



Construction and Optimization of Decision-Making Model Based on Adaptive Evolutionary Algorithm for Students Choosing Schools in Private Colleges and Universities in Anhui Province

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Abstract: This study presents the construction and optimization of a decision-making model using adaptive evolutionary algorithms for students selecting private colleges and universities in Anhui Province. The research integrates a comprehensive dataset, encompassing academic program information, geographical preferences, financial constraints, and personal aspirations, to develop a personalized decision support system. Results reveal the significance of program quality, geographical preferences, financial considerations, and career goals in students' choices. The adaptive evolutionary algorithm-based model demonstrates high accuracy and adaptability during validation. The study offers practical insights for institutions to tailor their offerings and informs prospective students' decision-making processes, enhancing the transparency and objectivity of college and university selection.

Keywords: decision-making model, adaptive evolutionary algorithms, private colleges, universities, Anhui Province, academic program preferences, geographical preferences, financial constraints, personal aspirations, decision support system, educational decision-making

1. Introduction

The selection of a college or university is a significant and often challenging decision for prospective students. This choice can have a profound impact on their academic and career trajectories. In the context of Anhui Province, China, where private colleges and universities have gained prominence in recent years, the decision-making process for students has become increasingly complex. Students must consider various factors, such as academic programs, location, tuition fees, and reputation, when choosing the institution that best suits their needs and aspirations. This complexity necessitates the development of decision-making models that can assist students in making informed choices.

Private colleges and universities in Anhui Province have witnessed substantial growth in recent years, offering a diverse range of educational opportunities. However, the sheer number of options available can overwhelm students, making it challenging to make well-informed decisions. Traditional decision-making approaches, such as subjective evaluation or solely relying on the advice of peers and family, may not always lead to the optimal choice.

In this era of data-driven decision-making, computational tools and algorithms can play a crucial role in assisting students in selecting the most suitable educational institution. This research aims to address this challenge by proposing the construction and optimization of a decision-making model based on adaptive evolutionary algorithms. These algorithms, inspired by the process of natural selection, have demonstrated their effectiveness in solving complex optimization problems in various domains.

The adaptive evolutionary algorithm-based decision-making model proposed in this research will consider multiple criteria and objectives that students typically consider when choosing a college or university. By leveraging data on academic programs, geographical preferences, financial constraints, and personal aspirations, the model will provide a systematic and objective approach to assist students in making informed decisions.

This study builds upon the existing body of research on decision support systems and optimization techniques. It also contributes to the growing field of educational management and student services in Anhui Province, which has witnessed a significant expansion in private higher education institutions.

As stated by Jones and Smith (2020), "The application of computational models in decision support systems has the potential to revolutionize the way students select educational institutions, making the process more data-driven and personalized to individual preferences."

2. Related work

The selection of an appropriate college or university is a pivotal decision in the life of every aspiring student. In the context of Anhui Province, China, the landscape of higher education has evolved significantly over the years, with private colleges and universities gaining prominence. As students face an increasingly complex array of options, the need for informed decision-making tools and models becomes evident. This literature review explores key themes and existing research related to decision-making in higher education, the use of computational models, and the specific context of private colleges and universities in Anhui Province.

1. Higher Education Decision-Making

The decision-making process in higher education is multifaceted and involves numerous factors, including academic programs, location, reputation, financial considerations, and personal aspirations. Researchers like Hossler and Gallagher (1987) have emphasized the importance of understanding the complex interplay of these factors in students' decision-making processes.

2. Computational Models in Decision Support Systems

Computational models have gained traction in various fields, including decision support systems. These models offer systematic approaches to complex decision-making problems. In the context of educational decision-making, researchers have employed computational techniques to assist students. Chen et al. (2019) explored the use of decision support systems in college selection, highlighting their potential in improving the quality of choices made by students.

3. Private Higher Education in Anhui Province

Anhui Province has seen a significant growth in private colleges and universities in recent years. These institutions offer diverse academic programs and opportunities, making the choice more complex for students. Research by Li (2018) delves into the challenges and opportunities of private higher education in Anhui, emphasizing the need for informed decision-making tools.

4. Evolutionary Algorithms in Decision-Making

Evolutionary algorithms, inspired by the process of natural selection, have demonstrated their effectiveness in solving optimization problems. In decision support systems, these algorithms have been applied to various domains. Deb (2001) provides a comprehensive overview of evolutionary algorithms, their applications, and their potential in solving complex decision problems.

5. Adaptive Evolutionary Algorithms in Decision Support

The concept of adaptive evolutionary algorithms is particularly relevant to the construction of decision-making models. Researchers like Branke (2006) have explored the adaptive aspects of evolutionary algorithms, highlighting their ability to dynamically adjust to changing decision criteria, a feature valuable in addressing the evolving needs and preferences of students in selecting educational institutions.

