Construction and Optimization Strategies of Prediction Model for Undergraduate Major Settings in Private Universities from the Perspective of Artificial Intelligence

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Abstract: With the popularization of higher education in China, private universities play a crucial role in strengthening the educational framework and promoting fairness. However, they encounter multiple difficulties in the setting of undergraduate majors. This paper takes artificial intelligence as the entry point and presents a prediction model for undergraduate major allocation that takes into account multiple factors such as strategies, consensus, market acceptance, and educational resources. The model is constructed based on data sample collection and processing, integrating strategy orientation, market trends, educational resources, and social recognition. The aim is to accurately predict the multi-dimensional needs of private universities. Research shows that this model can enhance the efficiency of major allocation decisions and reduce blind investment and resource waste. This paper further improves the model algorithm and plans optimization schemes from the dimensions of strategy, market, and resources, providing guidance for the professional planning of private universities. This research not only helps to improve the scientific nature of undergraduate major allocation in private universities but also points out a new direction for the deep application of artificial intelligence in the field of education.

Keywords: Artificial Intelligence; Private Higher Education Institutions; Undergraduate Major Setting; Prediction Model; Optimization Strategy

1. Introduction

1.1 Research Background and Significance

(1) The current situation and challenges of private higher education institutions development

Private higher education institutions are of vital importance in China's higher education system, meeting diverse educational demands, promoting educational equity, and facilitating social development. However, their development faces multiple challenges. Under the legal and policy framework, the development space of private universities is limited, especially in the choice between for-profit and non-profit models, where they encounter difficulties. Seventy percent of them have been registered as non-profit, which affects fundraising and sustainable development. Resource shortage is another major problem [1,2]. In 2021, the operating funds of private universities were only 42% of those of public universities, affecting teaching quality and the completeness of facilities. The stability and quality of the teaching staff also need to be improved. The proportion of master's degree holders and above among full-time teachers is significantly lower than that of public universities. In terms of professional settings, private universities may tend to converge due to the pursuit of "low investment, high returns", which affects competitiveness and social reputation. Brand appeal and social recognition are also low, affecting students' career development prospects and salary levels. Moreover, the uneven regional economic development also affects the acquisition of resources by private universities, and they face greater challenges in the central and western regions.

Despite this, private universities have demonstrated competitive advantages in certain fields, such as the cultivation of applied talents, collaborative innovation between universities and enterprises, and international

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education. For example, a certain private university in Guangdong has collaborated with an Internet company to enhance students' employment competitiveness. To address these challenges, private universities need to adopt innovative strategies, such as artificial intelligence, establish efficient discipline planning and optimization systems, enhance core competitiveness, and promote the development of private education to a higher level. This is crucial for aggregating resources, enhancing social recognition, and market competitiveness.

(2) The necessity of artificial intelligence assisting in professional designation setting

In recent years, private universities have encountered multiple challenges in the planning and implementation of undergraduate programs, such as changes in social demands, policy adjustments, diversification of students' interests, and limitations in resource allocation. The rapid development of artificial intelligence technology offers potential solutions to these challenges [3,4]. In terms of policy interpretation, artificial intelligence technology, through means such as natural language processing, can efficiently extract key information from policy documents and predict policy trends, providing a solid decision-making foundation for private universities. At the same time, it can accurately predict social demands in specific fields, solve the problems of insufficient sample size and long analysis cycles in traditional research methods, and provide data support for the formulation of professional development strategies. In terms of resource allocation optimization, artificial intelligence technology, through multi-objective optimization algorithms, simulates and optimizes the allocation of teaching resources, improves utilization efficiency, reduces course conflicts, and enhances the operational efficiency of the education system.

Furthermore, in response to the diverse student backgrounds of private universities, artificial intelligence technology can conduct specialized and personalized in-depth analysis, generate student profiles, predict their interests and selection trends in future professional fields, and enhance the targeted and adaptability of professional settings. With the evolution of artificial intelligence technology, its importance in the professional planning of private universities has become increasingly significant. It can assist universities in deeply analyzing policies, predicting social trends, refining resource allocation strategies, meeting students' diverse needs, and tapping into greater potential in professional settings.

