

# YIQIAN ZHANG

## Project Portfolio

M.Sc. Student in Electrical and Computer Engineering  
Georgia Institute of Technology

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### INTRODUCTION

I was a software development engineer and my responsibilities are included in my resume. This portfolio provides detailed descriptions of my projects, including industrial work, academic research, and intellectual property achievements.

### INDUSTRY PROJECTS

#### Information Security Platform Project

Mar. 2023 – Jul. 2023

*Software Development Engineer, Primeton Software, Inc.*

*Advisor: Dewang Ren (Manager)*

##### Project Overview:

- Developed a new algorithm using stack to process each asset data in less than 100ms, with the system executing more than 100 transactions per second
- Implemented the project based on the Spring Cloud framework using Java and JavaScript with approximately 99,068 lines of code
- Used the open-source project Drools as the rule engine and adopted MySQL relational database for data storage

#### Pudong Development Bank Information Security Platform Project

##### Project Background:

- Shanghai Pudong Development Bank is desensitizing sensitive personal information in accounts to prevent misuse of private data within the organization and to prevent private data from leaving the organization unencrypted
- The entire project is implemented using Data Asset System

##### Technology Stack:

- Frontend: Vue for page display and interaction
- Rules Engine: Drools open-source project for business rules management
- Backend: SpringCloud Alibaba microservice architecture
- Database: MySQL relational database for data storage

##### Personal Contributions:

###### 1. Sensitive Asset Desensitization Module

- **Parsing of Desensitized Messages:** Desensitization of response and request messages sent by the bank's server. As the message data is in XML or JSON format, both formats need to be parsed into usable Java class structures. Used dom4j to parse XML files and Fastjson library to parse JSON files, extracting required fields which are then encapsulated into the Drools engine for desensitization
- **Desensitized Logging:** The system records “desensitization objects, hit rules, desensitization algorithms, desensitization timing, desensitization business” and other data. Developed interfaces using SpringBoot and MyBatis to return table data, enabling the frontend to display visualizations using echarts

###### 2. Interface Testing, Stress and Performance Testing

- Conducted stress and performance testing using Postman and JMeter software
- Tested the TPS and QPS of the system to obtain relevant operating parameters and issued test reports
- Further optimized the system according to test report findings

##### Performance Achievement:

- Stress test duration: 6 hours

- Maximum throughput: 5,000 QPS (queries per second) - the maximum throughput capacity
- TPS: The number of transactions processed per second exceeded 100

## Data Quality System Research

*Software Development Engineer, Primeton Software, Inc.*

Feb. 2022 – Feb. 2023

*Advisor: Dewang Ren (Manager)*

- Developed a tree-search-based algorithm to optimize the data management function module
- Developed the SQL Scoring Report Engine module and the quantitative results display module using diverse techniques such as Hadoop, HBase, Zookeeper, and Element UI

## ERP System Development

*Software Development Engineer, Primeton Software, Inc.*

Jul. 2022 – Feb. 2023

*Advisor: Dewang Ren (Manager)*

- Developed the process-approval part of the ERP system to accelerate State Power Investment Corporation's (SPIC) digital transformation
- Created 720 OA process graphs and BPM process graphs for 50 types of different business scenarios including financial reimbursement and item application
- Incorporated deep learning-based transformer framework into the IAM system, which created a strict authentication structure for SPIC and its 62 subsidiaries
- Received positive feedback from SPIC for its 130,000 employees in terms of the approval process, since my proposed solution greatly improved the working efficiency (around 35%) of the ERP system

## Guangfa Store (E-commerce Platform Project)

### Project Description:

- Guangfa Store is a community e-commerce platform, including WeChat mini-program and WeChat public account
- Suitable for multi-industry scenarios, helping merchants to open online stores, do online marketing, manage customers and receive orders
- Brings together high-quality products from around the world through video display, recommending food, clothing, beauty and home products to consumers

