Geostatistical software suggestions

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The purpose of this page is to **suggest software and shareware to use if you are a newcomer in geostatistics**. These are suggestions only which are based on my own personal experience only. The software mentioned here are described in more details in the Software section of the AI-GEOSTATS web site. Because this page has been developed for those who are beginning to work in spatial data analysis, the tools have been selected on the basis of their cost, ease of use and the quality of the associated information (online help or manual).

Purpose	Software & Platform	Description
Learning/teaching geostatistics. **Spatial correlation analysis only.** **2D**	Variowin (free) Windows	Having a perfect understanding about the way one should analyze and model the spatial correlation between geostatistical data is certainly one of the main keys for a successful geostatistical case study. Variowin has become the standard tool for spatial correlation analysis. The success of the software is mainly based on the high levels of interactivity that are offered to the user, and this at all the stages of the study: from the display of the pairs of points on a map to the final modeling of the experimental variogram. Last but not least, the software allows the analysis of several variables (cross-variography). The software was sold with a book about the analysis of spatial data in 2 D. This book replaced the original online help which was initially developed for learning and teaching purposes. Because the book is currently out of print, the software has been made available free of charge. This is a good news ... except that the understanding of the outputs generated by the software might be a bit difficult for those who are new in the field: no help is available anymore. **Limits:** - limited to the spatial correlation analysis and the variogram modelling

Learning/teaching geostatistics. **Primary uni/multivariate geostatistical analysis of the data** **2D**	GeoEAS (free) DOS, Windows or Unix	GEOEas is certainly the most famous geostatistical package with GSLIB (most geostats software have the possibility to read "geoeas" files). Going in a systematic way through all the steps required in geostatistics (primary statistics, spatial correlation analysis, variogram modeling, interpolation with kriging and cross validation), it has also a clear manual which can be downloaded in various format (postscript and adobe acrobat format). Since it is a standard tool known by all geostatisticians, to become familiar with this tools is certainly a good start. The UNIX version (SUN only if I remember well) has an additional interface with XGobi which improves the visualization of the data. It can also handle more data and variables than the DOS version. An add on module for cokriging (multivariate geostatistics) is available from the ftp site. **Limits:** - poor outputs - lack of interactivity for exploratory variography - the GUI is quite good for a DOS program but it certainly deserves a windows version.
Learning/teaching geostatistics. Other methods are also available. **General primary analysis of spatial data** **2D**	Surfer 8 (600 US $) Windows	One of my favourite tools.... Surfer is a well known contouring package which has seen major improvements for what concerns geostatistics in versions 7 & 8. The latest version offers the possibility to analyze the semivariograms and to take linear or quadratic drifts into account. It will however handle univariate semivariogram models only (no cokriging yet). Many other interpolators are also available and their associated parameters can be properly controlled. New in version 8 are mainly two new gridding algorithms, new variogram models and the possibility to perform cross-validations. The contouring tools are developed for professional presentations (2D, 3D and relief) and it becomes therefore, with the possibility to import images, DEM, other grids, GIS data (if converted in an appropriate way before) a powerful tool. An important point is the possibility to work on the grids so that you can compare them. Last but not least, the macro language module (GS script, Visual Basic compatible environment) is well developed and facilitates batch processing of the data. Scripts can be found on the developers' web site. **Limits:** - univariate geostatistics only - The variography is not interactive like in GS+ or Variowin.
Learning/teaching geostatistics.	GS+ 5.3.2.	Easy to use, the software is a kind of mixture between Variowin and Surfer: the software offers interactive variography and contours the outputs

Deeper univariate & multivariate geostatistical analysis of the spatial data. **Beta version of software is free and allows multivariate geostatistics.** **1D, 2D**	(from 200 to 1000 US$ depending on your status) Windows	generated by ordinary kriging, co-kriging or by the inverse weighted distance function. More interesting are the other functions proposed to analyze the spatial correlation: Moran's index & fractal dimension. The handling of the data with the help of worksheets is well made and the algorithms used allow to manipulate without problems several thousands of points. The software also accepts a wide variety of input formats since it reads and writes GEOEas, ArcView, Surfer and ArcInfo file formats. **Limits:** - If the student price is OK (199 US$), the standard price of 999 US$ is very limiting. - No relative semivariograms which are widely used in environmental sciences - The outputs of maps is rather poor and there a many bugs - The manual does not provide much information about geostatistics.
Geostatistical analysis of the data **2D**	GSTAT 2.3.8. (free) C codes, binaries running under DOS, Windows or Unix	Very clean work, this software can be used by beginners as well as for more advanced work. The possibility to make geostatistical simulations is a good way to become more familiar with more advanced concepts of the use of the random function theory. Since it has been interfaced to various GIS (PC Raster, Grass, Idrisi), the user will have the possibility to make more advanced analysis. The manual (online, html, pdf, ps) is also well written and easy to follow. Even better, the associated mailing list is active and provides good support to the software users. If typing commands can be frustrating at a certain point, those who are familiar with the intuitive SPlus syntax will feel at home when using Gstat. A useful reference might be Edzer J. Pebesma and Cees G. Wesseling, 1998, Gstat: a program for geostatistical modelling, prediction and simulation. Computers & Geosciences Vol. 24, No. 1, pp. 17-31. **Limits**: - lack of interactivity for exploratory variography (no interaction between samples, h-scatterplots, variogram cloud, ...)
Geostatistical analysis of the data	GSLIB (free, requires	Listed last in this document, GSLIB has been used by almost all geostatisticians at least once in their lives. This collection of Fortran codes has been

| 2D & 3D | a Book for proper use)

Fortran Codes, binaries running under DOS, Windows or Unix | plundered by many developers and new functions where often derived from the original codes. GSLIB is also going a systematic way through all the steps required in geostatistics (primary statistics, spatial correlation analysis, variogram modeling, interpolation with kriging (2D or 3D), co-kriging and provides the user with many simulation functions. Its "manual" GSLIB: Geostatistical Software Library and User's Guide, written by Clayton Deutsch and André Journel (2nd edition, 1992, 340 pp. Oxford University Press) is a bestseller in the field.

For those allergic to source codes and the editing of parameter files, you will find a few utilities which will make the use of GSLIB 2.0 more user friendly:

• UPFILE is a computer program running under windows to display in a raster format the output of data generated with GSLIB.
• 3Plot also adds x,y co-ordinates to outputs from GSLIB.
• The Geostatistics package from Cyze & Associates is a free utility which provides the user with a simple but useful windows interface to the codes. It also provides an interface to the SAGE 2001 variogram reports.

A commercial front-end version running under windows (WinGSLIB) is also available (http://www.statios.com/WinGslib/)

A few readers will notice that I didn't put GSLIB in the first version of this FAQ. I did find indeed while making my first steps in geostatistics, that defining obscure (at the beginning at least) parameters in text files, compiling the whole code and looking for the output postscript file was not the most exciting way to start in the field. Variowin certainly contributed immensely to better digest the subject.

Limits:

- poor outputs
- lack of interactivity for exploratory variography
- no GUI |