

BOOK REVIEW

GEOSTATISTICS WITH APPLICATIONS IN EARTH SCIENCES by D.D. Sarma,
Capital Publishing Company, New Delhi, Kolkata, 2002, 170p. Price: Rs.595/-

The above publication authored by a senior scientist of the National Geophysical Research Institute (NGRI) is primarily intended as a text book at the post-graduate level for students of earth science. Statistical methods are of immense utility, when employed judiciously in tackling problems of uncertainty that abound in geological data collection, sampling and analysis.

This book contains nine chapters. The first four are on classical statistics including Stochastic Modelling and Forecasting. The next four chapters deal with geostatistics, based on the theory of 'Regionalised Variables' of Prof. G. Matheron (of the Centre de Geostatistique, Fontainebleau, France) but confines to linear Geostatistics part only. The examples of case studies chosen are entirely from Geosciences, for which the author deserves compliments. The last chapter deals exclusively with the software, developed in Fortran Language for some of the problems discussed in the other chapters. An attempt has been made by the author to bring out a comprehensive book on statistical methods applicable in Geosciences so that it can serve as a textbook for P.G. students and a reference book for research workers. But one important part of classical statistics viz. Multivariate Analysis, which has immense application in Geosciences has not been covered. The content of various chapters in the book are briefly outlined below.

Chapter 1: Statistical Methods applicable in Earth Science have been introduced here. Concepts of Random Variable, Probability, Frequency Function have been discussed.

Chapter 2: Univariate statistics covering frequency analysis, measures of central tendency, dispersion, skewness and kurtosis have been discussed. Concepts of linear correlation and regression analysis have been introduced. But in many situations non-linear correlations will exist and this aspect has not been adequately covered.

Chapter 3: deals with some of the most commonly used statistical distributions – normal, log-normal and Chi-square and their applications in geosciences.

Chapter 4: deals with stochastic modelling and forecasting. It includes introduction to stochastic processes; autocorrelation function; and stochastic modelling involving Auto Regression (AR), Moving Average (MA) and Autoregressive Moving Average (ARMA) processes which have

been illustrated very well. In the frequency domain, spectral analysis with Discrete Fourier Transformation (DFT) and Fast Fourier Transformation (FFT) have been clearly explained.

Chapter 5: deals with concepts of regionalised variable and variogram analysis and modelling. Stationarity of a variable, Intrinsic hypothesis, properties of variogram, anisotropies and drift have been explained. Commonly used variogram models have been discussed. Some elementary examples of variogram computations have been given. But, in the event of irregular data, a practical formula to calculate experimental variogram has not been provided. Also, no method is presented to tackle the variogram for non-stationary variables that are quite common in the earth sciences. Further, it would have been appropriate to deal with the relation between variogram and covariance when both exist.

Chapters 6 and 7 are on regularization and extension variance which have immense application in mining, have been illustrated in an excellent way.

Chapter 8 is on Kriging – a technique of calculating weighted average/estimate of grade of a deposit or any other required parameter under study. Kriging variance and kriging procedures have been explained very well with examples. However, non-linear kriging has not been covered.

At a number of places in the equations and notations typographic mistakes have crept in. A few of them for example: Chapter 2, page 24; It should be $n+1$ variable but not $(K+1)$ variable. Here k 's are constants. $X_1, X_2, \dots, X_n$ are n variables and y is the $(n+1)$ th variable. Chapter 5, page 62: x and $x+h$ refer to points in 3-dimensional space but not n -dimensional space; Chapter 9 page 108: line 4 and line 7 there is '-' sign. It should be '+'. In the first line of the Equation 8.12 the summation is over $J = 1$ to N ; Page 109 line 2: $\sigma_{21} \dots \sigma_{2N}$; Page 110: in the second line of the Equation 8.19 the summation is over $i = 1$ to N .

As the book is intended to be a text book for PG students, such mistakes need to be taken care of and eliminated in the next edition. Despite such small shortcomings, the book will serve as an excellent reference source for students and scholars of earth sciences.

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