1.2 Research Objectives and Contents

(1) Research objectives

This research aims to develop and optimize a predictive model for undergraduate programs in private colleges and universities, providing scientific data support for decision-making and promoting the rationalization, modernization and efficient operation of professional settings. With the deepening of higher education reform, the status of private colleges and universities has become prominent, and precise planning is needed to enhance teaching quality. Traditional professional allocation relies on experience and intuitive judgment, lacking systematicness. This research integrates artificial intelligence technology to construct a predictive model that integrates data analysis and machine learning algorithms, accurately predicting the establishment of undergraduate programs in private colleges and universities. The core objectives include: clarifying key elements and their internal connections, constructing a multi-dimensional collaborative composite predictive model, verifying and optimizing the model efficacy. To support practice, policy and management suggestions are proposed, which are transformed into specific decision-making guidance. The aim is to utilize artificial intelligence and data-driven strategies to provide scientific quantitative decision-making assistance for private undergraduate institutions, promoting development and educational level improvement.

(2) Core content

The core focus of this research is to explore the application value of artificial intelligence technology in the process of constructing and optimizing the prediction model for undergraduate major settings in private universities. The aim is to enhance the overall strength and educational quality of higher education institutions and to break through the rational decision-making bottleneck in the field of professional planning of current private universities. By reasonably introducing deep learning and artificial intelligence, this research has developed and empirically tested

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an efficient prediction model, aiming to address the challenges of data complexity, multi-dimensionality and dynamics faced by traditional major setting decisions. This research mainly assesses four core dimensions: policy compatibility, student family acceptance, market acceptance ability and educational resource allocation, with the aim of achieving the precise quantification goal of professional planning. Through effective model construction and optimization strategies, this research aims to provide clear decision-making guidelines for private universities, thereby promoting the connotative growth of universities and the innovation of the education system.

1.3 Research Methods and Framework

(1) Overview of research methods

This research aims to construct and optimize the prediction model for the undergraduate major settings of private colleges and universities. A systematic and rigorous research strategy is adopted to ensure the scientificity and credibility. The research process consists of four steps: theoretical exploration, data collection and analysis, model setting, and research. Theoretical exploration is based on educational management models, artificial intelligence, and data mining technologies, and it aims to summarize and analyze the constraints. Data collection ensures accuracy and diversity, and it comes from the official website of the Ministry of Education, university websites, questionnaires, and interviews, etc., providing support for the subsequent model establishment. Model construction adopts machine learning strategies, selects algorithms and model architectures, and optimizes parameters to enhance the accuracy and stability of the prediction. In the empirical verification stage, experiments are conducted in diverse regions and under the background of private higher education institutions, comparing the predicted results with actual decisions to evaluate the fit and optimize the model. The research aims to comprehensively and systematically explore and optimize the prediction based on artificial intelligence.

(2) Technical route and analytical structure

This research has designed an effective technical path, which includes "problem analysis - indicator selection - model design - model verification and optimization". Firstly, it comprehensively explores the current situation and challenges of undergraduate major settings in private universities, integrating policy orientation, market trends, and parental expectations. Secondly, it constructs an evaluation framework, considering policy compatibility, recognition degree, market demand and resource support. Adopting a model architecture based on Recurrent Neural Network (RNN) as the cornerstone, the correlation of input variables is optimized. Finally, the model efficacy is verified through actual datasets, and the sample and algorithm are adjusted to enhance the prediction performance. This technical path can generate practical and meaningful professional configuration optimization plans, providing scientific support for decision-making.

2. Theoretical Foundation and Related Research

2.1 The Development and Application of Related Technologies in Artificial Intelligence

(1) The applicable fields of current artificial intelligence technology

Artificial Intelligence (AI) as a cutting-edge technology has been widely applied in various fields such as education, healthcare, finance, manufacturing, transportation, and public affairs, exerting profound impacts [5-7]. In the field of education, AI enhances teaching efficacy through natural language processing and image recognition technologies, and promotes personalized education. Intelligent teaching systems and learning management systems improve teaching efficiency and promote educational equity. In the medical field, AI is applied in medical image analysis, disease prediction, new drug development, and surgical support, significantly improving diagnostic accuracy and the efficiency of medical resource allocation, especially in remote areas. In the financial industry, AI is utilized for intelligent wealth management, risk control, fraud detection, and high-frequency trading, achieving efficient loan approval and operational cost savings. In industrial manufacturing, AI builds "intelligent factories" to enhance production efficiency and reduce defective rates, addressing supply chain disruptions and labor shortages. In the

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transportation sector, intelligent transportation systems optimize signal light durations to enhance traffic efficiency, and unmanned driving technology revolutionizes transportation modes. In public affairs, AI enhances urban governance efficiency and is applied in garbage sorting, public safety monitoring, etc.

In summary, AI demonstrates great application prospects in education, healthcare, finance, manufacturing, transportation, and public services, promoting innovation and economic development, and generating widespread impacts. In the future, AI will continue to penetrate various industries, creating more value. However, at the same time, attention should be paid to the ethical, security, and social responsibility issues it brings about.

