CHAO WANG

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EDUCATION

Northeastern University — **Shenyang, China**
Master of Computer Science and Engineering — 2008 - 2010

Jiangnan University — **Wuxi, China**
Bachelor of Mechanical Engineering — 2003 - 2007

WORK EXPERIENCE

China Academy of Railway Sciences — 2010 - PRESENT

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 50%, **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 Classiffcation: 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] 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

[3] 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

[4] 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

[5] 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

[6] 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

[7] 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

[8] 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

[9] Research on frequent episode mining methods on interval event streams
Chao Wang*
Northeastern University (Master's thesis) 7(2010)

SELECTED RESEARCH EXPERIENCE

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/CJFDTotal-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
- 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

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

Reviewer	IEEE Transactions on Circuits and Systems for Video Technology	2023 – present
Member	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

** Represent undergraduate course*

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)