

Edwards, David

Introduction to graphical modelling. 2nd ed. (English) Zbl 0952.62003

Springer Texts in Statistics. New York, NY: Springer. xv, 333 p. (2000).

The author significantly improved, updated, and extended the contents of the first edition of this book from 1995, see the review [Zbl 0856.62004](#). Two new chapters are included: Chapter 7 describes the use of various types of directed graphs, and Chapter 8 surveys the field of causal inference, with particular reference to graphical modelling. Also, the treatment of mean linearity and CG-regression has been expanded, the description of MIM was updated, and an appendix describing various estimation algorithms has been added.

Briefly, about the contents of the book: the emphasis falls on model structure, more precisely, on conditional independence structures. Various families of models that can be specified in terms of pairwise conditional independence are examined. Using the equivalence between pairwise and global Markov properties, the structure of such models is easily represented as independence graphs. Chapter 2 describes the family of loglinear models for discrete data. For loglinear models, the pairwise conditional independences are equivalent to zero two-factor interactions. The chapter focuses on the aspects relevant to graphical modelling. Chapter 3 describes the treatment of graphical Gaussian models for continuous data. In this case, the pairwise conditional independences correspond to zero partial correlations, and these models are linked to other multivariate normal models such as multivariate regression and recursive equation models. Chapter 4 constitutes the core of this book, exposing the models for mixed discrete and continuous data, models obtained from the combination of those included in chapters 2 and 3. A central question, that is important to model interpretation, refers to the situation when complex models with many variables can be broken down into a sequence of simpler models with fewer variables. Other topics examined here are related to conditional models, CG-regression models, and the use of the models in connection with latent variables (or missing data) and discriminant analysis.

Chapter 5 surveys hypothesis testing for mixed models. There are described asymptotic likelihood ratio tests (requiring large samples), F-tests (that are valid for small samples), and exact conditional tests (which are valid under relaxed distributional assumptions). Chapter 6 exposes methods for model selection and criticism. It is important to assess the selected models critically, and various techniques to do this are included. The (new) Chapter 7 considers graphs with directed edges and associated models. Particularly useful in many applications proved to be chain graphs. Other types of examined graphs include local independence graphs, reciprocal graphs, and covariance graphs. The (new) Chapter 8 attempts to address the question of interpreting graphical models in terms of causal inference. Two competing statistical accounts of causality are described and compared, the key concepts involved being those of confounding and randomization.

The examples worked within the book are using the graphical modelling system MIM 3.1 and Windows, a program (language) whose instructions are described in Appendices A and B, and which can be downloaded from the MIM Web Site at www.hypergraph.dk. Appendix C provides results on symmetry tests, while Appendix D exposes some estimation algorithms.

Reviewer: [Neculai Curteanu \(Iași\)](#)

MSC:

- [62-09](#) Graphical methods in statistics (MSC2010)
- [62-01](#) Introductory exposition (textbooks, tutorial papers, etc.) pertaining to statistics
- [62J99](#) Linear inference, regression
- [62G10](#) Nonparametric hypothesis testing
- [05C90](#) Applications of graph theory
- [62J12](#) Generalized linear models (logistic models)

Cited in **89** Documents

Keywords:

[independence graphs](#); [loglinear models](#); [graphical Gaussian models](#); [model selection](#); [chain graphs](#); [graph-](#)

ical modelling system; MIM 3.1; Windows

Software:

LISREL; AS 159; MIM; StatXact; SPSS

Full Text: DOI