

## **Semiparametric Multivariate and Multi-site Weather Generator**

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We propose a semiparametric multivariate weather generator with greater ability to reproducing the historical statistics, especially the wet and dry spells. The proposed approach has two steps; (1) A Markov chain for generating the precipitation state (i.e., rain or no rain), and (2) A k-Nearest Neighbor (k-NN) bootstrap resampler for generating the multivariate weather variables. The Markov chain captures the spell statistics while the k-NN bootstrap captures the distributional and lag-dependence statistics of the weather variables. Traditional k-NN generators tend to undersimulate the wet and dry spells which are key to watershed and agricultural modeling. Hence the motivation for this research. We demonstrate the utility and improvement over the traditional k-NN approach by applying this to daily weather data from Pergamino, in the Pampas region of Argentina. We also show the applicability of the proposed framework in simulating weather scenarios conditional on the seasonal climate forecast and also at multiple sites from the Pampas region.

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