# Ruichen LIU

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## EDUCATION

**Imperial College London** ***Sept 2025 - Sept 2026 (expected)***

MSc Environmental Data Science and Machine Learning

- Core Courses: Computational Mathematics, Advanced Programming, Big Data Analytics, Cloud Computing, Environmental Data, Inversion and Optimisation

**University of Birmingham** ***Sept 2021 - Jun 2025***

BSc Applied Mathematics with Mathematics

- Score: First-Class Honour (78/100)
- Core Courses: Real Analysis, Linear Algebra, Statistics, Mathematical Modelling, Programming, Optimization Theory, Computational Intelligence

## PUBLICATIONS

1. **Liu, Ruichen**, Yinxi Li, and Mengdan Li. "Research on Vegetables Sales Profit Based on Machine Learning." Highlights in Science, Engineering and Technology 98 (2024): 22-30.

2. **Liu, Ruichen**, et al. "Research and Design of One-stop Intelligent Elderly Care Comprehensive Service Platform Based on Event-driven Architecture." Highlights in Business, Economics and Management 29 (2024): 169-178.

3. **Liu, Ruichen**, Yinxi Li, and Mengdan Li. "Result Prediction of Wordle Word Guessing Game Based on SVM And BP Neural Network Multi-Input-Multi-Output Regression Prediction Model." Highlights in Science, Engineering and Technology 70 (2023): 175-182.

## RESEARCH PROJECTS

**High-Resolution Urban Carbon Dispersion Modeling Based on Artificial Intelligence** ***May 2025 - Present***

*Research Assistant*

- Configured and executed the PALM (Parallelized Large-Eddy Simulation Model) system in Linux environment to simulate urban atmospheric boundary layer dynamics.
- Integrated ERA5 reanalysis data to drive PALM simulations, generating high-resolution environmental fields.
- Provided structured simulation outputs as training data for downstream AI models focused on urban carbon dispersion analysis.

**Deep Reinforcement Learning with LSTM for Adaptive Traffic Signal Control** ***Sept 2024 - Apr 2025***

*Undergraduate Thesis Project - Outstanding Thesis*

- Developed a Long Short-Term Memory (LSTM) model to predict dynamic vehicle flow and vehicle paths on a specific road segment.
- Applied Deep Q-Networks (DQN) to predict and optimize future traffic signal plan on the selected road section.
- Utilized SUMO (Simulation of Urban MObility) for traffic simulation, integrating it with the trained DQN model to evaluate traffic signal optimization strategies.

**Serve the Old - Intelligent Home Care System Based on Deep Learning Risk Prediction** ***Jun 2022 - Apr 2025***

*Leader - National Innovation and Entrepreneurship Training Program*

- Conducted market research to identify the key needs in elderly care, performed a SWOT analysis to provide guidance on strategic decision-making and compiled a detailed business plan based on market trends.
- Innovated the product and created a functional software solution based on the research results.
- Collaborated with local medical institutions to obtain relevant indicators of stroke patients and developed deep learning classification models using XGBoost.
- **Achievements:** Applied for a software copyright patent as the first inventor.

**Machine Learning on Tropical Geometry** ***Jul 2024 - Aug 2024***

*Member*

- Analyzed 20,000+ weight data to accurately forecast dimensions and weight distributions.
- Streamlined the data dimensionality through Linear Discriminant Analysis (LDA) and Principal Component Analysis (PCA), followed by Support Vector Machine (SVM) for modeling, and achieved an accuracy of 1, specifically when predicting a weight-set dimension of 5.

- Utilized PCA for dimensionality reduction and CatBoost for modeling, enhanced regression performance of CatBoost model, and obtained an R-squared value of 0.87 and a Root Mean Squared Error (RMSE) of 2.87 in total weight predictions.

**Research of Opinion Dynamics on Algorithmic Bias** ***Jul 2024 - Aug 2024***

*Member*

- Reviewed relevant 5 research papers on algorithmic bias and compiled a 6-page research proposal.
- Integrated findings on algorithm bias with Python's NDlib to fit and analyze the results.
- Investigated practical implications of algorithm bias in machine learning, improving the existing model's versatility to accommodate different realistic scenarios.

**Result Prediction of Wordle Game Based on SVM and BP Neural Network Model** ***Feb 2023 - Jun 2023***

*Leader*

- Used SPSS to preprocess Wordle Game history data in 2022 and analyze core features.
- Developed models utilizing Python and MATLAB, employing Support Vector Machine (SVM) and BP-Neural Network for regression analysis to predict the number of player attempts, achieving an R-squared value of 0.94.
- Applied entropy weight method, PCA, K-means clustering, and multiple regression to classify word difficulties into four levels.

## INTERNSHIPS

**GRG Banking Equipment Co., Ltd** **Guangzhou, China**

*Data Intern - Digital Human Research and Development Group* *Oct 2024 - Jan 2025*

- Filtered and refined text, audio, images, and various other forms of data by Python to ensure the accuracy of digital human modeling.
- Verified and checked the accuracy and consistency of the data using multiple sources, providing data supports for decision-making.
- Tested the privacy computing platform and analyzed the advantages and disadvantages of its machine learning intelligent privacy-preserving modeling process.

**Anhui Credit Information Co., Ltd** **Hefei, China**

*Intern of the Innovation Research and Development Center* *Jan 2024 - Feb 2024*

- Developed and implemented credit scoring models using Python, improving credit assessment accuracy by 2.2%.
- Conducted a market survey on credit products, examining credit scorecard models and data sources in specialized financial scenarios.
- Enhanced the database by sourcing diverse data streams from government policy, improving the analytical capabilities for assessments.

**Huishang Bank** **Hefei, China**

*Intern of the Big Data Department* *Jul 2022 - Aug 2022*

- Constructed and implemented the risk warning model using Python on cloud platform, increasing efficiency by 3%.
- Gained hands-on experience in applying big data analytics to financial services, deepening my understanding of risk management processes.

## HONORS & AWARDS

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| Outstanding Undergraduate Graduate | *May 2025* |
| First-Class Graduation Scholarship | *May 2025* |
| First-Class Scholarship for Outstanding Students | *Dec 2024, Dec 2023* |
| School of Mathematics Undergraduate Research Bursary | *Jul 2024* |
| Outstanding Youth Volunteers | *Jul 2024* |
| Summer Research Scholarship | *Jun 2024* |
| Outstanding Student Leader | *Dec 2023* |
| Provincial Second Prize in the Chinese Mathematical Contest in Modeling | *Nov 2023* |
| Honorable Mention in the US Mathematical Contest in Modeling | *May 2023* |

## SKILLS

- **Computer Skills:** Proficient in Python, C, C++, MATLAB, SQL, SPSS, LaTeX, Office.
- **Languages Skills:** Native in Mandarin, Fluent in English (IELTS: 7.0).