

Mathematical Modeling Project 5

In this project, you need to focus on the process of filling in college-entrance-exam (Gaokao) preferences.

Data Sources

- Minimum admission scores and enrollment quotas for each university and batch (First Tier, Second Tier, Vocational) in Guangdong Province over the past 5–10 years.
- Enrollment plans by major category, historical score distributions, and admitted-rank data for each program.
- Individual student information: mock-exam scores, subject strengths, and home location.

Problem Formulation

1. Given a student's mock-exam score, predict the probability of admission to each university (or program).
2. Based on student preferences (location, academic interests, employment prospects, etc.), construct a multi-criteria evaluation system to rank and filter university-major combinations.
3. Balance admission probability against expected benefits (employment rate, tuition, living costs) to generate three preference schemes: "Safe," "Balanced," and "Ambitious."
4. Analyze how key parameters affect the final recommendation, and develop an interactive visualization interface.

Requirements

1. Form a team of **no more than three members**, follow the provided report template, and collaboratively finalize the report.
2. You should format the report **using LaTeX**.
3. You are required to prepare presentation slides using either Beamer or PowerPoint. The presentation time for each group is 10 - 15 mins.
4. The programming language to be used is **not restricted**.

Notes

1. Suggested Models and Methods:

1. Statistical Analysis & Machine Learning
 - Logistic regression, decision trees, random forests
 - Model selection and cross-validation techniques
2. Multi-Objective Optimization
 - Genetic algorithms (NSGA-II), particle swarm optimization, simulated annealing
 - Pareto-optimal solution sets and decision rules

3. AHP & Scoring Models

- Construction of AHP judgment matrices
- TOPSIS or grey relational analysis for ranking

2. You are **encouraged** to use any AI tools, such as ChatGPT, DeepSeek and Claude, to generate a framework of the source code, assist with mathematical modeling and report writing. Please **describe** how you use the AI tools in your report.

Rules

1. **Deadline:** The deadline is **14:00, June 5(Thursday of the sixteenth academic week)**.
2. **Report:** The report should be easy to understand and describe each member's work well, especially the highlights of the work. The report must include the **names and Student ID** of all group members.
3. **Submission:** Please send the project to jzlisustc@gmail.com to keep record.

1. **Email Subject:** MM project 5-Team X(Replace "X" with your actual group number)

2. **Submission Content:**

- **Report:** Must be in **PDF format**.
- **Presentation Slides:** Must be in **PPT or PDF format**.

Attention: Only the submission of the report is required, the submission of source code is not necessary.

3. **Only one member per group** needs to submit the project.