# Prediction of Global Industrial Water Demand using Machine Learning

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## Abstract

Explicitly spatially distributed and reliable data on industrial water demand is very much important for both policy makers and researchers in order to carry a region-specific analysis of water resources management. However, such type of data remains scarce particularly in underdeveloped and developing countries. Current research is limited in using different spatially available socio-economic, climate data and geographical data from different sources in accordance to predict industrial water demand at finer resolution. This study proposes a random forest regression (RFR) model to predict the industrial water demand at 0.50× 0.50 spatial resolution by combining various features extracted from multiple data sources. The dataset used here include National Polar-orbiting Partnership (NPP)/Visible Infrared Imaging Radiometer Suite (VIIRS) night-time light (NTL), Global Power Plant database, AQUASTAT country-wise industrial water use data, Elevation data, Gross Domestic Product (GDP), Road density, Crop land, Population, Precipitation, Temperature, and Aridity. Compared with traditional regression algorithms, RF shows the advantages of high prediction accuracy, not requiring assumptions of a prior probability distribution, and the capacity to analyses variable importance. The final RF model was fitted using the parameter settings of ntree = 300 and mtry = 2. As a result, determinate coefficients value of 0.547 is achieved. The variable importance of the independent variables e.g. night light data, elevation data, GDP and population data used in the training purpose of RF model plays the major role in predicting the industrial water demand.

**Keywords: Random Forest, Boot strapping Night light data, Industrial water demand**

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