Space-time trajectories of wind power generation: Parameterized precision matrices under a Gaussian copula approach

Emphasis is placed on generating space-time trajectories of wind power generation, consisting of paths sampled from high-dimensional joint predictive densities, describing wind power generation at a number of contiguous locations and successive lead times. A modelling approach taking advantage of the sparsity of precision matrices is introduced for the description of the underlying space-time dependence structure. The proposed parametrization of the dependence structure accounts for important process characteristics such as lead-time-dependent conditional precisions and direction-dependent cross-correlations. Estimation is performed in a maximum likelihood framework. Based on a test case application in Denmark, with spatial dependencies over 15 areas and temporal ones for 43 hourly lead times (hence, for a dimension of n = 645), it is shown that accounting for space-time effects is crucial for generating skilful trajectories.

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