

Nonlinear, probabilistic statistical models for multi-site/multivariate climate downscaling

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This talk reviews the application of statistical models to climate downscaling at multiple sites and/or for multiple weather elements. In general, climate downscaling models must not only be accurate in terms of traditional model verification statistics, but they must also be able to replicate statistical properties of the historical observations, e.g. extremes, temporal persistence, trends, etc. In the case of multivariate downscaling, this also means correctly specifying relationships between sites and weather elements. Two extensions of the multilayer perceptron neural network -- the expanded Bernoulli-gamma density network (EBDN) and the mixture density network (MDN) -- are discussed in this context. Both models are nonlinear and probabilistic, and are designed specifically for multivariate downscaling tasks. The EBDN model is applicable to precipitation at multiple sites, whereas the MDN can be applied to continuous weather elements such as temperature.