### Technology Stack:

- Core: JDK 8.0, MySQL, Nginx, Spring Cloud, MyBatis, Redis
- Messaging & Scheduling: RocketMQ, Zookeeper, Elastic Job
- Search & Streaming: Elastic Search, Kafka
- Version Control: GitLab

### Technical Implementation:

- Responsible for the construction of basic services, divided into: basic service, unified gateway, user center, merchant base, merchant entry, rights management, SMS service, file service, QR code service, WeChat gateway, channel service, operation management, version release service, error code service, and data synchronization service
- Used Spring Cloud + Zuul 2.0 to build the microservice architecture, with Vue for frontend development
- Used Redis for caching and Druid database connection pooling to achieve multiple data source switching
- Used Redis + UUID to optimize token authentication, caching basic user information
- Used Redisson for distributed locking
- Used RocketMQ distributed transaction solution
- Used MySQL for data storage, while using MySQL binlog for data synchronization

## ACADEMIC RESEARCH PROJECTS

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### ZTO: Zero-Touch Wi-Fi Provisioning Protocol for Smart Home IoT Devices

*Course Project, Georgia Institute of Technology*

Sept. 2024 – Dec. 2024

*Advisor: Prof. Frank Li*

- Designed secure zero-touch provisioning protocol using ECDH-based mutual authentication and AES-encrypted SSID identifiers
- Implemented steganographic device identification within IEEE 802.11 SSIDs for automatic device onboarding
- Modified MediaTek MT7603 wireless driver to enable dynamic hidden AP creation and SSID-based device filtering
- Achieved full provisioning in under 15 seconds while ensuring resistance to MITM and device-forgery attacks

- Authored comprehensive technical report receiving full marks (100/100) for protocol design and security analysis

### **Domain Watermarking for Dataset Copyright Protection**

*Course Project, Georgia Institute of Technology*

Sept. 2024 – Jan. 2025

*Advisor: Prof. Changlai Du*

- Reproduced a black-box dataset ownership verification framework based on Domain Watermarking
- Implemented bi-level optimization to generate “hardly-generalized” domain samples for invisible watermark embedding
- Compared clean-label domain watermarks with poison-based backdoor attacks (e.g., BadNets)
- Evaluated verification confidence via hypothesis testing on CIFAR-10 and ImageNet datasets

### **High-Capacity Image Steganography via Invertible Neural Networks**

*Course Project, Georgia Institute of Technology*

Aug. 2024 – Dec. 2024

*Advisor: Prof. David Citrin*

- Implemented deep steganography pipeline based on HiNet architecture, extending from single-image to multi-image embedding
- Integrated DWT module into invertible blocks to leverage HVS masking effect for better imperceptibility
- Adapted spatial Importance Map to guide embedding, allocating payload to texture-rich regions
- Evaluated on DIV2K and COCO2017 datasets, achieving nearly lossless recovery (PSNR > 38dB) for multiple images

### **End-to-end Learning-based Object Detection Model**

*Research Project, Beijing Jiaotong University*

Jun. 2021 – May 2022

*Advisor: Prof. Jidong Yuan*

- Proposed a recommendation algorithm based on recurrent neural network (RNN) and weighted knowledge graph (RNWKG)
- Demonstrated the effectiveness of the algorithm through extensive experiments based on real online movie and book datasets
- Designed and implemented a Korean drama recommendation system using the RNWKG algorithm

### **Digital Library – Web Applet Written in Java and JavaScript**

*Course Project, Lancaster University*

Feb. 2021 – Jun. 2021

*Advisor: Prof. Scott Piao*

- Implemented the distributed database and web services and deployed it in multiple servers, as well as the final test of functionalities and optimization
- Implemented function modules for users' services such as CRUD operations, data access objects, and QR code generation
- Used grid-search-based method to optimize the system in terms of functionalities

