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## **The International Specialized Exhibition “INFOINVENT”**

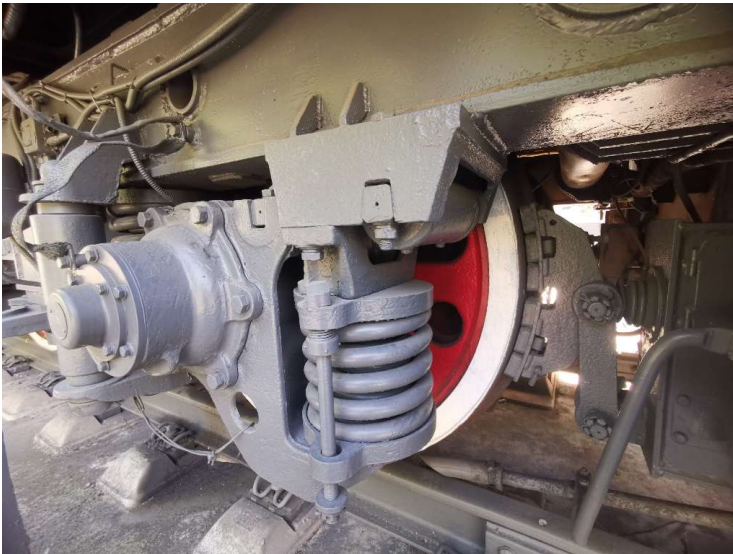
# **A method for monitoring and diagnosing the health of train components based on biogenetic characteristics**

**with 11 Chinese invention patents and 1 international PCT patent**

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Hunan Agricultural University, China**

There have been many train accidents caused by equipment failures worldwide, which caused serious personal and property losses. The **health of train components** plays a very important role in **guaranteeing the safe operation**.



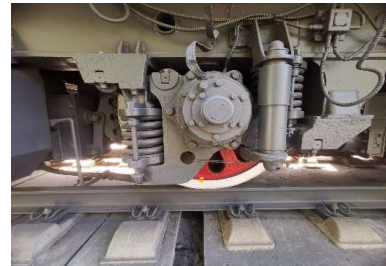
- In 1998, train derailment accident in Eschede, Germany
- In 2005, train derailment accident in Amagasaki, Japan
- In 2018, train derailment in St Poelten, Austria
- In 2021, train derailment accident in Montana, U.S.

## 01 Technical Background



To improve maintain performance of train components, it is necessary to establish a fatigue analysis theory. Clarify the **performance degradation** of key parts during the whole life, which provides **reference for the health maintenance and operation** of train parts during service.

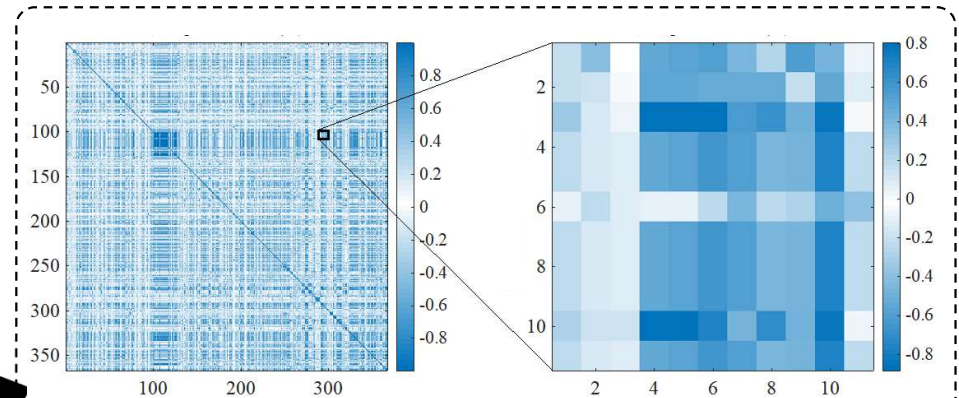
- Real-time monitoring of health status to ensure train safety
- Predictive maintenance to eliminate excess maintenance
- Optimize spare parts management and reduce inventory costs
- Repair as needed to improve equipment safety



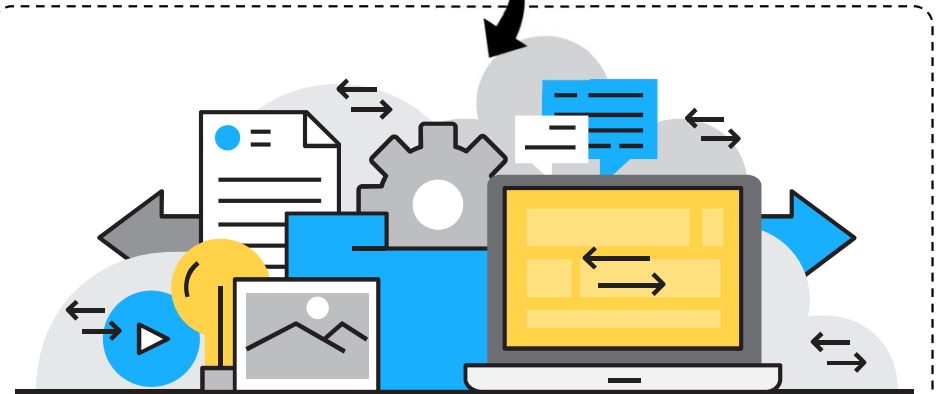
The project uses **genetic coding** to build a train fault database and health detection.



