

# CHAO WANG

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## EDUCATION

### Northeastern University

Master of Computer Science and Engineering

Shenyang, China

2008 - 2010

### Jiangnan University

Bachelor of Mechanical Engineering

Wuxi, China

2003 - 2007

## HONORS

- **The Second Prize of Science and Technology Progress of Beijing Rail Transit Society Award(top1%)** 2021
- The First Prize of China Academy of Railway Sciences Award (top 50%) 2020
- **Innovation Award of Communication Signal Research Institute (top1%)** 2018
- China Patent Excellence Award (top 60%, **highest intellectual property award in China**) 2017

## RESEARCH INTERESTS

Deep Learning (Computer Vision, Knowledge Distillation; Graph Neural Network);

Machine learning (Supervised Learning);

Data analysis (Text Data Parsing; Data Distributed Storage/Computing; Data visualization);

Cloud computing (kubernetes)

## PUBLICATIONS

### [1] The Staged Knowledge Distillation in Video Classification: Harmonizing Student Progress by a Complementary Weakly Supervised Framework

Chao Wang\*, Zheng Tang

**Accepted in IEEE Transactions on Circuits and Systems for Video Technology (Top-tier SCI)**. July. 2023

Paper link: <https://ieeexplore.ieee.org/document/10182291>

### [2] WSSGCN: Wide Sub-stage Graph Convolutional Networks

Chao Wang\*, Hailu Xu

**Submitted to NeurIPS 2023**. May. 2023

### [3] Research on Micro-service Architecture Scheme of ATS System Based on Cloud Platform

Song Xin, Zhang Deming, Xu Wei, **Chao Wang\***,

Railway Signalling & Communication, 006(2022):058.

Paper link: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_railway-signalling-communication\\_thesis/0201299496731.html](https://www.zhangqiaokeyan.com/academic-journal-cn_railway-signalling-communication_thesis/0201299496731.html)

### [4] CBTC software intelligent test system technology based on big data computing model

Chao Wang\*, Zhang Deming, Xu Wei, Song Xin

RAILWAY COMPUTER APPLICATION 29.7(2020):6

Paper link: <http://www.cnki.com.cn/Article/CJFDTotal-TLJS202007007.htm>

### [5] Train intelligent testing system based on convolution neural network optimization algorithm

Chao Wang\*

RAILWAY COMPUTER APPLICATION 28.5(2019):6

Paper link: <http://tljsjyy.xml-journal.net/article/id/f9cfd7c1-6183-4722-869b-dcffd400e26f>

### [6] Application of Decision Tree Optimization Algorithm in Train Simulation Technology

Chao Wang\*

**Urban Mass Transit(Chinese Science and Technology Core Journals)** 20.12(2017):3

Paper link: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_urban-mass-transit\\_thesis/0201220784136.html](https://www.zhangqiaokeyan.com/academic-journal-cn_urban-mass-transit_thesis/0201220784136.html)

### [7] Research and Implementation of Train Control Simulation System

Chao Wang\*

Railway Signalling & Communication 4(2016):3

Paper link: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_railway-signalling-communication\\_thesis/0201224631460.html](https://www.zhangqiaokeyan.com/academic-journal-cn_railway-signalling-communication_thesis/0201224631460.html)

### [8] Design and Realization of Vehicle Human-machine Interface of CBTC System

Zheng Wei, **Chao Wang\***, Chen Ningning

Railway Signalling & Communication 1(2016):3

Paper link: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_railway-signalling-communication\\_thesis/0201224631049.html](https://www.zhangqiaokeyan.com/academic-journal-cn_railway-signalling-communication_thesis/0201224631049.html)

## **[9] Software Design and Implementation of Intelligent Data Maintenance Terminal for Urban Rail Vehicle**

Zheng Wei, **Chao Wang\***, Chen Ningning

Railway Signalling & Communication 7(2016):3

Paper link: <http://www.cqvip.com/qk/91637x/201607/669679714.html>

## **[10] Research on frequent episode mining methods on interval event streams**

**Chao Wang\***

Northeastern University (Master's thesis) 7(2010)

