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Applied analysis of spatial data using R (296568)

Nositelji predmeta

izv. prof. dr. sc. Dragica Šalamon, **izv. prof. dr. sc. Toni Safner**

Opis predmeta

Advances in technology, low prices and availability of GPS devices resulted in overall presence of georeferenced data and heightened interest for spatial analysis. The goal of those analyses is describing spatial ordering of different processes (resources, pollution, biodiversity…) and modeling samples with that spatial structure. Modifying and linking a large number of statistical methods for analyzing and presentation of spatial data trough different software can be intimidating for new users. Main goal of this course is systematical introduction of spatial data analysis using case studies and hands-on approach that will enable students to analyze, visualize and interpret spatial data. Moreover, to familiarize students with the using and contributing to open data sources (research, spatial, environmental and ecosystem data, statistical data, open data from the nature sector, agronomy, etc.).
We chose open source system of R to demonstrate the analyses of spatial data because it ensures input, manipulation, analysis and presentation of spatial data in the same environment. Broad base of R users ensure quality and fast expansion of different functions (using packages) as well as tutorials and literature in different languages (predominately English).

ECTS: **6.00**

Sati nastave: 60
Predavanja: 30
Vježbe u praktikumu: 26
Seminar: 4

Izvođač predavanja

- dr. sc. Filip Varga
- izv. prof. dr. sc. Dragica Šalamon
- izv. prof. dr. sc. Toni Safner

Ocjenjivanje

Dovoljan (2): 60-70%
Dobar (3): 71-80%
Vrlo dobar (4): 81-90%
Izvrstan (5): 91-100%

Vrsta predmeta

- Graduate studies / MS Courses taught in English (Izborni predmet, 2. semestar, 1. godina)

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Opće kompetencije

To understand structure and content of georeferenced biological data. To critically choose and apply appropriate analysis. To show and interpret results of spatial interpolation of climatological (eg. temperature, rainfal etc.), environmental (eg. element concentration in watter and sediment, feed content etc.) and biological (species density, population density, genetic diversity etc.) spatial data. By analizing their own spatial data and using appropriate georeferenced layers to find locations uning spatial query (eg. temperature or rainfal span; habitat suitability etc.). To use open source R environment with no need to learn different interfaces of abundand special software and apps.

Oblici nastave

- Lectures
- Other

  partial e-learning; independent assignments; multimedia and the internet
- Seminars
- Exercises

Ishodi učenja i način provjere

Ishod učenja	Način provjere
Understand spatial data and work with spatial objects using R.	Seminar, written exam, oral exam
Graphicaly show their spatial dana using different graphical devices in R (screen device, .pdf, .eps, .png graphical devices).	Seminar, written exam, oral exam
Use online open data repositories to complement their own spatial data in R.	Seminar, written exam, oral exam
Apply and interpret spatial analysis using R packages.	Seminar, written exam, oral exam
Analyse and interpret relevant publications on spatial analysis.	Seminar, written exam, oral exam

Tjedni plan nastave

1. Structure of spatial data and available systems for their visualization and analysis
2. Spatial data in R
3. Defining coordinate systems and spatial projections to R spatial objects
4. Spatial data visualization using R
5. Topology
6. Other systems for working with open data, open databases and open data portals
7. Introduction to spatial analysis and methods depending on the type of data
8. Data connectedness, autocorrelation with nominal scale attributes
9. Point processes
10. Interpolations
11. Variograms
12. Spatial regression
13. Clustering spatial data
14. Student seminars and homework 1
15. Student seminars and homework 2

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Obvezna literatura

1. Bivand RS., Pebesma EJ., Gómez-RubioV. (2013). Applied Spatial Data Analysis with R (Use R). Springer.
2. Malvić T. (2013). Rječnik osnovnih geostatističkih pojmova.
3. Safner T., Miller MP., McRae BH., Fortin MJ., Manel S. (2011) Comparison of Bayesian clustering and edge detection methods for inferring boundaries in landscape genetics. International Journal of Molecular Sciences 12 (2), 865-889.
4. Safner T., Miaud C., Gaggiotti O., Decout S., Rioux D., Zundel S., Manel S. (2011) Combining demography and genetic analysis to assess the population structure of an amphibian in a human-dominated landscape. Conservation genetics 12 (1), 161-173.
5. Šprem N., Frantz AC., Cubric Curik V., Curik I. (2013) Influence of habitat fragmentation on population structure of red deer in Croatia; Mammalian Biology - Zeitschrift für Säugetierkunde.

Preporučena literatura

1. Spatial statistics. Bryan Ripley (http://www.people.fas.harvard.edu/~zhukov/spatial.html)
2. TODO project Consortium, Otvoreni podaci - što su i kako mi mogu koristiti? Smjernice dobre prakse za rad s otvorenim podacima u Hrvatskoj (otvorenog pristupa) http://science.geof.unizg.hr/todo-platform/course/view.php?id=6

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