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AHP-Based Optimization Model for Selecting University Offers in U.S. Engineering Programs

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Abstract
This paper addresses the problem of how students can make optimal college selection decisions after receiving offers from multiple U.S. universities for engineering programs. It constructs a multi-criteria evaluation model based on the Analytic Hierarchy Process (AHP). The model establishes four criterion-level indicators: post-graduation salary, program ranking, total cost of attendance, and quality of life. Five representative U.S. universities—UIUC, University of Michigan, UT Austin, Purdue University, and the University of Washington Seattle—are used as evaluation subjects. By constructing judgment matrices, calculating weights, and conducting consistency tests, the study ultimately derives comprehensive scores and rankings for each university. The results show that UT Austin ranks highest in overall performance. The model provides a scientific decision-support tool for college applicants, offering practical guidance.
Keywords: *Analytic Hierarchy Process (AHP); Selection Strategy; Employment Salary (or Post-Graduation Salary); Major Ranking (or Program Ranking); Total Cost of Education*

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I. Problem posing

With the popularization of higher education and the acceleration of globalization, an increasing number of students receive multiple admission offers (Offers) when applying to overseas universities. How to scientifically select the most suitable university for their personal development from multiple Offers has become an important decision-making challenge for both students and parents. This decision involves multiple influencing factors, including academic strength, post-graduation salary returns, total cost of university attendance, and campus life comfort.

Among these factors, the total cost of attendance includes tuition, accommodation, meals, transportation expenses, and scholarship amounts, while also accounting for the local cost of living. Comfort of campus life encompasses geographic location, safety, employment opportunities, and the quality of campus and dormitory environments. The importance of these factors varies among students, and interactions between them further complicate the decision-making process. While objective metrics—such as program rankings, salary data, and attendance costs—can be obtained from public sources, subjective indicators like "comfort of campus life" are highly individualized and difficult to quantify precisely. Thus, in modeling, subjective factors should be assigned relatively lower weights to minimize evaluation bias. Currently, most students still rely heavily on personal experience or preferences when selecting universities, which often leads to suboptimal decisions. Although existing ranking systems (e.g., QS, THE) reflect institutional reputation, they fail to address the multidimensional needs of individual applicants. A Multi-Criteria Decision Making (MCDM) mathematical model can provide students with clear comparative dimensions and visualized composite scores, supporting more rational decision-making. This approach is particularly valuable for students with limited access to resources (e.g., those from rural areas or international backgrounds), as it mitigates information asymmetry and reduces disparities in educational opportunities. Ultimately, such models enhance fairness and efficiency in university selection.

II. Methods and Models

2.1 Methods and Introduction

In multi-criteria decision making (MCDM) problems, commonly used analytical methods include the Entropy Weight Method, TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), and Analytic Hierarchy Process (AHP). Each has distinct advantages and limitations in terms of weight determination approach, adaptability to subjective preferences, and degree of data dependency. The table below summarizes their core characteristics and applicable scenarios.

Table 1 Comparison of different multi-criteria decision-making methods

methods	advantage	disadvantage	usage scenario
entropy weight method	Objective weighting, free from human interference; Suitable for scenarios with sufficient data and high indicator dispersion	Sensitive to data quality; Fails to capture individual subjective preferences	Corporate performance evaluation; Policy prioritization reinforcement
TOPSIS	Intuitive rationale with clear logic; Capable of integrating both subjective and objective weights; Capable of integrating both subjective and objective weights	Sensitive to outliers (most common in statistics); Assumes Euclidean distance is universally applicable across all indicators	Student admission ranking; Solution optimization; Supplier screening
AHP	Subjective preferences incorporable; Applicable to clearly hierarchical problems	Highly subjective weighting; Complex consistency verification of judgment matrices	School selection; Policy evaluation; Strategic planning decisions

2.2 method selection

This study aims to help students make optimal university selection decisions based on multiple key factors when considering admission to engineering programs at multiple American universities. This type of decision-making involves not only quantitatively accessible objective indicators (such as graduate salary and tuition costs) but also subjective factors that are difficult to quantify (such as quality of life and campus environment preferences). These factors are highly individual and driven by subjective preferences. Therefore, model construction requires an analytical approach that balances both subjective and objective information, provides a clear structure, and is operational.