### **SELECTED RESEARCH EXPERIENCE**

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#### **Communication signal research institute, China Academy of Railway Sciences**

##### **Research on target classification technology of rail transit based on computer vision** Jun. 2020- Jun. 2023

###### **Leader/Core Developer**

- Research two fine-tuning methods for custom models and pre-trained models, enabling effective classification and recognition of pedestrians, vehicles, and traffic signals.
- Explore knowledge distillation techniques to efficiently construct lightweight deep learning models for pedestrian, vehicle, and traffic signal detection and classification.
- Propose a new loss method, DF, which is based on the feature distribution and is able to uncover knowledge hidden in the distribution of features.
- Propose two new weakly supervised distillation frameworks. The first, SKD, is a substage-integrated framework that simulates the human-stage learning process. The second, RSKD, is based on a relevant combination stage approach that improves efficiency and accuracy.
- Conduct experiments and demonstrate that our models achieve state-of-the-art or competitive results using knowledge distillation.
- Paper link: <https://ieeexplore.ieee.org/document/10182291>

##### **Human body detection and alarm system based on cloud platform**

Jun. 2020- Jun. 2022

###### **Leader/Core Developer**

- Apply lightweight object detection model and integrate it with a small-scale industrial computer to automate human detection and alarm triggering.
- Develop cloud-based big data system to enable real-time uploading of alarm data, facilitating prompt review by dispatchers in the central control room.
- A reward was obtained: Second prize of science and Technology Progress Award of Beijing Rail Transit Society.
- Award Link: <https://www.bjsmet.org.cn/3a75b2e47858c25cca0d79cf17810cf43.html> (**Multi-project Award**)

##### **Data service analysis platform of the CBTC system based on the big data framework**

Jun. 2017 - Jun. 2020

###### **Leader/Core Developer**

- Build an automated, modular, highly scalable, and efficient data processing platform for comprehensive intelligent railway train control systems.
- Conduct research and integration of various technologies within the big data ecosystem, including but not limited to Hadoop and Spark, to enable real-time and offline functionalities and parallelized task scheduling on the platform.
- Accomplish automated visualization of analyzed data.
- A reward was obtained: Second prize of science and Technology Progress Award of Beijing Rail Transit Society.
- Award Link: <https://www.bjsmet.org.cn/3a75b2e47858c25cca0d79cf17810cf43.html> (**Multi-project Award**)
- Paper link: <http://www.cnki.com.cn/Article/CJFDTotat-TLJS202007007.htm>

##### **Development of Maglev Train on-board Signal Equipment Monitoring System**

Jun. 2015- Jun. 2017

###### **Core Developer**

- Develop a monitoring system for maglev train signaling equipment, enabling online real-time monitoring and alert functions for the maglev train's speed and positioning system.
- Implement an automated fault analysis feature for log data of maglev train signaling equipment..
- Propose an algorithm based on attribute matrix graphs to address the exponential time complexity issue when dealing with large datasets.
- Enhance the implementation of the ID3 algorithm for decision trees, resolving the bias issue in predicting information gain when processing real-time data.
- Established a data mining system that incorporates feedback mechanisms to adjust information and transmit it to various subsystem modules, effectively reducing the probability of failures and enhancing train operation efficiency.
- Conduct experiments and demonstrate that our algorithm accurately classifies and categorizes fault issues, providing a reliable foundation for fault prediction.
- Paper link: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_urban-mass-transit\\_thesis/0201220784136.html](https://www.zhangqiaokeyan.com/academic-journal-cn_urban-mass-transit_thesis/0201220784136.html)
- One patent was obtained: An ATO Speed Measuring and Ranging System.
- A reward was obtained: China Patent Excellence Award.

