

The comparison among different cloud classification schemes using Satellite imagery

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Abstract

Using extensive GOES-11 satellite imagery data, ten basic cloud types are classified based on three different algorithms (Artificial Neural Network, Genetic Programming and Support Vector Machine). These classification algorithms are compared to evaluate the quality of classification. Data training and validation are based on the cloud Classification done in Naval Research Laboratory. Three training cases are built based on 200, 500 and 800 samples, respectively. These cases cover the west of the U.S. and Pacific Ocean Coast domains. Artificial Neural Network (ANN) was developed to mimic the neurophysiology of the human brain so as to detect the complex nonlinear relationship in the data and has been used commonly in cloud classification. However, poor performance could be observed when irrelevant attributes or small data sets exist. Genetic programming is an automatic methodology inspired by biological evolution to find solution of high level computing problems. This method performs well for irrelevant attributes data and even small data set, unlike ANN which is only appropriate for large data sets. Support vector machine (SVM) is a new statistical algorithm in machine learning, suitable for pattern classification and nonlinear regression by minimizing the structural risk. Better performance is detected using the SVM.