While the entropy weight method offers advantages such as objectivity and the avoidance of human intervention, it relies on the discrete nature of raw data and cannot effectively handle highly subjective and difficult-to-quantify evaluation dimensions. This makes it difficult to apply to perceptual indicators such as living comfort. While the TOPSIS method offers clear logic and intuitive ranking, its "ideal solution" and "negative ideal solution" settings are subject to significant subjectivity in school selection. Different students often have significantly different definitions of "ideal university," making it difficult to achieve a unified standard.

In contrast, the Analytic Hierarchy Process (AHP) can clearly separate the objective, criteria, and solution layers by constructing a hierarchical model. It also incorporates individual or expert preferences through a judgment matrix, effectively integrating qualitative and quantitative factors. While ensuring a rigorous structure, AHP can also avoid judgment imbalances through consistency testing, improving the model's stability and credibility.

Therefore, considering the multidimensionality, subjectivity and personalized needs of the factors in school choice decision-making, this paper finally selected AHP as the modeling tool to be closer to students' actual thinking logic and decision-making methods, thereby improving the adaptability and practical value of the model.

2. 3 Hierarchical structure model construction and indicator system construction

To scientifically describe the multidimensional factors involved in the university offer selection process, this article constructs a three-tiered evaluation model based on the Analytic Hierarchy Process (AHP). This model, divided from top to bottom into the goal layer, the criteria layer, and the solution layer, clearly delineates the decision-making objectives, influencing factors, and available universities, facilitating a comprehensive evaluation and ranking of different schools.

(1) Construction of hierarchical model

Figure 1 shows the AHP hierarchical structure model of this study: the target layer is "the best choice of university offer"; the criterion layer includes four core indicators: graduate salary, major ranking, total cost of attendance (COA) and quality of life (QoL); the option layer is five alternative universities: UIUC, University of Michigan, University of Texas at Austin, Purdue University, and University of Washington at Seattle.

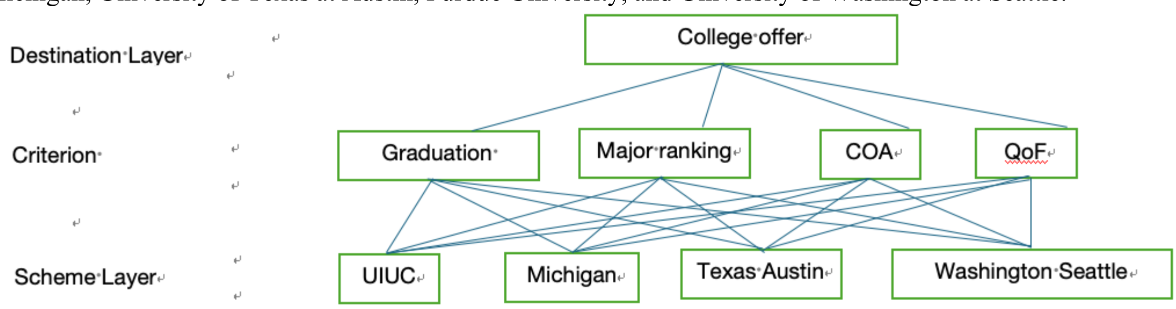

Figure 1. AHP hierarchical model of students' school choice decision-making

This article defines four criteria-level indicators: graduate salary, major ranking, total cost of education, and quality of life, covering the key dimensions that students consider most when choosing a university. Graduate salary reflects the average starting salary of students in the job market after completing their studies and is a core economic indicator for measuring the input-output of education. Major ranking reflects the academic status and research resources of a school in a specific engineering field, significantly impacting the depth of students' future learning and their employment competitiveness. The total cost of attendance (COA) covers major expenses while in school, such as tuition, accommodation, transportation, and food, and is an important basis for students and their families in making financial decisions. Quality of life (QoL) comprehensively considers subjective experience factors such as location, climate, safety, internship opportunities, and campus environment. Although it is difficult to quantify accurately, it has a significant impact on students' happiness and adaptability.