(2) Overview of the application of artificial intelligence in the field of educational management

In recent years, the application of artificial intelligence technology in the field of educational management has been continuously expanding, integrating into key areas from educational policy planning to customized learning experiences [8]. Its application highlights key values and promotes precise decision-making and efficiency optimization. Specific practices include: precise educational decision-making at the macro level, optimizing institutional management at the micro level, promoting the development of personalized education services, facilitating educational equity, and building a prediction and early warning system to enhance efficiency. Through statistical models and data mining, artificial intelligence achieves precise decision-making, optimizes course arrangements and resource allocation, and improves the accuracy of teaching evaluations. In terms of personalized education services, intelligent recommendation systems and platforms tailor educational resources to individuals. Artificial intelligence also contributes to educational equity by providing personalized resources and services. The prediction and early warning mechanism identifies potential mental health risks and provides timely intervention strategies. Despite obstacles such as data privacy protection and high technical investment, with algorithm optimization and the popularization of intelligent applications in the future, artificial intelligence will contribute more intelligent and precise solutions in the field of educational management.

2.2 Theoretical and Practical Research on the Settings of Undergraduate Majors

(1) Analysis of policies and regulations regarding the establishment of undergraduate majors

The policy and regulations concerning the establishment of undergraduate majors are of vital importance to the construction of university majors, and they have an impact on the planning of higher education and students' career choices [9,10]. The allocation of higher education majors in China is constrained by multiple factors and is divided into national legal regulations, industry guiding documents, and regional policy provisions. With educational reforms, policies have been continuously optimized. For instance, the "Regulations on the Management of Undergraduate Major Establishment in Higher Education Institutions" and the "Catalogue of Undergraduate Majors" provide standardized guidance for universities. Universities need to carefully assess and apply for approval to ensure that the majors are practical and forward-looking. National policies encourage the establishment of innovative disciplines and the reduction of traditional fields. The education authorities implement dynamic adjustment strategies to optimize resource allocation. Private universities have more flexibility in major planning, but they need to consider market demand. The planning of higher education majors is centered on employment orientation and teaching quality. When local governments approve new majors, they focus on assessing their contribution to the local economy. Policies and regulations are developing towards intelligence and digitalization, indicating that the core role of intelligent decision-making mechanisms in the professional planning of universities will become increasingly prominent in the future, providing universities with flexibility and targeted guidance to ensure that the establishment of majors is in line with the needs of the economy and society.

(2) The influence of market demands on the setting of professional majors

Undergraduate major planning plays the role of a bridge in higher education, aiming to align

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with students' educational needs and social employment demands [11,12]. With the economic growth and changes in the labor market, market-oriented demands have become the key driving force for the layout of undergraduate majors. The employment orientation requires universities to closely connect with the labor market demands. For instance, the rapid development of emerging industries such as information technology and artificial intelligence has promoted the growth in the enrollment of related majors. Fluctuations in industry dynamic demands drive the emergence of new majors and the optimization of existing ones. For example, the demand in fields like intelligent manufacturing has promoted the establishment of innovative majors, and traditional majors also need to adjust to meet the skills demands of emerging industries. Unique regional economic demands are also key considerations in influencing the setting of undergraduate majors. For instance, the Guangdong-Hong Kong-Macao Greater Bay Area has added majors such as fintech, while the central and western regions have strengthened disciplines related to agriculture and tourism. However, excessive market orientation may lead to short-term profit pursuit, neglecting the long-term educational significance, and resulting in an oversupply of popular majors. Therefore, when market demands shape the layout of undergraduate majors, it is necessary to plan scientifically, prospectively, and moderately to ensure that higher education effectively cultivates talents and precisely serves social needs, fulfilling the functions of education and social service.

