

# Feier Lyu

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## EDUCATION

### University of Edinburgh, Edinburgh, UK

09/2023-07/2027

- BSc Mathematics
- Average Mark in Year 1: 78% (First Class), with exceptional performance in Linear Algebra (97%), Algebra & Calculus (87%), and Probability (86%)
- Key topics covered in past and current courses: linear algebra, calculus, data science, probability, statistics, mathematical proofs, computational methods

## INTERNSHIPS

### Beijing Qidian Xingyu Technology Co., Ltd., Beijing, China

06/2025-07/2025

Data Analyst Intern, Data Analytics Department

- Performed conversion funnel analysis with MaxCompute SQL (formerly ODPS SQL) on Alibaba Cloud's big data platform (DataWorks) by investigating PV (event volume) vs UV (unique devices) between initiation and completion steps to identify drop-offs and uncover event-tracking issues
- Conducted multi-dimensional user analytics, including retention metrics (next-day, key-visit) and channel attribution (first-touch vs last-touch)
- Built error distribution queries to detect anomalies and support troubleshooting
- Cleaned and standardized event data with SQL; used Python to simulate test events and validate event tracking coverage and correctness
- Ran pre/post-launch and cohort analyses; found a UTM mapping error that misattributed traffic in first/last-touch reports, fixed the mapping, and recomputed the attribution results
- Published daily KPI reports; conducted ad hoc deep-dive analyses (PV/UV gap analysis, error code analysis, attribution validation)

### Sichuan OST Slope Protection Engineering Co., Ltd., Chengdu, China

06/2024-05/2025

Intern – Mathematical & Computational Modeling

- Developed mathematical models to optimize the design of slope protection nets:
  - Studied gravel particles' movement patterns in slope environments, including force analysis, collision, and fragmentation behavior during the rolling process; explored the impact of factors like particle size, shape, and material properties on their trajectories and built corresponding mathematical models
  - Calculated the impact of parameters (e.g., initial release angle, height, and speed) on rolling behavior and final stacking state to provide theoretical support for optimizing slope protection designs
  - Examined gravel rolling patterns under different terrain conditions, analyzed their potential threat to slope stability, and proposed suggestions to improve protective measures
  - Organized theoretical analysis results, drafted technical documentation, and improved reports guided by team members (graduate/doctoral students) to provide data support for subsequent experimental phases
  - **Skills used:** NumPy and SciPy for numerical computing; Matplotlib and Seaborn for data visualization
- Collaborated with Prof. Runqiu Huang at the State Key Laboratory of Geohazard Prevention and Geoenvironment Protection to develop a theoretical analysis plan adopted for subsequent field experiments

## PROJECTS

### Formal proof — Greedy Approximation for Submodular Maximization (Isabelle/HOL)

06/2025-present

Supervisor: Dr. Wenda Li (Lecturer, Univ. of Edinburgh; Visiting Research Fellow, the University of Cambridge)

- Formalized the greedy approximation for submodular maximization in Isabelle/HOL, focusing on the classical cardinality-k, monotone case (matroid and non-monotone extensions deferred):
  - Defined the formal setting in Isabelle/HOL (finite ground set V; non-negative, monotone, submodular function f) and encoded marginal gain Delta f(S,e) with a greedy step selecting argmax Delta f

- Proved baseline properties of the greedy sequence, including monotonicity, the size invariant  $|S_i| = i$ , and diminishing-returns lemmas supporting the charging argument
- To prove the one-step inequality  $f(S_{i+1}) - f(S_i) \geq (1/k) \cdot (\text{OPT} - f(S_i))$  and the inductive bound  $f(S_i) \geq (1 - (1 - 1/k)^i) \cdot \text{OPT}$  toward the  $(1 - 1/e)$  guarantee
- To organize the development into reusable theories (Submodular.thy, Greedy.thy) with lightweight automation (simp rules, Sledgehammer hints)

#### **Entrepreneurial Project: Gravel Distribution System for Material Segregation Prevention 06/2024-09/2024**

- Applied numerical computing and statistical analysis techniques to the spreader's system modeling, optimization, and control, responsible for:
  - Calculating the spreader's operating parameters (e.g., spreading speed, conveyor speed, and vibration frequency) and analyzing their impact on gravel particle trajectories and spreading uniformity
  - Using statistical methods (normal distribution and hypothesis testing) to analyze gravel particle size distribution and optimizing the spreading design for higher spreading uniformity
  - Analyzing sensor data to calibrate vibration frequency and further reduce particle segregation during the spreading process
- The team has filed a patent (accepted for review) for this spreader and secured long-term cooperation with 3 state-owned enterprises

#### **Student Academic Performance Analysis Using Poisson Regression in Python 10/2024-12/2024**

- Extracted, cleaned, and prepared data from the UCI Student Performance Dataset
- Modeled the data via Poisson regression, with the dependent variable being "failures" (number of academic failures) and independent variables being family backgrounds, educational resources, learning experiences, etc.
- Calculated the incidence rate ratio (IRR) based on regression results and visualized the IRR of independent variables to interpret and compare their impact on academic failure probability
- Drew residual plots to visualize model fit and residuals' distribution characteristics; analyzed the plots to check for systematic biases in the model and verify the normality of residual distribution
- Concluded that the model's residual distribution was close to symmetric, but data underdispersion suggested the model did not fully capture data variability; proposed using generalized Poisson regression to enhance model fit and inference robustness

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#### **ACTIVITIES**

##### **Course from Harvard University (HarvardX):**

##### **Structure and Function of Argument: Introduction to Critical Thinking**

**11/2024-01/2025**

- Engaged in dynamic practice exercises to develop the ability to recognize, analyze, and construct arguments encountered on a daily basis; improved overall English language skills

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#### **PATENTS**

Invention Patent:

Anti-Segregation Spreading Method and Device (Accepted for Review; Application No.: 2024112756051)

Utility Model Patent:

Anti-Segregation Spreading Device (ZL202422234130.3, authorized on July 4, 2025)

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#### **OTHER INFORMATION**

- **Technical Skills:** Programming: Python, R
- **Other Tools:** LaTeX, Excel
- **Languages:** Chinese (Native), English (Fluent)
- **Interests:** Music (composition, arrangement, mixing); Instruments (bass, electric guitar, violin); Photography; Illustration (anime-style)