(2) Construction of judgment matrix

After constructing the hierarchical model, the next step is to compare the importance of each of the four indicators at the criterion level, thereby establishing a judgment matrix and calculating the corresponding weights. The AHP method uses a numerical scale to characterize the relative importance of each factor, typically using the 1-9 scale proposed by Saaty. This scale assigns integer scores to represent the relative importance of one factor relative to another, providing good discrimination and operability. Table 2 provides an explanation of the meaning of the standard scale.

Table 2 Definition of Saaty judgment scale

Standard value	Explanation of meaning
1	The two factors are equally important
3	One factor is slightly important
5	One factor is clearly more important
7	One factor is more important
9	One factor is extremely important
2, 4, 6, 8	Intermediate value, used for approximate judgment
1/x	relative reverse judgment

When constructing the criterion-level judgment matrix, this study compared four criteria (graduate salary, program ranking, total cost of education, and quality of life) pairwise, taking into account the student perspective. This comparison adhered to the following principle: If a criterion is considered more important than another in the school selection decision, it is assigned a higher scale value in the corresponding judgment matrix; if it is considered less important, it is assigned the reciprocal value. The judgment matrix should satisfy positive reciprocity, meaning that$a_{ij} = 1/a_{ji}$ between any two criteria, and the diagonal elements are always 1. Table 3 shows the criterion-level judgment matrix constructed in this study.

Table 3 Criteria level judgment matrix (based on 1-9 scaling method)

	Major ranking	COA	graduate salary	quality of life
Major ranking	1	1/2	1/4	3
COA	2	1	1/3	4
graduate salary	4	3	1	7
quality of life	1/3	1/4	1/7	1

The above judgment matrix reflects students' subjective preferences for different school selection factors. For example, "graduate salary" is considered significantly more important than "quality of life" in decision-making, so the corresponding position is assigned a value of 3; on the other hand, "school cost" is generally considered less important than "major ranking," so it is assigned a value of 1/3. After obtaining the judgment matrix, the next step is to calculate the relative weight of each criterion based on its eigenvalues and eigenvectors, and conduct consistency checks to ensure the logical consistency and credibility of the subjective judgment.

(3) Weight calculation and consistency test

After constructing the judgment matrix, it needs to be processed using the eigenvector method to calculate the weight distribution of each criterion or solution at the corresponding level. Approximate weight estimation is often used in AHP. This involves first normalizing the judgment matrix by column and then averaging the normalized matrix by row. The resulting mean is the approximate weight of each factor. This method is simple and suitable for scenarios with a small hierarchical structure and moderate computational accuracy requirements.

However, because the values in the judgment matrix are derived from human judgment, they may contain subjective biases or logical inconsistencies. Therefore, consistency checks are required to verify the rationality of the judgments. If there are obvious transitive errors within the matrix (for example, A is more important than B, B is more important than C, but A is less important than C), then the judgment matrix has consistency issues, and the calculated weights will lack reliability.