2.3 Theoretical Basis of Research Index

(1) The connotation analysis of policy permissibility and resource support

The policy permissiveness and resource supportability are the key factors restricting the layout of undergraduate programs in private universities. The compatibility of policies requires that the professional settings of universities should comply with national and local educational policies. For instance, the "General Catalogue of Undergraduate Programs in Higher Education Institutions" provides policy guidance for the allocation of programs and reduces redundant allocation and resource wastage. Private universities, in their professional planning, are supported and motivated by national policies, but they also face regulatory restrictions. For example, the "Amendment to the Law on the Promotion of Private Education" encourages the adjustment of programs based on the national blueprint for educational development. Local governments, such as Guangdong Province, provide support for professional settings through the "Measures for the Management of Professional Settings in Private Universities". Resource supportability involves teachers, facilities, academic background, and funds, which directly affect the high-quality development and educational service quality of newly established programs. According to the "Standards for the Establishment of Ordinary Higher Education Institutions", the addition of new programs requires ensuring adequate resources. However, resource supportability is uneven across regions. Universities in the eastern coastal areas have relatively sufficient resource support due to active economic development, while those in the central and western regions are relatively scarce. The operation mode of private universities affects their ability to obtain resources. For example, a university in the eastern region enhances resource allocation through school-enterprise cooperation, while inland universities have insufficient resources due to weak financial and cooperation foundations. Policy permissiveness and resource supportability are interdependent. Policies regulate the legality and strategic positioning of programs, and resource supportability concerns the operational efficiency and improvement potential of programs. In-depth exploration of the interaction mechanism between these two factors provides decision support for program planning, promotes the optimization of educational resource allocation, enhances the advantages of universities, and supports national economic and social development goals.

(2) The assessment of the weight of the factors related to student parents' recognition and market acceptance degree

In the professional configuration of private undergraduate institutions, the recognition of students' families and the market acceptance are the core influencing parameters. Theoretically, parents' recognition of a major is based on its social significance, employment opportunities, and career growth potential;

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while market acceptance reflects the match between the graduates' skills and job requirements. This study, through theoretical analysis, questionnaire surveys, and quantitative assessment, deeply explored the weights of these two factors. The questionnaire was targeted at parents, students, and employers, and 1,028 valid questionnaires were collected. The results showed that parents preferred majors with high employment rates, and students preferred courses with high social attention. Market research indicated that majors in the fields of information technology and intelligent manufacturing have high employment rates, and new majors have higher initial salaries, reflecting market influence. Quantitative analysis using the Analytic Hierarchy Process (AHP) was conducted to divide the recognition degree of parents into social value, employment prospects, and career growth potential; market acceptance was divided into employer demand matching and industry growth potential. The weight results showed that although the weights of both were comparable, market acceptance had a slight advantage in undergraduate professional planning, as market demand directly affects the setting of employment-oriented professional courses. Additionally, regional differences were significant, with parents' recognition being more crucial in economically backward areas. In practical operations, issues such as parents' limited understanding of niche potential majors need to be addressed, and communication should be strengthened. Data analysis and publicity should be used to assist decision-making. The professional goal is to meet policy, market, and educational needs, and to eliminate cognitive and practical barriers.

In conclusion, the recognition of students' families and market acceptance are constrained by multiple factors, but quantitative weight assessment and data analysis can provide scientific decision-making support for undergraduate professional establishment. Future research will deepen factor analysis and integrate artificial intelligence to optimize the weight assessment system.

3. Construction of a Prediction Model for the Settings of Undergraduate Majors in Private Universities

3.1 Design of the Indicator System

(1) The basis and logic of multi-index selection

When constructing a professional setting prediction model for private undergraduate institutions, the rationality and accuracy of the index system are of vital importance. This paper, centering on four dimensions: policy guidance, public awareness and demands, market demand acceptance, and educational resource supply, has constructed a multi-index framework.

Firstly, policy permission degree is the foundation for professional establishment. It is necessary to follow the relevant policy guidelines of the Ministry of Education, such as the "Catalogue of Undergraduate Professional Programs of Ordinary Higher Education Institutions", and select indicators closely related to policy adaptability, such as the pass rate of professional registration, the timeliness of review, and the proportion of policy-subsidized disciplines. These indicators reflect the intensity of policy restrictions and support. Secondly, the recognition degree of parents affects enrollment, and attention should be paid to educational quality, training purposes, and career development opportunities. By integrating indicators such as employment rate, professional social evaluation index, and parental satisfaction, the immediate demand of the enrollment market for professional allocation is reflected. Thirdly, market acceptance measures professional competitiveness. It needs to closely align with the demands of social economic development. Attention should be paid to indicators such as the matching degree of the profession and the industry, the initial salary level of graduates, and the contribution to supporting the industrial chain, to provide quantitative benchmarks for evaluating the suitability of the professional market for the model. Finally, the support of educational resources is a key element, covering faculty, experimental facilities, and financial support. Indicators such as the student-faculty ratio, the proportion of teachers with doctoral degrees, the allocation ratio of special funds, the support of experimental facilities, and the level of school-enterprise cooperation should be considered to reveal whether the resources meet the professional needs and assess the optimization effect of resources.

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In conclusion, this paper has constructed a strategic framework consisting of four dimensions and over twenty detailed evaluation indicators. It integrates policy and market mechanisms, coordinates the dynamic balance between external demands and internal environment, and provides a solid theoretical pillar and operational guidelines for the development of the prediction model.

