

Preface

Graphical models in their modern form have been around since the late 1970s and appear today in many areas of the sciences. Along with the ongoing developments of graphical models, a number of different graphical modelling software programs have been written over the years. In recent years many of these software developments have taken place within the R community, either in the form of providing an R interface to existing software or in the form of new R packages. At the time of writing, the taskview for graphical models in R at

<http://cran.r-project.org/web/views/gR.html>

lists some thirty packages related to graphical models. It is expected that this number will grow considerably, and the packages will be extended and modified.

This book attempts to give the reader a gentle introduction to graphical modelling using R and the main features of some of these packages, hopefully sharpening the appetite for using and developing these packages further. In addition, we shall give a few examples of how more advanced aspects of graphical modelling can be represented and handled within R.

We emphasize that this book is not a manual to the collection of packages mentioned and the general theory of the models is only described to an extent which allows the book to be read meaningfully on its own. For a more extensive description of the theory we refer to the textbooks available, such as Whittaker (1990), Lauritzen (1996), and Edwards (2000).

The organization of the book is as follows:

Chapter 1 treats graphs without any direct reference to statistical models although the significance of graphs for conditional independence is briefly explained and exemplified. This chapter may be skipped at first reading and returned to as needed.

Chapter 2 discusses graphical models for contingency tables, i.e. graphical models for discrete data. Chapter 3 deals with Bayesian networks and the updating of conditional probabilities. Chapter 4 deals with graphical models for the normal distribution, i.e. for continuous data. Chapter 5 discusses mixed interaction models which refers to a combination of discrete and continuous variables and this chapter thus unifies Chaps. 2 and 4.

Chapters 2, 4 and 5 all deal with models which are largely data-driven, mostly analysed within a frequentist perspective; these chapters constitute the core of the book.

Chapter 6 discusses graphical models for complex stochastic systems with focus on methods of inference which involve Markov chain Monte Carlo sampling (Gilks et al. 1994). Both Chaps. 3 and 6 deal with models which strongly exploit prior substantive knowledge and are mostly treated within a Bayesian perspective.

A perspective on graphical models which has become particularly important in the last decades involves their ability to deal with problems involving data of high dimension. This aspect is dealt with in Chap. 7.

Finally, we would like to thank Sofia Massa, Clive Bowsher and Vanessa Didelez for reading early drafts of this book and providing us with encouragement and constructive comments.

Aalborg, Denmark
Tjele, Denmark
Oxford, UK

Søren Højsgaard
David Edwards
Steffen Lauritzen

<http://www.springer.com/978-1-4614-2298-3>

Graphical Models with R

Højsgaard, S.; Edwards, D.; Lauritzen, S.

2012, IX, 182 p. 112 illus., 24 illus. in color., Softcover

ISBN: 978-1-4614-2298-3