The consistency check includes the following steps:

a. Calculate the maximum eigenvalueλ_{max}

Multiply the judgment matrix A by the weight vector ω, and then divide the result by the corresponding weight $\omega_i$and take the average value to get the approximate value of the maximum eigenvalue.

b. Calculate consistency index (CI)

The consistency index (CI) is used to measure the consistency of the judgment matrix. The calculation formula is:

$$\mathrm{CI} = (\lambda_{\max} - \mathrm{n})/(\mathrm{n} - 1)$$

among:

$\lambda_{\max}$: The maximum eigenvalue of the judgment matrix;

n: Matrix order (When comparing the four indicators, n=4).

a. Look up the table to obtain the random consistency index (Random Index, RI)

RI is a reference value calculated by Saaty based on a large number of random matrices. RIs for common orders are shown in the following table: Table 4 Random Long Consistency Index RI for Different Orders

Table 4 Random Consistency Index (RI) under Different Matrix Orders

n (Matrix order)	1	2	3	4	5	6
RI	0.0	0.0	0.58	0.90	1.12	1.24

b. calculate the Consistency Ratio (CR)

(Consistency Ratio, CR) is the ratio of CI to RI:

$$\mathrm{CR}=\frac{CR}{RI}$$

c. Consistency Judgment Criteria

If CR < 0.1, the judgment matrix passes the consistency check and the weights are reliable. If CR ≥ 0.1, the matrix is inconsistent and the judgment matrix needs to be adjusted (e.g., rescaling the pairwise comparison values).

2.4 Evaluation object description

To facilitate model implementation and analysis, this article selected five representative American universities for evaluation: the University of Illinois at Urbana-Champaign (UIUC), the University of Michigan, Ann Arbor, the University of Texas at Austin, Purdue University, West Lafayette, and the University of Washington, Seattle. These universities all have strong reputations for engineering programs and are highly representative in terms of geography, proportion of international students, cost of living, and employment opportunities. The following is a brief introduction to each university:

(1) UIUC

UIUC is a major hub for engineering education in the United States, particularly in computer and electronic engineering, and enjoys a widely recognized academic reputation. The university has a student body of over 56,000, including approximately 35,000 undergraduates and 21,000 graduate students. International students account for 15%, with a high proportion coming from China. Located in central Illinois, the 6,370-acre campus is approximately a 2.5-hour drive from Chicago. This inland location offers a quiet pace of life, ideal for academic concentration. The cost of living is relatively low, with annual living expenses averaging approximately $12,000–$15,000. The local climate features four distinct seasons, with cold and snowy winters and hot and humid summers. The university boasts a long history and rich scientific research resources, with over 30 Nobel Prize winners among its alumni and faculty, providing students with an excellent platform for academic development.

(2) University of Michigan, Ann Arbor

The University of Michigan, located in Ann Arbor, Michigan, is a highly comprehensive public university renowned for its engineering and business programs. It has a student body of approximately 51,000, including approximately 32,000 undergraduates and 19,000 graduate students, with 7% of the student body being international. Ann Arbor is a safe, culturally rich city, approximately 45 minutes from Detroit and four hours from Chicago, offering convenient living and a pleasant environment. The cost of living is moderate, with an average annual budget of approximately $15,000–$18,000. The climate has four distinct seasons, with cold and snowy winters and beautiful campus scenery in the fall. The university encourages student innovation and entrepreneurship, and offers support through the Zell Lurie Entrepreneurship Center, which has earned it a reputation as one of the best cities in the United States for entrepreneurial opportunities.

(3) University of Texas at Austin

UT Austin is Texas' most representative public research university, with strong engineering and business programs and an excellent reputation for employment. The university has a total student body of approximately 52,000, including over 41,000 undergraduates and over 11,000 graduate students, with international students accounting for approximately 6%. As the capital of Texas, Austin is a highly modern city with a vibrant industry and a high concentration of technology startups, providing students with a wealth of internship and employment opportunities. The local climate is subtropical, with warm winters and little snow and hot summers, reaching temperatures above 35°C. The cost of living is moderately high, with an average annual expenditure of approximately $15,000–$20,000, but it still offers a high value compared to first-tier cities like New York and San Francisco.

