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PREDICTION FUNCTIONS AND GEOSTATISTICSA. F. Desmond
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We consider analogues of estimating functions for situations in which the prediction of observables is of primary interest. We show that the mode of the predictive density has an optimality property for prediction analogous to a similar optimality property for the mode of the posterior density in the case of parametric estimation. Applications of predictive estimating functions in spatial statistics with particular reference to the geostatistical method known as kriging are developed.

Key Words: Predictive estimating functions; kriging; predictive density; spatial statistics.

1 Introduction

Applications of estimating functions have mainly focused on estimation and inference for parameters either in fully parametric or semi-parametric models. While the focus on parameters as indices of probability distributions is at the core of modern statistics ever since Fisher (1922) (See Stigler (1976)), several authors have argued persuasively that prediction of potential observables may sometimes be important. For example, Pearson (1920) refers to this as the Fundamental Problem of Statistics. It is also central to the treatment of de Finetti (1974, 1975) although he prefers the term prevision. Geisser (1993) gives an extensive discussion of predictive inference focusing, however, mainly on the Bayesian approach. In this article we discuss predictive analogues of estimating functions, motivated by similar ideas for parametric estimation. Such analogues might be termed prediction functions, although this term has been used previously in at least two different senses. Mathiasen (1979) uses it to denote a function of the future observable and the current data which ranks values of the future observation in terms of relative plausibility in the light of the data. Such a function has also