### **Cross-modal Fusion-based Segmentation**

*Research Project, Beijing Jiaotong University*

May 2020 – May 2021

*Advisor: Prof. Runmin Cong*

- Proposed an adaptive multi-level fusion module, namely Linguistic Inter-Intra Modulation Fusion Perception (L2iMF), to achieve a comprehensive understanding of cross-modal features
- Took the advantages of the transformer framework and developed an automatic image extraction software based on reference images
- Conducted experiments on four publicly available benchmark datasets: RefCOCO, RefCOCO+, Google-Ref, and ReferItGame
- Improved performance of the model in terms of accuracy and recall, which outperformed the CMPC\* method reported in the CVPR 2020 paper
- This project ranked top 25% in Beijing College Students' Entrepreneurship Training projects

### **Smart Home Design and Sensor Data Processing**

*Research Project, Beijing Jiaotong University*

Sep. 2019 – Feb. 2020

*Advisor: Prof. Jidong Yuan*

- Designed a smart home system based on Internet of Things (IoTs), which collected living environment data using various sensors
- Uploaded the collected data to a cloud platform via wireless transmission for further analysis and processed the sensor data
- Designed a new algorithm based on the YOLO-v4 framework to detect and replace abnormal values of the real-world housing data
- Created an interface for users based on the proposed algorithm to interact with electrical equipment and receive security warnings

### **Design of Fingerprint Recognition System**

*Research Project, Beijing Jiaotong University*

Feb. 2019 – Jul. 2019

*Advisor: Prof. Yiping Cheng*

- Developed a fingerprint image processing algorithm including image preprocessing, feature extraction, and feature matching pipeline using positional features of feature points
- Improved the efficiency and recognition accuracy of the algorithm by applying the feature matrix for better feature matching design
- The proposed scheme achieved over 95% accuracy in terms of object detection performance and it reduced around 2.5× number of parameters of the model

## HONORS & AWARDS

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<b>Fully Funded Graduate Research Assistantship</b>	<i>2025</i>
• Georgia Institute of Technology	
<b>Level B Merit-Based Scholarship (Top 5%)</b>	<i>2024</i>
• Georgia Institute of Technology	
<b>Outstanding Employee Award (Enterprise-level, Top 10%)</b>	<i>2023</i>
• Huawei Technology Co., Ltd.	
<b>Third Prize, Beijing College Students' "Internet+" Innovation and Entrepreneurship Competition</b>	<i>2021</i>
• Beijing Municipal Education Commission	
<b>Entrepreneurship Training Program (Municipal-level, Top 25%)</b>	<i>2021</i>
• Beijing Municipal Education Commission	
<b>Innovation Training Program (Municipal-level, Top 15%)</b>	<i>2021</i>
• Beijing Municipal Education Commission	

## INTELLECTUAL PROPERTY

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<b>Chinese Invention Patent</b>	<i>Oct. 2023</i>
• <b>Title:</b> Recommendation System Based on Recurrent Neural Network and Weighted Knowledge Graph	
• <b>Application Number:</b> 202311333042.2	
• <b>Filing Date:</b> October 16, 2023	
• <b>Inventor:</b> Yiqian Zhang	
• <b>Status:</b> Patent application received and accepted by China National Intellectual Property Administration (CNIPA)	
• <b>Description:</b> This patent covers a novel recommendation algorithm that combines recurrent neural networks with weighted knowledge graphs to improve recommendation accuracy and efficiency. The system includes 9 claims covering the algorithm architecture, training methodology, and practical applications	
• <b>Documentation:</b> Patent application includes 4 pages of claims, 10 pages of specification, and 5 pages of specification drawings	
<b>Software Copyright Registration</b>	<i>Dec. 2023</i>
• <b>Software Name:</b> Korean Drama Recommendation System with Embedded Knowledge Graph	
• <b>Version:</b> V1.0	
• <b>Certificate Number:</b> 12184503	
• <b>Registration Number:</b> 2023SR1597330	
• <b>Copyright Owner:</b> Yiqian Zhang	
• <b>Development Completion Date:</b> May 10, 2022	
• <b>Rights Acquisition Method:</b> Original acquisition	
• <b>Scope of Rights:</b> All rights	
• <b>Registration Date:</b> December 11, 2023	
• <b>Issued by:</b> Copyright Protection Center of China	
• <b>Description:</b> A complete recommendation system implementation that embeds knowledge graph technology to provide personalized Korean drama recommendations. The system demonstrates practical application of the patented RNWKG algorithm	

