

Competition Title: Fault prediction on engineering machinery equipments based on machine learning

equipment

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

Background description

[Overall background]

With the development of sensing, communication and cloud computing, it will inevitably lead to the engineering machinery industry to advance to the direction of information and intelligence, so as to improve the high-tech content of engineering machinery, meet the needs of different customers and promote the prosperity and development of engineering machinery.

Because of the continuous development and perfection of engineering technology, users have put forward higher market requirements for engineering machinery and equipment. It is the latest development trend of the engineering machinery industry to realize the on-line monitoring and automatic fault diagnosis of the work process of the engineering machinery, and to predict and eliminate the possible failures according to a certain intelligent system.

[Business background]

Fault prediction of engineering machinery equipment is the key technology in the information and intellectualization of engineering machinery. It can continuously improve and improve the level of equipment maintenance. It makes the equipment maintain good performance with the most economical and reasonable life cycle cost, guarantees the needs of the engineering, improves the utilization rate and prolongs the service life of the machine. And it promotes engineering enterprises to improve production efficiency and economic efficiency.

Project description

[Problem description]

From the point of view of maintenance methods, engineering machinery can be divided into the following two categories: post maintenance and preventive maintenance. At present, the main maintenance mode is after the post maintenance, that is, the failure of the engineering machinery in the use of maintenance, the price of the equipment parts of the engineering machinery is generally high, and the loss of the shutdown is relatively large, and the post maintenance method will bring a large economic loss to the user after the maintenance. If the fault of the engineering machinery and equipment can be predicted and the equipment can be prevented and maintained in time, the best maintenance effect can be obtained by using the least maintenance cost, and more economic value will be brought to the user. Training data shows that every data in the training data set is divided by \n, and \t is used between fields, and the fault data has a clear fault code. During the game, the following two ways can be obtained.

Training data:

1) The participants need to provide IP and port of the acquisition procedures for receiving real time data of engineering machinery and equipment. The competition provider will be desensitized to send out the actual working condition data of more than 1000 engineering machinery equipment for one month, and the participants can test the data flow of the whole system by this way.

2) Off-line access to training data from the event website or to the organizer, and the participants can easily use the format data to build and train the model. Test data show that after the participants completed the online submission and deployment of the program, the competitor will send another batch of desensitized engineering machine working data for the scheme evaluation.

[User expectations]

- 1) Data acquisition, real-time analysis and storage of large data for engineering machinery and equipment.
- 2) Providing visualization tools for visual management, monitoring and real-time fault prediction results.
- 3) Training the fault prediction model for the collected working condition data.
- 4) Based on training model, real-time prediction of the collected data is carried out.
- 5) Updating the prediction model on time on line.

[Expected economic effect]

With the continuous breakthrough of new technologies such as the Internet of things, large data, and other new technologies, production cost control has a better solution, that is, machine monitoring and predictive maintenance. Predictive maintenance is based on the test results, depending on the specific state of the equipment, determine the most appropriate repair time and more reasonable repair methods. The state monitoring avoids the sudden failure of the mechanical equipment, thus avoiding the huge loss caused by forced shutdown, and the mechanical state analysis provides a reliable basis for the pre known maintenance period of the equipment. Moreover, it can be repaired when necessary, so that the maintenance parts can be prepared in time, the maintenance plan is arranged, the maintenance plan is arranged and the maintenance plan is overcome. The unnecessary economic loss and equipment performance decrease to improve the reliability of equipment. Correct fault diagnosis can accurately determine the type of fault and fault location, avoid overrepair and lack of repair of equipment, improve work efficiency, make maintenance simple and easy, greatly shorten the maintenance period. Practice has proved that after an effective predictive maintenance, the inventory accuracy of spare parts is over 95% and the life cycle of equipment is more than 10%. It can be seen that equipment foresees maintenance will bring huge economic benefits to enterprises.

[Technical path]

Based on the mainstream of big data technology to achieve data acquisition, analysis and storage;
Based on machine learning algorithm or deep learning algorithm to construct the model.

[Technical indicators]

- 1) Supporting data acquisition and storage per second;
- 2) Supporting the real time fault prediction of ten thousand times per second.
- 3) When the throughput is satisfied, the higher the accuracy and recall, the higher the score.

[Standard submission]

Participants are asked to design a distributed system that meets the above requirements from the developer's perspective.

- 1) Achieving high concurrency acquisition, real-time resolution and big data storage.
- 2) Providing visualization tools for system management, monitoring and real-time fault prediction results display.
- 3) Training the fault model according to the collected data.
- 4) Based on training model, real-time prediction of the collected data is carried out.
- 5) The fault prediction model being updated online regularly.

[Scheme review]

The participants need to deploy and demonstrate the whole process (remote operation) in the cluster environment provided by the competitor, and predict the failure of the test data. The evaluation results are comprehensively evaluated according to the demand matching degree and fault prediction.

Grading standard

The full score of this competition is 100 points, the total score of the task completion (20 points), the prediction accuracy score (40 points), and the recall rate score (40 points) are three parts:

- 1) Ensuring that the participation scheme meets the requirements of the submission standard, and the degree of system perfection is scored from 5 aspects: data access, parsing, storage, prediction and presentation, with a maximum of 20 points;
- 2) From the parameter scheme that meets the above requirements, the highest accuracy rate of real-time prediction is chosen as the benchmark. The accuracy rate of racers is: the accuracy / accuracy of competitors is *40 points.
- 3) From the parameter scheme that meets the above requirements, we choose the highest real-time recall rate as the benchmark. The recall rate of racers is: the recall rate of participants / the highest recall rate is *40 points.

Note: the competition plan must ensure data integrity. If there is missing data, the score of the participants will be 0.

[Task list]

The distributed system installation package, installation and deployment document, user manual and prediction model plan can be used normally.

Time notes

Before May 31, 2018: the participants entered the IP and port of registration procedures to achieve training data;

Before July 10, 2018: submit the above information to complete the competition department's supplier's department.

Unified deployment and testing;

Before August 10, 2018: release the final achievement and ranking of the participants;

[Reference tool]

None

[Reference data]

None

[Data interface]

None