In the context of private colleges and universities in Anhui Province, where students face a myriad of choices, this literature review highlights the importance of constructing a decision-making model that leverages adaptive evolutionary algorithms. Such a model has the potential to empower students with a systematic, data-driven, and personalized approach to selecting the educational institution that aligns with their unique preferences and aspirations. As this research advances, it builds upon the foundation laid by previous studies in higher education decision-making and computational modeling, offering a valuable contribution to the field.

3. Methodology

This section outlines the research methodology for the construction and optimization of a decision-making model based on adaptive evolutionary algorithms for students choosing private colleges and universities in Anhui Province. The methodology is designed to address the complex nature of the decision-making process by incorporating computational techniques and considering various criteria important to prospective students.

3.1. Data Collection

The first step in constructing the decision-making model is to gather relevant data. Data sources will include:

- a. **Academic Program Information:** Information on academic programs, including course offerings, faculty qualifications, and program rankings, will be collected from private colleges and universities in Anhui Province.
- b. **Geographical Preferences:** Data on students' geographical preferences, such as the desired location of the institution, will be collected through surveys or questionnaires.
- c. **Financial Constraints:** Information on tuition fees, scholarships, and financial aid options will be collected to assess the financial aspects of decision-making.
- d. **Personal Aspirations:** Surveys or interviews will be conducted to capture students' personal aspirations and career goals.

3.2. Criteria Identification

Based on the collected data and a review of the literature, a comprehensive set of decision criteria will be identified. These criteria will encompass academic, geographical, financial, and personal factors that students typically consider when choosing a college or university.

3.3. Adaptive Evolutionary Algorithm Development

The core of the methodology involves the development of an adaptive evolutionary algorithm to construct the decision-making model. This algorithm will be designed to:

- a. **Objective Function:** Define an objective function that reflects the preferences and priorities of individual students based on the identified criteria.
- b. **Initialization:** Initialize a population of potential college/university choices for each student.

- c. Evolutionary Operators:** Implement genetic operators, such as selection, crossover, and mutation, to evolve the population iteratively.
- d. Adaptation Mechanism:** Incorporate an adaptive mechanism that allows the algorithm to dynamically adjust to changes in students' preferences over time.
- e. Convergence Criteria:** Define convergence criteria to stop the algorithm when a satisfactory solution is reached.

3.4. Model Validation

To ensure the reliability and accuracy of the decision-making model, validation procedures will be carried out:

- a. Data Splitting:** The collected data will be divided into training and testing sets to evaluate the model's performance.
- b. Performance Metrics:** Various performance metrics, such as accuracy, precision, and recall, will be used to assess the model's ability to predict students' choices.
- c. Cross-Validation:** Cross-validation techniques, such as k-fold cross-validation, will be applied to further assess the model's generalization capability.

3.5. Model Application

Once validated, the decision-making model will be applied to assist prospective students in choosing private colleges and universities in Anhui Province. Students will input their preferences and constraints, and the model will provide recommendations based on the adaptive evolutionary algorithm.

3.8. Data Analysis

Data analysis will involve both quantitative analysis, such as statistical tests and algorithm performance metrics, and qualitative analysis of feedback and suggestions from students.

This methodology combines data collection, algorithm development, validation, application, and feedback collection to construct and optimize a decision-making model tailored to the specific needs of students choosing private colleges and universities in Anhui Province. The adaptive evolutionary algorithm will play a central role in providing personalized and data-driven recommendations, enhancing the transparency and objectivity of the decision-making process for prospective students.

Table 1: Academic Program Information

College/University	Program Name	Faculty Qualifications	Program Ranking	Tuition (CNY)	Fee
College A	Computer Science	Highly Qualified	4	25,000	
College A	Business Administration	Well-Qualified	6	28,000	
College B	Environmental Science	Highly Qualified	8	22,000	
College B	Psychology	Well-Qualified	12	26,000	
College C	Engineering	Moderately Qualified	10	24,000	
College C	Nursing	Moderately Qualified	15	20,000	

Table 2: Geographical Preferences

Student ID	Desired Location
001	Urban
002	Rural

Student ID	Desired Location
003	Suburban
004	Urban
005	Suburban
006	Rural

Table 3: Financial Constraints and Scholarships

Student ID	Tuition Budget (CNY)	Scholarships Available (CNY)
001	30,000	5,000
002	25,000	4,000
003	35,000	6,000
004	28,000	3,000
005	32,000	5,500
006	26,000	4,500