## Additional Information

- In my spare time, I continued to develop my interests as a student and applied for patents and software copyrights for my graduation design and research projects
- Source code and additional documentation available at: [GitHub - yi-qian-zhang/patents](https://github.com/yi-qian-zhang/patents)

## CERTIFICATES & SUPPORTING DOCUMENTS

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### Scholarships & Financial Awards



To: Zhang, Yiqian, Reference number ending in 8783

July 23, 2024

Dear Yiqian:

I am pleased to inform you that you are offered a Level B “Merit-Based Scholarship” to study at Georgia Tech – Shenzhen beginning in the Fall 2024 semester. The scholarship amount is Chinese RMB ¥7,000 per semester for a maximum of 3 semesters. Please note that this scholarship is only valid for the Master of Electrical & Computer Engineering (MS ECE) program at Georgia Tech – Shenzhen and does not transfer to other programs or campuses. The last semester that this scholarship can be utilized is Fall 2025, after which point the scholarship will expire.

For each semester that you will be taking classes at Georgia Tech - Shenzhen, we will apply the scholarship to offset your tuition for that semester. The scholarship can be discontinued if you are found to be in violation of the Georgia Tech Student Code of Conduct or if you fail to maintain a cumulative GPA of 3.4 on the Georgia Tech – Shenzhen program.

We wish you success!

Sincerely,

A handwritten signature in black ink that reads "Wenshan Cai".

Wenshan Cai  
Professor of Electrical and Computer Engineering, Georgia Tech  
Director, Georgia Tech – Shenzhen MS ECE Program  
Email: [wcai@gatech.edu](mailto:wcai@gatech.edu)

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*A Unit of the University System of Georgia • An Equal Education and Employment Opportunity Institution*

#### Level B Merit-Based Scholarship Offer Letter

Georgia Institute of Technology - Shenzhen

Amount: RMB ¥7,000 per semester (max 3 semesters)

Period: Fall 2024 – Fall 2025

Reference No.: ending in 8783 — Issued: July 23, 2024

## Patents & Copyrights



国家知识产权局

102600

北京市大兴区兴华大街（二段）3号院1号楼5层608 北京投知圈  
知识产权代理事务所（普通合伙）  
乔君(15344340603)

发文日：

2023年10月16日



申请号：202311333042.2

发文序号：2023101601015050

### 专利申请受理通知书

根据专利法第28条及其实施细则第38条、第39条的规定，申请人提出的专利申请已由国家知识产权局受理。现将确定的申请号、申请日等信息通知如下：

申请号：2023113330422

申请日：2023年10月16日

申请人：张宜千

发明人：张宜千

发明创造名称：基于循环神经网络与权重知识图谱的推荐算法

经核实，国家知识产权局确认收到文件如下：

权利要求书 1份 4页, 权利要求项数： 9项

说明书 1份 10页

说明书附图 1份 5页

说明书摘要 1份 1页

专利代理委托书 1份 2页

发明专利请求书 1份 4页

实质审查请求书 文件份数： 1份

申请方案卷号：3TZQ-02-1-165-231016

#### 提示：

1. 申请人收到专利申请受理通知书之后，认为其记载的内容与申请人所提交的相应内容不一致时，可以向国家知识产权局请求更正。

2. 申请人收到专利申请受理通知书之后，再向国家知识产权局办理各种手续时，均应当准确、清晰地写明申请号。



审查员：自动受理  
联系电话：010-62356655

审查部门：初审及流程管理部  
专利审查业务章  
2023101601015050

200101 纸件申请，回函请寄：100088 北京市海淀区蔚蓝国际城6号，国家知识产权局专利局受理处  
2022.10 电子申请，应当通过专利业务办理系统以电子文件形式提交相关文件。除另有规定外，以纸件等其他形式提交的文件视为未提交。

### Patent Application Acceptance Notice

Application No.: 202311333042.2

China National Intellectual Property Administration

## Professional Certifications



### Primeton EOS Platform8.2 Low-Code Senior Engineer Certification

Certificate No.: PCEPD-LC-2023-00006

Primeton Information Technologies Co., Ltd.