(4) Purdue University, West Lafayette

Purdue University is a traditionally strong engineering university in the United States, renowned for its strengths in engineering, aerospace engineering, and agriculture. Its student body is approximately 50,000, including over 37,000 undergraduates and over 13,000 graduate students. International students make up 15%, with a significant concentration of students from China and India. Located in West Lafayette, Indiana, the university offers a safe, quiet, and relaxed environment ideal for focused study and research. The cost of living is among the lowest in the country, averaging approximately $12,000–$15,000 per year. The teaching style emphasizes hardcore science and engineering, and the curriculum is challenging. Engineering students often joke that "Purdue = Pain Until Reality Finally Unveils Everything," reflecting the university's strong academic atmosphere and high standards.

(5) University of Washington, Seattle

Located in Seattle, a major technology hub in the northwestern United States, the University of Washington is a research-focused university considered a "golden springboard" to leading companies due to its close ties with tech companies like Amazon and Microsoft. The university has a student body of approximately 49,000, including over 32,000 undergraduates and over 17,000 graduate students, with international students comprising approximately 14%. Thanks to its advantageous location, students have ample opportunities for internships, collaborative projects, and employment. However, the cost of living in the area is high, especially with rent, resulting in a relatively high average annual cost of living. Seattle has a temperate maritime climate, with a long rainy season and relatively short sunshine hours. However, its beautiful natural environment makes it suitable for students who prefer urban living and a technologically advanced environment.

III. Model solution and comprehensive scoring

After constructing the hierarchical model and setting the judgment matrices for each indicator, the next step is to follow the basic process of the Analytic Hierarchy Process (AHP) to construct judgment matrices for each criterion at the scenario level (i.e., the five candidate universities). Based on these, local weight vectors are calculated to rank the universities along different dimensions. Subsequently, combined with the criterion-level weights, a comprehensive score is calculated for each university, which is then used to determine the final ranking. This chapter will sequentially describe the construction of the scenario-level judgment matrix, the calculation of local weights, the consistency test process, and the final comprehensive evaluation results.

3.1 Construction of solution-level judgment matrix

After determining the relative weights of each criterion-level indicator, the next step is to construct a judgment matrix at the solution level within each criterion level to evaluate the relative performance of the five universities on that criterion dimension. This judgment matrix also utilizes a 1–9 scale, allowing for pairwise comparisons based on students' subjective judgments to determine which university has a superior advantage over another on a given criterion. Once the matrix is constructed, column-by-column normalization and the arithmetic mean of each row are calculated to determine the local weights (i.e., local scores) of the five universities on that criterion.

(1) Graduate Salary Judgment matrix under indicators:

$$GS=\begin{bmatrix} 1 & 1 & \frac{1}{2} & 1 & \frac{1}{2} \\ 1 & 1 & \frac{1}{2} & 1 & \frac{1}{2} \\ 2 & 2 & 1 & 2 & 1 \\ 1 & 1 & \frac{1}{2} & 1 & \frac{1}{2} \\ 2 & 2 & 1 & 2 & 1 \end{bmatrix}$$

(2) Major Ranking Judgment matrix under indicators:

$$MR = \begin{bmatrix} 1 & 2 & 1 & \frac{1}{2} & 3 \\ \frac{1}{2} & 1 & \frac{1}{2} & \frac{1}{3} & 2 \\ 1 & 2 & 1 & \frac{1}{2} & 3 \\ 2 & 3 & 2 & 1 & 4 \\ \frac{1}{3} & \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & 1 \end{bmatrix}$$

(3) COA Judgment matrix under indicators:

Under the "total cost of study" criterion, the five universities were compared for their overall financial burden, including tuition, accommodation, food, transportation, and other daily expenses. The judgment matrix was constructed based on publicly available annual average living expenses data and local price levels. The overall comparison followed the principles of the 1-9 scaling method of the Analytic Hierarchy Process (AHP), resulting in the following matrix:

$$COA = \begin{bmatrix} 1 & 4 & 1 & \frac{1}{4} & 1 \\ \frac{1}{4} & 1 & \frac{1}{4} & \frac{1}{8} & \frac{1}{4} \\ 1 & 4 & 1 & \frac{1}{4} & 1 \\ 4 & 8 & 4 & 1 & 4 \\ 1 & 4 & 1 & \frac{1}{4} & 1 \end{bmatrix}$$

