

Zuoyu Chai

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https://zychai.github.io | Planned Start Date: Fall 2025

EDUCATION

Southeast University

Sep 2021 - Jun 2025

Major in Traffic Engineering (MAO Yisheng Honor Class)

Bachelor

Main Courses: Transportation Planning (97), Academic reading and writing (94), Linear Algebra (94), Engineering mathematical analysis (93), Data Structures and Algorithms (93), Probability Theory and Mathematical Statistics (92), Urban Public Transport Planning and Operation Management (92), Transportation system Analysis

GPA : 3.75 / 4.00

RESEARCH EXPERIENCES

Urban public transport planning and operation management

Feb 2024 - Jun 2024

Core Member

Supervised by Prof. Xuewu Chen

Course Project

- Analysis of structural characteristics of urban public transport network: Collected data on Nanjing public transport stations and lines using Autonavi API, performed coordinate conversion, and built a multi-modal bus-subway network in L-space with NetWorkX. Conducted robustness analysis, visualized the network, and handled report writing.
- Analysis of urban bus operation characteristics: Conducted field surveys, collated data, and performed statistical analysis and visualization of evaluation indicators.
- Bus passenger flow analysis and timetable preparation: Preprocessed data, performed passenger statistics, calculated passenger flow density and line departure frequencies, and handled material writing.

Optimizing Lane Layout and Control Strategies for Intelligent Toll Stations

Nov 2023 - May 2025

Project Team Leader

Supervised by Prof. Yanjie Ji

Jiangsu Province University Innovation Training Program

- Collected and processed data on toll station layouts, toll fees, and traffic flow, and analyzed the spatiotemporal distribution of traffic to establish an equivalent topological structure for the highway network.
- Created, programmed, and solved a bi-level planning model to optimize toll station lane configurations, minimizing total vehicle travel time and improving traffic assignment.
- Provided optimal strategies for different ETC (Electronic Toll Collection) penetration rates.
- Designed a dynamic lane configuration scheme to balance supply and demand based on traffic variations over time. Built a traffic micro-simulation model and customized the SUMO simulation software.
- Managed project tasks, coordinated team efforts, organized meetings, prepared project documentation, and participated in the project defense.

Research Outcomes: a journal Paper (1st, working paper), a journal paper (other, under review)

Demand Forecasting and Scheduling Optimization for Ridesharing Services

Feb 2023 - Jun 2023

Project Team Leader

Supervised by Prof. Zhiyuan Liu and Dr. Ziyuan Gu

Course Project

- Processed and analyzed ride-hailing order data.
- Conducted time series analysis and short-term forecasting of ride-hailing demand using the ARIMA model. Analyzed and visualized the spatial and temporal distribution characteristics of ride-hailing services.
- Designed a discrete event simulation model for ride-hailing based on Markov chains.
- Optimized scheduling strategies by fine-tuning hyperparameters and cooling times, and validated the effectiveness of these strategies through comparisons with pre-optimization metrics.
- Led the team in completing a comprehensive project report and achieved excellent results.

Development of acquisition and recognition system for driving behavior

Nov 2022 - Oct 2023

Project Team Leader

Supervised by Prof. Tiezhu Li

Southeast University Student Research Training Program

- Designed, assembled, and installed hardware for recording driver lane changes and following behavior; collected data through follow-car video recording.
- Used machine vision to detect and extract car pedal rotation.
- Developed indices for identifying lane changes, acceleration, and deceleration, and evaluated driving behavior.
- Managed multi-source data fusion, project division, coordination, scheduling, and organized group activities and records. Presented findings in the project defense.

Research Outcomes: A journal Paper (1st, working paper)

TEACHING EXPERIENCES

Southeast University School of Transportation Programming Answer Room

Sep 2022 - Aug 2024

Part-time volunteer

Community Services

As a programming helpdesk volunteer, I answer students' questions, provide guidance on projects, organize learning activities, host educational lectures, grade mock exam papers, and maintain resources. I help troubleshoot issues, support their learning, and gather feedback to improve our programming courses.

Southeast University School of Transportation

Aug 2022 - Jul 2023

Class Supervisor

Part-time

- Managed daily class activities to maintain order, discipline, and build class cohesion.
- Supported students' academic and personal development, including providing academic guidance, addressing issues, and offering individual counseling.
- Assessed students' performance regularly to identify and address potential problems.
- Communicated with parents about students' performance and gathered feedback to enhance student involvement.
- Organized class meetings to gather opinions, encourage teamwork, and improve communication among students.

Recognition: Outstanding Class Supervisor (1 / 10)

CONTESTS EXPERIENCES

COMAP'S Interdisciplinary Contest in Modeling (ICM®)

May 2024

Award: Finalist (Top 2%)

Consortium for Mathematics and its Applications

Contemporary Undergraduate Mathematical Contest in Modeling (CUMCM)

Sep 2023

Award: Second Prize in Jiangsu Division China Society for Industrial and Applied Mathematics

The National Undergraduate Mathematics Competitions

Jan 2023

Award: Third prize

Chinese mathematical society

The Advanced Mathematics Contest for University Students in Jiangsu Province

Dec 2022

Award: First prize Association for Mathematics Education in High Schools, Jiangsu Province

HONORS & AWARDS

Southeast University Zhi-shan Scholarship

Dec 2023

Three-star volunteer of Southeast University

Jun 2023

Outstanding Class Supervisor of School of Transportation, Southeast University

May 2023

Southeast University Zhi-shan Scholarship

Dec 2022

Southeast University Design Institute Scholarship

May 2022

Excellent Team for National College Students "Cloud Teaching at the Beijing Winter Olympic"

Apr 2022

Excellent Volunteer for National College Students "Cloud Teaching at the Beijing Winter Olympic"

Apr 2022

OTHER EXPERIENCES

Solution of user equilibrium model of traffic allocation based on Frank Wolfe algorithm

Apr 2024

Developed a solution for the user equilibrium model of traffic allocation based on the Frank-Wolfe algorithm in Python.

Published on GitHub and other developer communities, the project earned over 7,000 views and more than 120 stars.

The JOIN Art Troupe at Southeast University

Sep 2021 - Aug 2022

Member

Extracurricular activities

Southeast University Volunteer Association

Oct 2021 - Present

Member

Community Services

SKILLS

Research Tools: Python, C++, Latex, Markdown, CUDA, ArcGIS, SUMO, Vissim, Transtar, Navicat

Others: poster making, website building