

## New Elective Course

# Environmental Data Analysis

The Department of Biological Applications and Technology, University of Ioannina, is pleased to announce this *new course* beginning on Thursday 3/10/19 at 3pm in Lecture Theatre A (New BET building, ground floor). This first lecture will be just an informative meeting about the course. Feel free to come along, no obligations attached!

### Why this course?

The last two decades have seen remarkable growth in the availability of data, especially biodiversity data, via satellite technology, next-generation sequencing and an explosion in the number of online databases. At the same time, the expanding rate and complexity of climatic change brings unprecedented threats to ecological communities. The conjunction of all these changes is creating both new problems and new possibilities for environmental data analysis. These decades have also seen the widespread adoption of R as the preferred software for data analysis. R is a freely-downloadable software package that has become extremely popular with environmental and biological scientists; it has become a de facto standard in the analysis of environmental data. Due to its popularity, a great array of software libraries have been developed, which allow us to analyze almost any problem. The flexibility and power of this package has been the key to its success. Thus, now is an appropriate moment to begin to learn about these phenomena and the data describing them with this powerful package.

### Goals

This course will familiarize students with environmental data and how to analyze it using the R programming environment. Students learn to:

- ✓ Understand environmental data
- ✓ Locate and obtain environmental data from public sources
- ✓ Organize data in appropriate structures using R
- ✓ Analyse data using basic statistical methods in R
- ✓ Present the results of data analysis

### Course contents

- Introduction to the R programming environment.
- Data structures and how to manage data in R.
- Types of environmental data.
- Graphical presentations in R.
- Basic analyses such as t-tests, ANOVA and linear regression.
- Further analysis techniques, such as Generalized Linear Models.
- The meaning of environmental variability.
- Time-series models of environmental change. Measuring climatic shift and variability, population growth or loss, environmental risk.
- Environmental “big data”. Analyzing data from biodiversity databases, spatial patterns and species migration and molecular phylogenies.

### **Teaching approach**

Three hours per week. Typical sessions will include short introductions followed by work individually or in pairs solving problems in R. All basic concepts will be developed through interactive lectures, with minimal requirements for mathematical technique. Methods will be illustrated with applications to problems in population biology, biogeography and biodiversity, atmospheric and climatic change, molecular phylogeny and other instances in the biological environment.

### **Course prerequisites:**

Attendees should have passed at least Biostatistics (preferably also Mathematics) but we won't be using sophisticated mathematics on this course.

### **Course evaluation:**

Exam (50%) and project (50%). 3 ECTS

### **Teaching Language and Textbooks**

The course language is English.

- (Text In English) Verzani, John. "Using R for Introductory Statistics." New York: CUNY, 0.4 edition URL <http://www.math.csi.cuny.edu/Statistics/R/simpleR/index.html> 106 (2002).
- (Στα ελληνικά) "ΕΙΣΑΓΩΓΗ ΣΤΗ ΣΤΑΤΙΣΤΙΚΗ ΜΕ ΤΗΝ R", Κωδικός Βιβλίου στον Εύδοξο: 50656357, Έκδοση: 2η Αμερικανική/2016, Συγγραφείς: JOHN VERZANI, ISBN: 978-960-461-672-5, Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ"

John M. Halley, BET.