Geophysical Research Abstracts, Vol. 8, 01221, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01221

Multi-scale support vector regression for automatic mapping and spatial novelty detection

A. Pozdnoukhov (1), **M. Kanevski** (2)

(1) IDIAP Research Institute, Martigny, Switzerland, (2) Institute of Geomatics and Analysis of Risk, University of Lausanne, 1015 Lausanne, Switzerland (Mikhail.Kanevski@unil.ch / Phone +41-21-6923531)

Support Vector Regression (SVR) has recently shown promising performance in a number of spatial mapping tasks. SVR is a robust nonlinear regression method based on the Statistical Learning Theory (SLT). SLT is a general framework for solving data mining problems, such as classification, regression and probability density estimation. SVR is a non-parametric regression method based on the kernel estimation. It attempts at minimizing the empirical risk (the residuals on the training data), simultaneously keeping low the complexity of the model and avoiding over-fitting. In environmental monitoring, one often deals with the non-stationary multi-scale data. In this case observed data reveal complicated variability at several characteristic spatial scales. Particularly, this is the case for anthropogenic accidents and emergencies such as radioactive fallouts, chemical contamination, etc. An adaptive data driven method for simultaneous detection and modeling of the unusual spatial phenomena in the described conditions is of particular interest. In this paper, an extension of the SVR method is considered. In the proposed multi-scale SVR, the regression estimation is based on the so-called kernel dictionaries, i.e. the linear combination of different kernel functions. Particularly, the combination of Gaussian RBF of different fixed bandwidths was considered. The joint influence of different scales is tuned in an automatic way, providing an optimum mixture of short and large scale models. The presence of the previously unseen short-scale components in the data model indicates the possibility to detect emergency situation as well (novelty detection). The real case study deals with the radioactive contamination after the Chernobyl fallouts. The method has proven to be an effective tool for detection and mapping of the emergency situations. The performance of the model is compared with geostatistical models.