Modeling space anisotropy and non-stationarity via Partial Differential Equations

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We propose a novel approach to spatial statistics consisting in regression models with partial differential regularizations. The Partial Differential Equation (PDE) is used to model the space variation of the phenomenon, using problem-specific prior information. The proposed PDE modeling allows for important flexibility in this respect, accounting also for space anisotropy and non-stationarity in a straightforward way, as well as unidirectional smoothing effects. The method is illustrated in various applied contexts.

Keywords: space-anisotropy; non-stationarity; partial differential equations; finite elements.