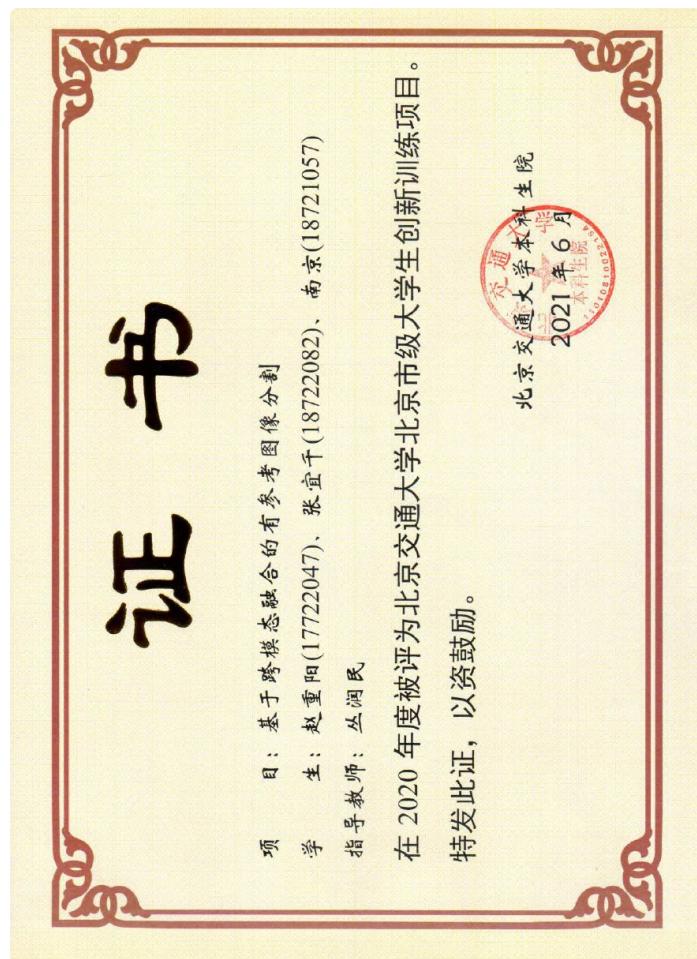


### Software Copyright Registration Certificate

Certificate No.: 12184503

Copyright Protection Center of China

## Competition Awards & Honors



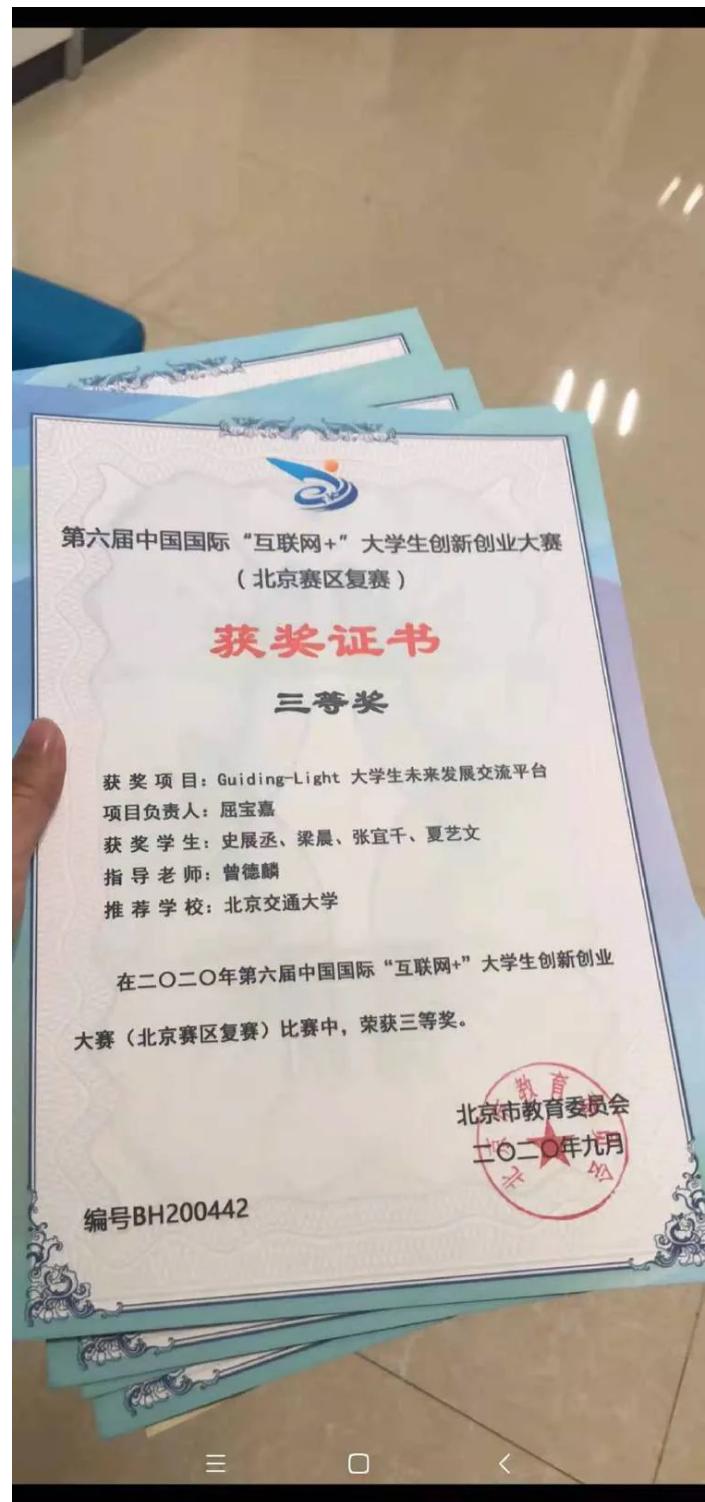
Beijing Municipal Innovation Training Program  
Beijing Jiaotong University, 2020



Beijing Municipal Entrepreneurship Training Program  
“Guiding-Light” Project  
Beijing Jiaotong University, 2021



National E-Commerce Competition  
Third Prize (School Level)  
Beijing Jiaotong University, 2020



China “Internet+” Innovation & Entrepreneurship  
Competition  
Third Prize (Beijing Regional Finals)  
Beijing Education Committee, 2020

## International Competitions



2021

### Interdisciplinary Contest In Modeling® Certificate of Achievement

Be It Known That The Team Of

Yiqian Zhang  
Boning Li  
Qi Li

With Student Advisor  
Yiqian Zhang

Of

Beijing Jiao Tong University

Was Designated As  
Successful Participant

Amanda Beecher, Contest Director

Administered by  
With support from

Kate Coronges, Problem Coordinator

### Interdisciplinary Contest In Modeling (ICM)

Successful Participant  
COMAP, 2021

2020

### Mathematical Contest In Modeling® Certificate of Achievement

Be It Known That The Team Of

Yiqian Zhang  
Zhancheng Shi  
Chen Liang

With Faculty Advisor

Chuanqi Li

Of

Beijing Jiaotong University

Was Designated As  
Successful Participant

Patrick Driscoll, Contest Director

Administered by  
With support from

Robert Burks, Head Judge

### Mathematical Contest In Modeling (MCM)

Successful Participant  
COMAP, 2020