Train Component Information  
Preprocessing

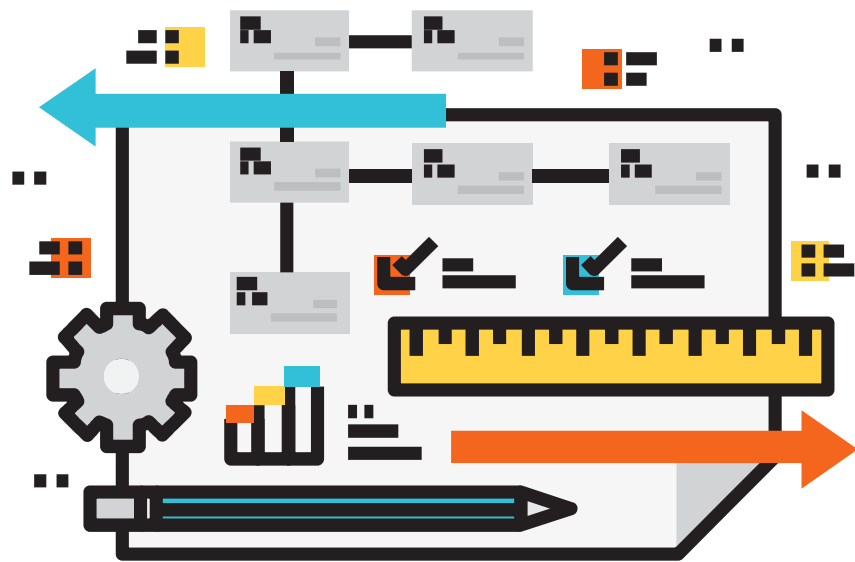


Gene Coding Visualization

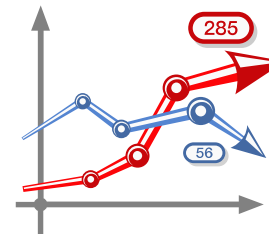


Giant Genetic Information library

**Deep learning modeling** is carried out on the information of the gene database to realize the **early warning and fault diagnosis** of train component status, respectively.



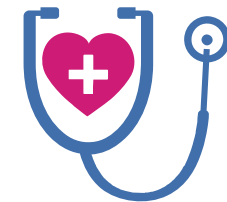
Equipment Health Monitoring and Fault Diagnosis Modeling Based on Deep Learning Theory



Failure Warning of Train Component Status

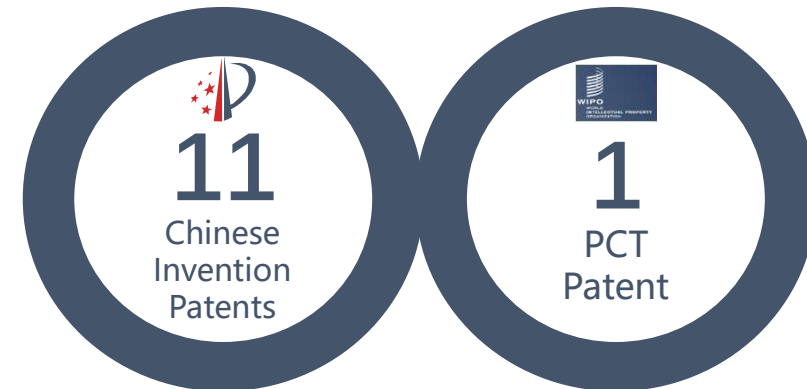


Classification, Identification and Diagnosis Results of Train Faulty Parts





The project has authorized and applied for **11 Chinese invention patents** and **1 international PCT patent**.



PCT/CN2020/141464

ZL 201910506772.5

202011616139.0

202011620731.8

202011616264.1

ZL 201910677416.X

ZL 201910676732.5

ZL 201811458792.1

ZL 201811458795.5

ZL 201910471732.1

ZL 201710299469.3

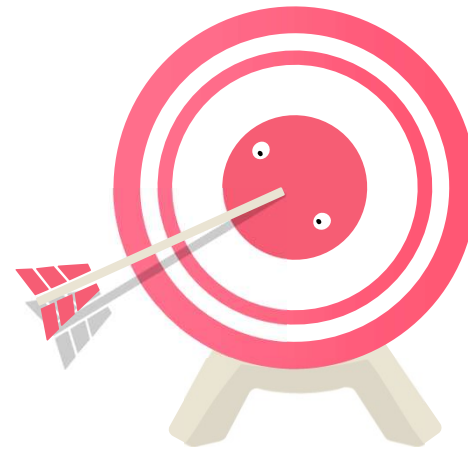
ZL 201710299446.2

The **digital fault diagnosis method** will provide a variety of diagnosis results and cost analysis for different levels of faults.



- The comprehensive train fault detection accuracy rate is over 98%.
- The false positive rate is less than 2%.
- The false negative rate is less than 0.1%.

Build the Internet of train component failures to realize the **real-time communication** of train fault information, **high-precision fault diagnosis**, saving manpower and material resources.



- Global train failure data interconnection and sharing

- Intelligent diagnosis and analysis of train faults with high precision

- Reduce the threshold of fault diagnosis and save a lot of manpower and material resources





# Thank you!