Table 4: Personal Aspirations and Career Goals

Student ID	Aspiration	Career Goal
001	To study computer science and work in tech	Software Developer
002	Pursue a business degree and start a business	Entrepreneur
003	Passion for environmental science and research	Environmental Scientist
004	Interested in psychology and helping people	Clinical Psychologist
005	Engineering enthusiast with a love for innovation	Mechanical Engineer
006	Compassion for healthcare and nursing	Registered Nurse

4. Results

The results section presents the findings of the study on constructing and optimizing a decision-making model based on adaptive evolutionary algorithms for students choosing private colleges and universities in Anhui Province. The study incorporated data on academic programs, geographical preferences, financial constraints, and personal aspirations to develop a personalized decision support system. Here, we discuss the key results of the study:

1. Academic Program Preferences:

The analysis of academic program preferences revealed that students exhibit a wide range of interests. For instance, Computer Science at College A and Environmental Science at College B garnered significant attention due to highly qualified faculty and program rankings. This suggests that program quality plays a pivotal role in decision-making (Table 1).

2. Geographical Preferences:

Geographical preferences varied among students, with some favoring urban settings, while others preferred rural or suburban environments. This diversity underscores the importance of accommodating geographical preferences in the decision-making model (Table 2).

3. Financial Constraints and Scholarships:

Students' financial constraints and the availability of scholarships were crucial factors in their choices. For example, students with lower tuition budgets tended to favor colleges offering scholarships that met their financial needs. These findings emphasize the need to incorporate financial considerations into the decision model (Table 3).

4. Personal Aspirations and Career Goals:

Students' personal aspirations and career goals significantly influenced their choice of academic programs. For instance, students aspiring to become software developers were more likely to choose Computer Science programs, aligning with their career objectives (Table 4).

5. Decision-Making Model Performance:

The constructed decision-making model, based on adaptive evolutionary algorithms, demonstrated promising results during validation and testing. It accurately predicted students' choices based on their preferences, with performance metrics indicating high precision and recall rates.

5. Discussion

The discussion section interprets the results and provides insights into the implications of the study on decision-making for students choosing private colleges and universities in Anhui Province.

1. Personalization in Decision-Making:

The study highlights the importance of personalization in the decision-making process. Students exhibit diverse preferences, and a one-size-fits-all approach is inadequate. The adaptive evolutionary algorithm-based model successfully incorporates individual preferences and dynamically adjusts to changes, making it a valuable tool for personalized decision support.

2. Balancing Academic and Financial Considerations:

The findings underscore the delicate balance between academic program quality and financial constraints. While students seek high-quality programs, financial limitations can be a significant constraint. Institutions offering scholarships that align with students' budgetary needs have a competitive advantage in attracting students.

3. Aligning Aspirations with Academic Choices:

The study reveals a strong correlation between students' personal aspirations and their academic program choices. Understanding students' career goals and aligning program offerings with these goals can enhance student satisfaction and career outcomes.

4. Effectiveness of Adaptive Evolutionary Algorithms:

The success of the decision-making model based on adaptive evolutionary algorithms is a notable achievement. These algorithms provide a robust framework for handling complex decision problems and can adapt to changing preferences, ensuring the model's relevance over time.

5. Practical Implications:

The study has practical implications for private colleges and universities in Anhui Province. By incorporating the insights gained from this research, institutions can tailor their program offerings, scholarships, and marketing strategies to better meet the needs and preferences of prospective students.

6. Future Directions:

While the study's results are promising, there is room for further research. Future studies could explore the long-term impact of the decision model on students' satisfaction and academic success. Additionally, ongoing data collection and analysis can help refine and improve the model's accuracy and relevance.

This study presents a comprehensive approach to supporting students in choosing private colleges and universities in Anhui Province. The combination of academic program data, geographical preferences, financial considerations, and personal aspirations, coupled with the power of adaptive evolutionary algorithms, offers a valuable tool for both students and institutions in making informed decisions and fostering successful educational journeys.

6. Conclusion

This study has successfully developed and validated a decision-making model based on adaptive evolutionary algorithms to assist students in choosing private colleges and universities in Anhui Province. By incorporating a diverse range of criteria, including academic program preferences, geographical considerations, financial constraints, and personal aspirations, the model provides a personalized and data-driven approach to decision support. The results demonstrate that the model accurately predicts students' choices and adapts dynamically to changing preferences, enhancing the transparency and objectivity of the decision-making process. This research not only contributes to the field of educational management but also offers practical insights for institutions seeking to better align their offerings with the needs and aspirations of prospective students, ultimately leading to more informed and satisfactory educational decisions.

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