(4) Quality of Life, QoL Judgment matrix under indicators

Quality of life encompasses aspects such as climate, public safety, urban convenience, cultural atmosphere, internship opportunities, and campus environment. This study compared five schools pairwise, combining the overall livability of their cities, student feedback, and the abundance of internship resources. The following judgment matrix was constructed.

$$\text{QoL}=\begin{bmatrix} 1 & 1 & 3 & 1 & \frac{1}{3} \\ 1 & 1 & 3 & 1 & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{3} & 1 & \frac{1}{3} & \frac{1}{3} \\ 1 & 1 & 3 & 1 & \frac{1}{3} \\ 3 & 3 & 8 & 3 & 1 \end{bmatrix}$$

Because the University of Washington (Seattle) is located in a high-tech company cluster (such as the headquarters of Amazon and Microsoft), it has abundant internship opportunities and a strong livability, so it has a high advantage in the QoL indicator. On the other hand, Austin, Texas, has hot summers and a fast pace of life, so its overall score is relatively low.

(5) Criterion layer judgment matrix

To determine the relative importance of each criterion in the final school selection decision, this paper constructed a criterion-level judgment matrix based on the Analytic Hierarchy Process (AHP). This matrix compared each of the four evaluation indicators (graduate salary, program ranking, total cost of education, and quality of life) pairwise. The judgment matrix was constructed based on students' subjective perceptions of the importance of different factors during the school selection process. The matrix is as follows:

$$\text{Criterion Layer}=\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{4} & 3 \\ 2 & 1 & \frac{1}{3} & 4 \\ 4 & 3 & 1 & 7 \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{7} & 1 \end{bmatrix}$$

3.2 Local weight calculation and consistency check

After constructing the scenario-level judgment matrix, local weights for the five schools under each criterion must be calculated and the judgment matrix must be checked for consistency to ensure the rationality of the judgment logic and the reliability of the results.

Local weights are calculated using the approximate eigenvector method, which uses normalization followed by row-wise averaging. Specifically, the judgment matrix is normalized by column, and each row of the normalized matrix is then averaged to obtain the local weight for each school under that criterion. Using the "Graduate Salary" criterion as an example, the calculation steps are as follows:

(1) Normalize each column of the judgment matrix;

(2) Average each row to get the weight vector;

(3) Use the judgment matrix to multiply the weight vector to obtain the approximate value of the maximum eigenvalue;

(4) Calculate the consistency index (CI) and consistency ratio (CR);

(5) If CR < 0.1, the judgment matrix passes the consistency test.

Table 5 shows the local standardized score results of the five universities under the four criterion level indicators and the consistency test indicators.

Table 5 Standardized scores and consistency test results of different universities under each criterion level indicator

	Graduate Salary	Major Ranking	COA	QoL	
	1/2	9/55	22/87	2/29	
UIUC	1/7	7/30	1/6	14/87	0.173
Michigan	1/7	1/10	4/95	14/87	0.1095
Texas Austin	2/7	2/5	1/6	1/17	0.254
Purdue	1/7	7/30	1/2	14/87	0.247
Washington Seattle	2/7	1/30	1/6	27/59	0.222
maximum eigenvalue	5	5.0331	5.0586	5.3358	
CI	0	0.008275	0.01465	0.08395	
RI	1 3/25	1 3/25	1 3/25	1 3/25	
CI/RI	0.0000	0.0074	0.0131	0.0750	

Note: Graduate Salary, Major Ranking, COA (total cost of schooling), and QoL (quality of life) are criterion-level indicators. λ_{max}, CI, RI, and CR are consistency test parameters.

