Air Quality Forecast Based on Principal Component Analysis-Genetic Algorithm and Back Propagation Model

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Abstract : Under the circumstance of environment deterioration, people are increasingly concerned about the quality of the environment, especially air quality. As a result, it is of great value to give accurate and timely forecast of AQI (air quality index). In order to simplify influencing factors of air quality in a city, and forecast the city’s AQI tomorrow, this study used MATLAB software and adopted the method of constructing a mathematic model of PCA-GABP to provide a solution. To be specific, this study firstly made principal component analysis (PCA) of influencing factors of AQI tomorrow including aspects of weather, industry waste gas and IAQI data today. Then, we used the back propagation neural network model (BP), which is optimized by genetic algorithm (GA), to give forecast of AQI tomorrow. In order to verify validity and accuracy of PCA-GABP model’s forecast capability. The study uses two statistical indices to evaluate AQI forecast results (normalized mean square error and fractional bias). Eventually, this study reduces mean square error by optimizing individual gene structure in genetic algorithm and adjusting the parameters of back propagation model. To conclude, the performance of the model to forecast AQI is comparatively convincing and the model is expected to take positive effect in AQI forecast in the future.