Mining Temperature Trends with GEP Ensembles

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Changes in the statistical behavior of usual climate variables can have great impact on the occurrence of extreme weather events and finally on climate change. In this paper we tackle the problem of modeling and forecasting the direction of change in long temperature time series. The problem is usually tackled with statistical approaches, like binary autoregressive models, generalized linear models of Hidden Markov Models. We formulate the problem in terms of supervised learning. The use of ensemble techniques is known to improve the accuracy and robustness of simple classifiers.
We propose an approach that is based on the evolutionary algorithm Gene Expression Programming (GEP), combined with an ensemble technique, in order to enhance its performance. First, GEP is used to induce pools of base classifiers, which are later combined by means of a specialized weighted voting scheme. We compare the performance of the obtained models with state-of-the-art statistical and machine learning methods. The experiments performed on long time series of temperatures recorded in several meteorological stations in the South-East of Romania show that the complex ensemble models are efficient and competitive to classical methods.