IntR – Interactive GUI for *R*

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In recent years, *R* is increasingly being used by soil scientists. Its popularity is due to the fact that it is free, open-source, but also due to the large number of packages dedicated to spatial statistics and geostatistical interpolation. On the other hand, the necessity to learn a brand new programming language, with a relatively steep learning curve, has kept and still keeps most soil scientists away from *R*.

This software is designed to solve this problem and speed up the learning process. IntR is a graphical user interface, wrote in Python, that eases the procedure of the creation and execution of an *R* script for 2D and 3D geostatistical interpolation. This interface works by asking "questions" to the user: for instance to select the data file, the model of the variogram ect., and compiling the *R* script based on the commands inserted. The user is therefore in full control of every part of the process. The script is run in batch mode and the results are shown at the end of the process and saved. Normally the output of a geostatistical analysis is a table of the results, an image of the variogram, and images of the prediction and uncertainty maps and, where available, a plot of the observed versus the predicted values. The script is also saved for the user to control it and thus learn the language. The algorithms that can be used in IntR are: for the 2D version, inverse distance interpolation, ordinary kriging, universal kriging and regression kriging, random forest and CART, plus a module for obtaining a point grid from a polygon shape file and a module for the variogram and the anisotropy analysis. For the 3D version, the user can choose between inverse distance, ordinary kriging and universal kriging, plus a module to create a 3D prediction grid, a module for variogram and anisotropy analysis, a module for creating a series of slice images of the 3D map and a module for sticking the slices in an animation video. The packages used to perform all the analysis are: **gstat**, **sp**, **maptools**, **randomForest**, **tree**, **rgdal**, **lattice**, **akima**.

The software was developed with two different datasets, one in 2D and the other in 3D. The bidimensional dataset is composed by 30 textural data samples (sand, clay and silt) collected at three depth interval: 0-10 cm, 10-30 cm and 30-70 cm. The second dataset is composed by 57 cone-index samples taken on a regular grid, with a vertical resolution of 4 cm. In both cases we used geophysical covariates for the prediction, namely EM38, EM31 and Gamma-ray data. Regarding the 2D case study, the results show that universal kriging is the best performer among the major prediction interpolators incorporated into IntR. In the 3D case study, a comparison between a 3D ordinary kriging and 3D universal kriging was undertaken. As expected, the best predictor in 3D universal kriging. For this reason, universal kriging was used to create a 3D map of the Lany field.

References

Bivand R.S., Pebesma E.J., Gomez-Rubio V. (2008). Applied spatial data analysis with R. *Springer, NY.*

ESRI (1998). ESRI Shapefile Technical Description.

Liaw A. and Wiener M. (2002). Classification and Regression by randomForest. In *R News 2(3).*

Pebesma, E.J. (2004). Multivariable geostatistics in S: the gstat package. In *Computers & Geosciences, 30: 683-691.*

Pebesma, E.J., Bivand R.S. (2005). Classes and methods for spatial data in R. In *R News 5 (2)*.

Ripley, B. (1998). Package ‘tree’.

Sarkar, Deepayan (2008) Lattice: Multivariate Data Visualization with R. Springer, New York. ISBN 978-0-387-75968-5

Albrecht Gebhardt (1998). Akima: Interpolation of irregularly spaced data

Nicholas J. Lewin-Koh and Roger Bivand (2005) – package ‘maptools’

Timothy H. Keitt, Roger Bivand, Edzer Pebesma, Barry Rowlingson (2003) – package ‘rgdal’