

## **Data visualization**

*Prof. Dr. Michael Greenacre, Universitat Pompeu Fabra, Barcelona*

<b>Date &amp; Time:</b>	<b>23 April 2018</b>
<b>Location:</b>	AWI Building E; room 4025
<b>Language:</b>	English
<b>POLMAR credit points:</b>	1
<b>Registration:</b>	info.polmar@awi.de

**Course content:** The course deals with the visualization of small, medium and large data sets as a means of communicating relevant data patterns in the form of graphical displays, in order to interpret and understand the data. The course aims to increase participants' visual literacy, to sensitize them to the graphical elements that are used to create data visualizations, and to root the choice of graphical display in the context of the data and the audience for which it is intended. Different methods of visualizing data will be demonstrated, starting with graphics of univariate data typically used in scientific papers and posters, followed by the visualization of time series data, spatial data and multivariate data. Generally, the R package will be used in the presentation as well as the practical exercises.

**Target group:** The course is primarily, but not exclusively, directed at advanced undergraduate and graduate students in ecology, marine biology, the geosciences and oceanography. For the most part and where possible, the level of instruction will take into consideration the spread of disciplinary backgrounds of course participants. For additional guidance please see the recommended reading or contact the instructor.

The language of instruction and discussion in class will be English.

**Prerequisites:** The participants are expected to have a basic background in descriptive statistics, for example they are assumed to know what a mean, median, variance, standard deviation, standard error, percentile and confidence interval are. These concepts can be easily revised online --- see, for example:

[https://onlinecourses.science.psu.edu/statprogram/review\\_of\\_basic\\_statistics](https://onlinecourses.science.psu.edu/statprogram/review_of_basic_statistics)  
[https://pubs.usgs.gov/of/2008/1017/ofr2008-1017\\_rev.pdf](https://pubs.usgs.gov/of/2008/1017/ofr2008-1017_rev.pdf)

They should also have some experience with statistical software. Experience with the R package is a prerequisite. We strongly recommend that participants sign up for the R-Course with Prof. Stephan Frickenhaus, held on April 5 & 6, 2018.

**More information:** The material in this course is gleaned from several sources, such as *The Visual Display of Quantitative Information*, by Edwin Tufte. An excerpt from this book, with some nice ideas to think about, can be found at

[www.econ.upf.edu/~michael/visualdata/tufte-aesthetics\\_and\\_technique.pdf](http://www.econ.upf.edu/~michael/visualdata/tufte-aesthetics_and_technique.pdf)

The paper *Data Reporting and Visualization in Ecology*, by Michael Greenacre (*Polar Biology*, 39:2189–2205, 2016) will be distributed to participants.

The textbook '*Multivariate Analysis of Ecological Data*' (Greenacre & Primicerio, 2014) is relevant to the last part of the course (it is the main literature for the course straight after this one). It can be downloaded for free from [www.multivariatestatistics.org](http://www.multivariatestatistics.org)

Course participants are kindly asked to bring a laptop (with wireless network card) to access data and to be able to complete the R sessions during the afternoon PC labs.

### Course program:

- Some basic principles of data visualization.
- An exercise: the good, the bad and the ugly.
- Visual elements.
- Simple graphics of univariate data: still a challenge!
- Visualizing time series and spatial data.
- Introduction to methods of dimension-reduction (a taste of the next course to come, *Multivariate Analysis of Ecological Data*, on 24-26 April)

---

*Our courses are generally free of charge for all participants. However, they do have a price and can cost POLMAR as much as 150 € per day per student. Please take this into account when cancelling your place at the last minute.*

---