

# The R Book

By Michael J. Crawley

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The high-level language of R is recognized as one of the most powerful and flexible statistical software environments, and is rapidly becoming the standard setting for quantitative analysis, statistics and graphics. R provides free access to unrivalled coverage and cutting-edge applications, enabling the user to apply numerous statistical methods ranging from simple regression to time series or multivariate analysis.

Building on the success of the author's bestselling *Statistics: An Introduction using R*, *The R Book* is packed with worked examples, providing an all inclusive guide to R, ideal for novice and more accomplished users alike. The book assumes no background in statistics or computing and introduces the advantages of the R environment, detailing its applications in a wide range of disciplines.

- Provides the first comprehensive reference manual for the R language, including practical guidance and full coverage of the graphics facilities.
- Introduces all the statistical models covered by R, beginning with simple classical tests such as chi-square and t-test.
- Proceeds to examine more advance methods, from regression and analysis of variance, through to generalized linear models, generalized mixed models, time series, spatial statistics, multivariate statistics and much more.

*The R Book* is aimed at undergraduates, postgraduates and professionals in science, engineering and medicine. It is also ideal for students and professionals in statistics, economics, geography and the social sciences.

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## The R Book By Michael J. Crawley Bibliography

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## Editorial Review

### Amazon.com Review

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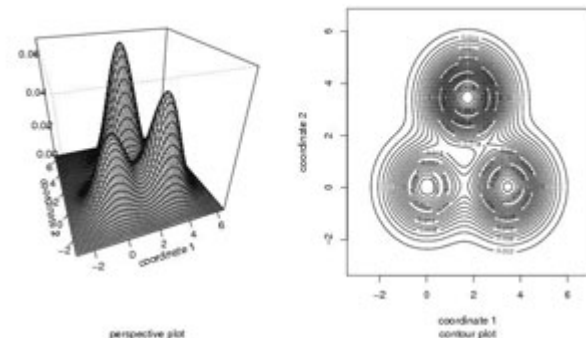
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## Excerpts from Chapter 4 of *The R Book*

### Chapter 4: Level Set Trees and Code

Learn how to make a volume plot and a barycenter plot, and calculate level set trees with the algorithm LeafsFirst, which is implemented in function ```leafsfirst```. This function takes as an argument a piecewise constant function object.

### The multimodal 2D example



(Click on image to enlarge)

We consider the density shown in the 2D three-modal density, and calculate first a piecewise constant

function object representing this function, and then calculate the level set tree.

```
N<-c(35,35) # size of the grid pcf<-
sim.data(N=N,type="mulmod") # piecewise constant function lst.big<-
leafsfirst(pcf) # level set tree
```

We may make the volume plot with the command "plotvolu(lst)". However, it is faster first to prune the level set tree, and then plot the reduced level set tree. Function "treedisc" takes as the first argument a level set tree, as the second argument the original piecewise constant function, and the 3rd argument "ngrid" gives the number of levels in the pruned level set tree. We try the number of levels ngrid=100.

```
lst<-treedisc(lst.big,pcf,ngrid=100)
```

Now we may make a volume plot with the function "plotvolu".

```
plotvolu(lst)
```

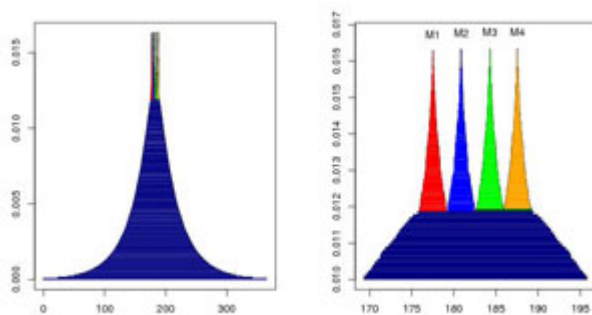
We draw barycenter plots with the function "plotbary".

```
plotbary(lst,coordi=2) # 2nd coordinate
```

**Note:** We may find the number and the location of the modes with the "modecent" function, which takes as argument a level set tree. Function "locofmax" takes as argument a piecewise constant function and calculates the location of the maximum.

```
modecent(lst) locofmax(pcf)
```

### The 3D tetrahedron example



(Click on image to enlarge)

We consider the 3-dimensional example. The calculation is much more time consuming this time.

