs), are also largely confined to the exponential family. This book treats distributions and classical models as generalized regression models, and the result is a much broader application base for GLMs and GAMs.

The book may be used in senior undergraduate and first-year postgraduate courses on GLMs and regression modeling, including categorical data analysis. It may also serve as a reference on vector generalized linear models and as a methodology resource for VGAM users. The methodological contribution of this book stands alone and does not require use of the VGAM package. In the second part of the book, the R package VGAM makes applications of the methodology immediate. R code is integrated in the text, and datasets are used throughout. Potential applications include ecology, finance, biostatistics, and social sciences.

About the Author

Thomas W. Yee is a Senior Lecturer in the Department of Statistics at University of Auckland, New Zealand. The author of over 30 articles published in statistical and other scientific journals, his work usually has a methodological focus and has direct applications in the fields of biostatistics and ecology. He is author of the VGAM R package, one of the largest by a single author. Dr Yee received his PhD in statistics from the University of Auckland.

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