## SELECTED PROJECTS

### Communication signal research institute, China Academy of Railway Sciences

#### Intelligent Platform for Urban Rail Train Control System based on private Cloud Jun. 2020- Jun. 2022

##### Leader

- Computer vision technology is employed to achieve target classification and target detection of rail transit equipment.
- Business data monitoring and analysis technology enables automated analysis and identification of data.
- The system and devices are deployed on virtualized devices within the private cloud architecture.
- A reward was obtained: Second prize of science and Technology Progress Award of Beijing Rail Transit Society.
- Award Link: <https://www.bjsmet.org.cn/3a75b2e47858c25cca0d79cf17810cf43.html>(**Multi-project Award**)

#### CBTC System Architecture and Key Technologies Based on Cloud Platform Mar. 2019- Mar. 2021

##### Core Developer

- Conduct research on the architecture and key technologies of the Communication-Based Train Control (CBTC) system, aligned with cloud platform technology, with the aim of achieving the digitalization and advancement of urban rail transit industry construction.
- A paper was published: [https://www.zhangqiaokeyan.com/academic-journal-cn\\_railway-signalling-communication\\_thesis/0201299496731.html](https://www.zhangqiaokeyan.com/academic-journal-cn_railway-signalling-communication_thesis/0201299496731.html)

#### Foundation of Intelligent Software Test System for Urban Rail Transit Jun. 2018- Jun. 2020

##### Leader/Core Developer

- Computer vision technology is ingeniously applied to achieve automated testing of a portion of CBTC software.
- Establish high-reliability software quality measurement parameters, and develop an intelligent software testing system.
- During the subsequent testing of multiple high-speed rail and subway projects, the overall testing efficiency of the projects has been significantly enhanced.
- One patent was obtained: Intelligent Automatic Test System Based on CBTC.
- A reward was obtained: Innovation Award of Communication Signal Research Institute Innovation Competition of China Academy of Railway Sciences.

## SELECTED PATENTS

• Train arrival warning method based on distributed structure	No.ZL202011516650.3, 2023
• Automatic control method of train reentry route	No.ZL202011518244.0, 2023
• Intelligent Automatic Test System Based on CBTC	No.ZL201811504086.6, 2022
• Real-time Monitoring Platform of Urban Rail Vehicle Signal System	No.ZL201822216346.1, 2019
• Train protection system based on two channel redundant vehicle communication	No.ZL201510977159.3, 2017
• An Automatic Test Method and System for Subway Train Signal System	No.ZL201310652894.8, 2016
• An On-line Monitoring and Early Warning Device for Subway Train Signal System	No.ZL201310654233.9, 2016
• A Method and System for Real-time Adjustment of Automatic Train Running Grade	No.ZL201410515708.0, 2016
• An ATO Speed Measuring and Ranging System	No.ZL201410563349.6, 2016

## SERVICES

<b>Reviewer</b>	IEEE Transactions on Circuits and Systems for Video Technology	2023 – present
<b>Member</b>	IEEE member	2023 – present

## SELECTED COURSES

Applied Mathematical Statistics	Fuzzy Mathematics	Knowledge Discovery and Data Mining
Machine Learning	Advanced Artificial Intelligence	Distributed Data Systems
Distributed Operating Systems	Internet Technologies	*C Programming
*Fundamentals of computer	*Advanced Mathematics	*Linear Algebra
<i>* Represent undergraduate course</i>		

## SKILLS

**Languages:** C, Python, JAVA, Scala, JavaScript, SQL, LATEX

**Frameworks:** Pytorch, Tensorflow, Keras, SpringBoot, E-Charts, Hadoop, Spark

**Tools:** Git, MySQL, IDEA, JupyterLab, K8s, Hive, Kafuka, Flume, Nginx, Zookeeper, Sqoop, Ganglia

**Platforms:** Linux, Windows, Web, Nvidia Jetson, VMware

**Competitions:** Kaggle (contributor), Tianchi (contributor)