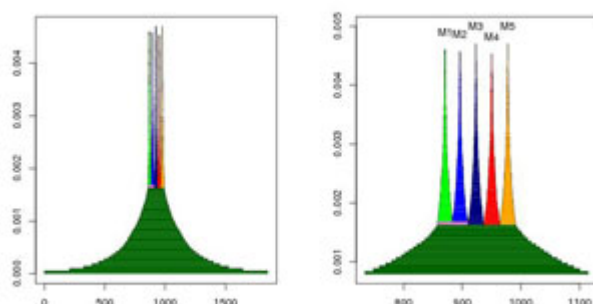
```
N<-c(32,32,32) # the size of the grid pcf<-
sim.data(N=N,type="tetra3d") # piecewise constant function lst.big<-
leafsfirst(pcf) # level set tree lst<-
treedisc(lst.big,pcf,ngrid=200) # pruned level set tree
plotvolu(lst,modelabel=FALSE) # volume plot
plotvolu(lst,cutlev=0.010,ptext=0.00045,colo=TRUE) # zooming coordi<-1
# coordinate, coordi = 1, 2, 3 plotbary(lst,coordi=coordi,ptext=0.0006) #
barycenter plot
```

This time we have used parameter "cutlev" to make a zoomed volume plot. When this parameter is given, then only the part of the level set tree is shown which is above the value "cutlev". Typically it is better to zoom in to the volume plot by cutting the tails of the volume function away. This is achieved by the parameter "xlim". We may use for example the following command to make a "vertically zoomed" volume plot.

```
plotvolu(lst,xlim=c(140,220),ptext=0.00045,
colo=TRUE,modelabel=FALSE)
```

Additional parameters which we have used are the "modelabel", which is used to suppress the plotting of the mode labels, "ptext", which lifts the mode labels with the given amount, and "colo", which colors the graph of the volume function to make a comparison with the barycenter plots easier.

### The 4D pentahedron example



(Click on image to enlarge)

We consider the 4-dimensional example.

```
N<-c(16,16,16,16) pcf<-sim.data(N=N,type="penta4d") lst.big<-
leafsfirst(pcf) lst<-treedisc(lst.big,pcf,ngrid=100)
plotvolu(lst,modelabel=F) # volume plot
plotvolu(lst,cutlev=0.0008,ptext=0.00039,colo=TRUE) # zooming coordi<-1
# coordinate, coordi = 1, 2, 3, 4
plotbary(lst,coordi=coordi,ptext=0.0003) # barycenter plot
```

### Review

"It may seem strange to include a new edition of a textbook in the preview, but I feel that this is one that is definitely worth highlighting. It is a classic that does not just sell to students during term time but has a much wider appeal ... This edition will sell really well on publication." (The Bookseller, 16 December 2011)

"There is a tremendous amount of information in the book, and it will be very helpful ... This is a potentially very useful book." (*Journal of Applied Science*, December 2008)

"...if you are an R user or wannabe R user, this text is the one that should be on your shelf. The breadth of topics covered is unsurpassed when it comes to texts on data analysis in R." (*The American Statistician*, Aug 2008)

"The R Book; provides the first comprehensive reference manual for the R language." (*Statistica* 2008)

"...a 950-page comprehensive reference manual for what is perhaps becoming the most powerful and

flexible statistical software environment..." (*CHOICE*, December 2007)

'The High-level software language of R is setting standards in quantitative analysis. And now anybody can get to grips with it thanks to The R Book...' (*Professional Pensions*, 19th July 2007)

"There is a tremendous amount of information in the book, and it will be very helpful ... This is a potentially very useful book." (*Journal of Applied Science*, Dec 2008)

#### Review

"This heavy statistics book, by the author of The Flora of Berkshire, proved to be one of the best sellers at every conference in Europe that NHBS attended in 2007 - probably the only book on the subject you will ever need."

– Anneli Meeder, Title Researcher & Cataloguer

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