WATER – POSTER #45

Water Environment Risk Prediction Using Bayesian Network

Ershad Sharifahmadian, sharifah@unlv.nevada.edu
University of Nevada, Las Vegas

Co-Author: Shahram Latifi, University of Nevada, Las Vegas

Here, Bayesian network is applied to water environment risk prediction. Risk prediction of water resources is critical to efficiently utilize water resources. To determine the water environment risk situation, the four indices of water environment are forecasted. These indices are per capita water resources, total volume of water consumption, total amount of water resources, and total amount of discharge for wastewaters. A Bayesian network is a probabilistic graphical model which represents conditional independence relations between random variables via a Directed Acyclic Graph (DAG). The DAG is formed by a set of vertices and directed edges, each edge connecting one vertex to another, such that there is no way to start at vertex i and follow a sequence of edges that eventually loops back to i. The Bayesian network is used to provide a representation of the dependence relationships among four indexes of water environment and improve utilization efficiency of water resources. Two steps are done to choose effective parameters during prediction. During first step, some DAGs are selected. To do that, the scoring approach is utilized. The scoring approach is generally utilized when a set of given conditional independence statements is not available. The Bayesian information criterion is chosen for scoring, and is based on the maximum likelihood criterion. The Maximum Likelihood Estimation (MLE) technique is used to build a predictive model and estimate the appropriate set of the parameters describing the conditional dependencies among the variables. The Bayesian network is completed after selection of DAGs and parameters. The completed Bayesian network provides the probabilistic relations among selected parameters from the selected DAG. Afterwards, the future value of four indices of water environment is predicted. The efficiency of proposed method was tested by water environment data in Nevada. Based on results, the proposed method provides appropriate results in water environment forecasting.