

Kai Zhao

Software Engineer | AI Research

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Portfolio: zkmanuel0123.github.io/

Education

Technical University of Darmstadt & Goethe University Frankfurt Msc. Medical Technology Specialization in AI and Software Development	04/2022 - Present
Technical University of Darmstadt, Germany Pre-Master's Studies in Electrical and Information Technology	04/2021 - 03/2022
Technical University of Dresden, Germany DSH Preparation Program	10/2020 – 03/2021
Beijing University of Chinese Medicine, China Master of Medicine in Chinese Medicine	09/2017 – 06/2020
Hefei University of Technology, China Bachelor of Engineering in Automation	09/2009 – 06/2013
Academic Preparation Period Prepared for national postgraduate entrance examination	06/2014 – 06/2017

Work Experience

Working Student in Data Analysis Rosenpark Research GmbH, Darmstadt, Germany	02/2024 – 07/2024
<ul style="list-style-type: none">- Develop and implement data analysis pipelines for medical datasets using Python- Apply statistical analysis and machine learning techniques for healthcare data evaluation- Collaborate with research team to optimize data processing workflows	
Teaching Assistant in C++ Programming Department of Mathematics, Technical University of Darmstadt, Germany	04/2023 – 07/2023
<ul style="list-style-type: none">- Led programming exercises for "Introduction to Programming II (C++)" course- Provided code reviews and evaluated student submissions	
UX Research Working Student Custom Interactions GmbH, Darmstadt, Germany	11/2022 – 02/2023
<ul style="list-style-type: none">- Conducted user research for Emergency Room Monitoring Systems- Contributed to frontend development and UI optimization using JavaScript- Collaborated in agile development team for healthcare software solutions	

Editorial Research Intern in Scientific Journal
World Science and Technology, Beijing, China

08/2020 – 09/2020

- Evaluated scientific manuscripts in medical informatics and digital healthcare
- Performed quality assessment of data analysis methodologies in research papers
- Collaborated with senior editors on manuscript review processes

Clinical Data Research Assistant
National Chinese Medicine Department, BUCM, Beijing, China

09/2018 – 01/2020

- Designed and maintained PostgreSQL databases for patient prescriptions and clinical outcomes
- Applied machine learning techniques to analyze prescription data using Python and scikit-learn
- Implemented data collection protocols and organized clinical workflows for efficient data capture

Engineering Intern
Hefei Hengda Jianghai Pump Co., Ltd., China

07/2013 – 12/2013

- Participated in automation process optimization for pump electromotor production
- Assisted in implementing digital inventory management system

Publications

[1] Multi-Agent Framework for Automated Pharmacological Network Analysis (Under Review, Dec. 2024)

- Developed multi-agent framework utilizing LLMs to automate pharmacological network analysis
- Implemented a research pipeline using LangChain framework to coordinate multiple agents

[2] Study and Implementation on Knowledge Graph of Guizhi Decoction Associated Formulas Based on Neo4j. **Zhao Kai**, Shi Na, Sa Zhen, Wang Huaxing, Xu Xiaoying. World Chinese Medicine, 2019, 14(10): 2636-2639+2646. **(Included in CNKI Academic Abstracts (2023.09-10) as high-ranking PCSI articles, highly cited articles, and highly downloaded articles.)**

[3] Text mining and analysis of treatise on febrile diseases based on natural language processing. **Zhao Kai**, Shi Na, Sa Zhen, Wang Huaxing, Lu Chunhua, Xu Xiaoying. World J Tradit Chin Med, 2020, 6: 67-73.

[4] Mechanisms of Dachaihu Decoction in Treatment of Type 2 Diabetes Based on Network Pharmacology. **Zhao Kai**, Xu Xiaoying. Modernization of Traditional Chinese Medicine and Materia Medica-World Science and Technology, 2020, 22(09): 3225-3234.

[5] Systematic Pharmacological Study on Dahuang Huanglian Xiexin Decoction on Helicobacter Pylori Infection. Lu Chunhua, **Zhao Kai**, Sa Zhen, Wang Huaxing, Xun Caimeng, Gao Xue, Liu Yansong, Lu Tao. World Chinese Medicine, 2020, 15(12): 1699-1704.

Research Projects

LLM-Enhanced Natural Language Inference for Biomedicine application 12/2024 – Present

Master's Thesis under the Department of Computer Science, Technical University of Darmstadt

- Developing novel multi-agent frameworks to optimize LLMs for biomedical semantic reasoning
- Implementing cost-efficient methods for medical knowledge extraction and inference
- Designing advanced prompt engineering strategies for improved model performance

Medical AI-Agents QA System

10/2024 – 11/2024

- Implemented domain-specific LLM fine-tuning using LoRA and PEFT frameworks
- Developed RAG with FAISS vector database and Sentence Transformer
- Multi-agent system using LangChain and Hugging Face Transformers
- Github: <https://github.com/zkManuel0123/TinyLlama-medical-qa-system>

Semi-Automatic Tool for Annotating Large-Scale 3D Assets

10/2023 – 09/2024

One year Project in the department of Computer Science, Technical University of Darmstadt

- Developed a semi-automatic tool for annotating large-scale 3D assets from RGB videos
- Integrated state-of-the-art models (NeRF, SA3D, SAM2) for 3D reconstruction and mesh generation
- Implemented user interface for efficient annotation workflow management to reduce manual annotation

Immunological Response Analysis in Temperature Variation Study

09/2018 – 05/2020

Scientific Research Fund Project, Beijing University of Chinese Medicine

- Conducted comprehensive research combining immunological experiments and bioinformatics analysis
- Applied network pharmacology methods to analyze drug-target interactions using Python, R, SAS
- Developed data analysis pipeline for processing multi-source experimental data
- Implemented statistical modeling and visualization for complex biological datasets using Cytoscape

Professional Development

The Web Developer Bootcamp (Udemy, 2024)

- Full-stack development with HTML5, CSS3, JavaScript, Node.js, Express.js, React, MongoDB
- Implemented responsive design and REST APIs using modern frameworks
- Verify Link: udemy.com/certificate/UC-e4b84898-b758-4216-b73a-75eebb6ba459/

Java Masterclass 2025 (Udemy, 2025)

- Mastered core Java programming fundamentals including OOP concepts and industry best practices, with readiness for enterprise frameworks like Spring and Java EE.
- Verify Link: udemy.com/certificate/UC-a6975d1f-7e73-4c1c-84fd-69529d53dfda/

AI-Agents: Automation & Business with LangChain & LLM Apps (Udemy, 2024)

- Built AI automation systems using LangChain, LangGraph, AutoGen, and various LLMs
- Implemented RAG systems and custom AI agents for business automation
- Verify Link: udemy.com/certificate/UC-e4b84898-b758-4216-b73a-75eebb6ba459/

Multi-Agent Systems (CrewAI, 2024)

- Developed collaborative AI agent architectures using CrewAI framework
- Designed automated solutions for complex task processing
- Verify Link: learn.deeplearning.ai/accomplishments/344b35c5-e0e0-4cfe-9a77-7f1fb74dfd02?usp=sharing

Language Skills

English (TOEFL iBT 89) | German (DSH-2)