As shown in the table above, the consistency ratio (CR) of all judgment matrices is less than 0.1, meeting the consistency test requirements of the AHP method. This indicates that the constructed judgment matrices have good logical consistency and the obtained local weights are reliable and usable.

3.3 Comprehensive score calculation and school selection ranking

After calculating the local weights at the criterion and solution levels, this paper uses the Weighted Sum Model (WSM) to provide a final comprehensive score for the five universities, thereby achieving a ranking.

The specific method is as follows: Each university's local weights for each of the four criterion-level indicators are multiplied by the criterion-level weights for each indicator, and the sum is calculated to obtain the university's comprehensive score. The mathematical expression is: $\text{Total Score}_i = \sum_{j=1}^{n} w_j \cdot s_{ij}$

among,

w_j: The weight of the j-th criterion;

s_{ij}: The standardized score of the i-th school under the j-th criterion;

$i \in \{1, 2, 3, 4, 5\}$, Corresponding to five universities;

$j \in \{1, 2, 3, 4\}$, The distribution is based on four indicators: graduate salary, program ranking, cost of study, and quality of life. Taking UIUC as an example, its total score is:

$$Score_{UIUC} = 0.233 * 0.163 + 0.167 * 0.253 + 0.143 * 0.5 + 0.161 * 0.068 = 0.173$$

Using the same method, the comprehensive scores of the five universities are calculated as follows:

Table 6 Comprehensive scores and school selection rankings of universities

School name	Comprehensive score	ranking
Texas Austin	0.254	1
Purdue	0.247	2
Washington Seattle	0.222	3
UIUC	0.173	4
Michigan	0.1095	5

The comprehensive scoring results show that the University of Texas at Austin has the best overall performance under the four criteria, ranking first, especially in "graduate salary" and "attendance cost"; Purdue University is second, with an outstanding advantage in "professional ranking"; UIUC and Michigan are ranked at the bottom because they are weak in all aspects.

IV. Summary

This article uses engineering programs at five American universities as case studies and constructs a school selection decision model based on the Analytic Hierarchy Process (AHP). Based on four dimensions: graduate salary, program ranking, total cost of study, and living comfort, the model calculates the subjective weights and overall scores of each indicator, forming a quantitative ranking of different offers. This model provides students with a valuable reference for selecting a school based on objective data (such as tuition, employment rates, and program rankings), reducing the risk of decision-making errors caused by personal preferences, incomplete information, or a preoccupation with prestigious schools.

The application value of the model is mainly reflected in two aspects: first, it helps students identify schools that are highly compatible with their goals in advance, thereby avoiding the waste of time and economic costs (such as application fees, examination fees, etc.) brought about by the "wide-scale application" strategy; second, it improves the efficiency and scientific nature of school selection decisions, which is of great practical significance, especially for groups with limited information channels (such as rural students and international students).

At the same time, the promotion and application of the model may also have certain impacts on the higher education ecosystem. On the one hand, if universities overly cater to the model's guidance (for example, by unilaterally improving employment rates), they may neglect academic characteristics and the development of humanities education, resulting in a simplistic education evaluation mechanism. On the other hand, if lower-ranked schools fail to quickly optimize their own indicators, they may face a loss of students, thereby exacerbating the imbalance of educational resources.

Furthermore, this study faces certain limitations. If the model's data source is biased, such as failing to adequately consider the needs of minority groups, it could inadvertently perpetuate educational inequality. Furthermore, in practical applications, if sensitive information such as students' individual preferences and family backgrounds needs to be collected, data privacy and ethical risks must be considered with high regard.

In summary, the AHP model, as a decision-making tool for university selection, balances scientific and personalized approaches and has promising application prospects. While ensuring data quality and ethical compliance, it is expected to provide strong support for achieving fairer, more efficient, and more transparent university admissions.

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