

Title: Construction of an Image-based Ambient Air Quality Assessment Model

Industrial Applications □Intelligent Manufacturing □Intelligent Driving □Intelligent Life □Smart Medicine ■Smart City

Background description

[Overall background]

Air quality has attracted much attention in recent years. At present, domestic precision detection equipment is mainly used to detect the concentration of pollutants in the air. However, these detection instruments have high cost, and can only be placed in fixed observation points. It is difficult to cover every corner of the city. Secondly, it is difficult to update the detection system in real time. With the popularization of mobile devices, the rapid development of the Internet and the improvement of artificial intelligence technology, it has become a very meaningful topic to obtain air quality information through images.

[Business background]

Through constructing a model, the air quality index can be obtained from the image. The model can be applied to the following two scenarios:

- (1) Embedding in road cameras to monitor the air quality in real time.
- (2) Embedding in mobile devices to obtain ambient air quality information anytime and anywhere.

Project description

[Problem description]

The contest item is divided into two small problems.

- (1) Using the fixed point database that we give as the training set for training model, to predict the PM2.5 concentration in the fixed location. The database gives the environmental images of four locations, where each image has the corresponding location of the PM2.5 concentration and the air humidity label, detailed the database description file.
- (2) Using the unfixed database that we give as the training set for training model, to predict the air quality level of the random location. The database gives the environment images at different locations, where each image has the label of the air quality level of the corresponding location, and the details of the database description file.

[User expectations]

- (1) The first problem requires the model can obtain the PM2.5 concentration of the test image at the given location, which should be as close as the actual PM2.5 concentration.
- (2) The second problem requires that the model can obtain the air quality grade of the test image at random site, which should also be as close as the actual air quality grade.
- (3) The algorithm has high time efficiency.

[Expected economic effect]

In the future, the auxiliary detection station can be used for air quality detection, and the future urban environment can be predicted through automated information statistics, and effective suggestions for environmental improvement projects should be provided.

Task requirements

[technical path]

- (1) building a physical model
- (2) traditional machine learning methods
- (3) deep learning method

[Technical indicators]

Result evaluation index

- (1) For the first problem, the MAE (mean absolute error) will be used as the evaluation index to evaluate the running precision of the model on the test set, and finally the rank of all the teams is ranked according to the index.
- (2) For the second problem, the GOD (difference degree) will be used as evaluation index to evaluate the operation precision of the model on the test set, and finally the ranking of all the teams is ranked according to the index.
- (3) The final model will be tested with the test set at the site. Then, we calculate the total running time for the two problems, and finally rank all the teams according to the index. Finally, the ranking of the teams will be sorted according to the average ranking of the above three indicators.

[Standard Submission]

The test will be held on the spot, and the test set will be given on the spot, using the same configuration of the PC computer (WIN system) to run the model given by the competitors. We will give forecast accuracy, time and final rankings on the spot. The participants need to prepare the following:

- (1) Executable exe files or other programs or codes that can be run on the spot.
- (2) A brief process description of the algorithm. It can be a flow chart or a method description document.

[Task list]

- (1) For the first problem, four PM2.5 concentration prediction models for four locations should be constructed, or a model can be used to predict the concentration of PM2.5 at the same time at the same time.
- (2) For the second problem, a prediction model of air quality grade should be constructed.

Reference information

[Reference tool]

None

[Reference data]

- [1] Benqian Yang, Qiang Chen. PM2.5 Concentration Estimation Based On Image Quality Assessment. The 4th Asian Conference on Pattern Recognition (ACPR 2017), 2017.
- [2] Liu X, Song Z, Ngai E, et al. PM2.5 monitoring, al. Smartphones in participatory sensing. Computer Communications Workshops, 2015, 630-635.

[Data interface]

Link: <https://pan.baidu.com/s/1wf6K7elkFiA3fLavr7-rDg>

Password: v4q