AI-based (ANN and SVM) statistical downscaling methods for precipitation estimation under climate change scenarios

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Since statistical downscaling methods are the most largely used models to study hydrologic impact studies under climate change scenarios, nonlinear regression models known as Artificial Intelligence (AI)-based models such as Artificial Neural Network (ANN) and Support Vector Machine (SVM) have been used to spatially downscale the precipitation outputs of Global Climate Models (GCMs). The study has been carried out using GCM and station data over GCM grid points located around the Peace-Tampa Bay watershed weather stations.

Before downscaling with AI-based model, correlation coefficient values have been computed between a few selected large-scale predictor variables and local scale predictands to select the most effective predictors. The selected predictors are then assessed considering grid location for the site in question. In order to increase AI-based downscaling model accuracy pre-processing has been developed on precipitation time series. In this way, the precipitation data derived from various GCM data analyzed thoroughly to find the highest value of correlation coefficient between GCM-based historical data and station precipitation data. Both GCM and station precipitation time series have been assessed by comparing mean and variances over specific intervals. Results indicated that there is similar trend between GCM and station precipitation data; however station data has non-stationary time series while GCM data does not.

Finally AI-based downscaling model have been applied to several GCMs with selected predictors by targeting local precipitation time series as predictand. The consequences of recent step have been used to produce multiple ensembles of downscaled AI-based models.