(2) Model definition

When constructing a professional setting prediction model for private undergraduate institutions, the definition of input and output parameters constitutes the cornerstone of the model architecture. The appropriateness of these parameters has a decisive impact on the accuracy of the prediction performance and the practicality of the model. In this study, we selected four core indicators as input variables, namely policy compatibility (P), family and social identity (S), market acceptance (M), and educational resource support (R). When selecting these variables, we comprehensively considered multiple factors such as policy guidance, data obtained from surveys, and educational resources, aiming to ensure the completeness and practicality of the model. Additionally, the definition of output variables is intended to predict the final configuration of university majors, covering feasibility estimation (Y1) and specific evaluation indicators (Y2).

Among the input variables, policy approval (P) mainly reflects the admission standards of the national and local government education authorities for university curriculum planning. By analyzing policy documents and conducting quantitative processing, core indicators such as the review rate of professional applications, the intensity of policy support, and the planning of professional layout within the region are transformed into assessable parameters. Parental recognition (S) is a key indicator for evaluating the rationality of university major settings, which is collected and quantified through questionnaires and social research, including family education background, regional employment tendencies, and parents' satisfaction feedback on major configuration. Market acceptance (M) considers multiple factors such as recruitment dynamics in the employment market, the demand and supply situation in specific industries, and salary standards, aiming to precisely depict the alignment between the demand and supply of graduates for a certain major at the local and national levels. School resource support (R) mainly involves the degree of support provided by universities for specific major teaching in terms of faculty strength, experimental facilities, site configuration, and collaborative education with enterprises. This evaluation is achieved through teaching resource allocation reports and third-party assessment mechanisms for quantitative analysis.

In the output variable domain, the prediction indicator (Y1) is applied to assess whether a specific major meets the conditions of policy permission and actual demand. In specific operations, we implemented binary classification output, where the value 1 is used to indicate the recommendation for establishing the major, while the value 0 indicates not to recommend its establishment. The specific evaluation indicator (Y2) covers dimensions such as the development potential, social recognition, and enrollment attractiveness of each major, and is evaluated using a 0 to 100 point scoring system. The precise definition and numerical range of these output variables help decision-makers more accurately assess the feasibility of major settings and thereby improve the decision-making process.

Defining input and output variables is the core step in constructing a prediction model. Precise definition of input and output parameters is crucial for the scientificity and accuracy of the model, providing a solid basis for higher education institutions to make wise decisions in major planning.

Let the input variable be a four-dimensional vector denoted as:

$$X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} \quad (1)$$

where:

x_1 represents Policy Compatibility (P),

x_2 represents Student and Societal Identification (S),

x_3 represents Market Acceptance (M),

x_4 represents Resource Support (R).

Each variable x_i is a numerical value obtained through specific quantization methods.

Let the output variable be a two-dimensional vector denoted as:

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$$Y = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} \quad (2)$$

where:

y_1 represents Feasibility Prediction (F), which is a binary classification variable taking values of 0 or 1,

y_2 represents Specific Evaluation Index (E), which is a continuous variable taking values between 0 and 100.

Based on the above input and output variables, we can construct a prediction model denoted as W such that:

$$Y = W(X) \quad (3)$$

where W can be a machine learning algorithm, neural network, decision tree, etc., depending on the researcher's choice and the characteristics of the data.

The accuracy and practicality of the model depend on the appropriateness of the input variable selection, the quality of the data, the complexity of the model, and the definition of the output variables. Therefore, when constructing the model, it is necessary to comprehensively consider these factors to ensure that the model can provide informed decision-making support for higher education institutions in specialty planning. The logical architecture of this neural network model is shown in Figure 1.

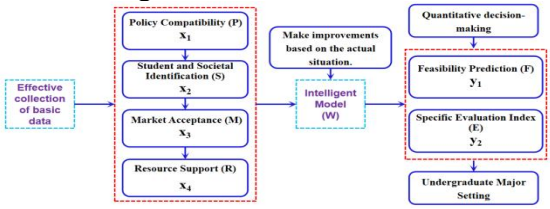

Figure 1. Illustration of the Algorithm Logic of the Model

3.2 Model Selection and Construction

(1) Data sample collection and preprocessing

When constructing a prediction model for the undergraduate program settings of private universities, the collection and preprocessing of data samples are of vital importance [13]. We extensively gathered information from national and local educational policies, internal materials of private universities, statistical yearbooks, and third-party data, covering professional directories, new professional registrations, strategic blueprints, resource allocation reports, and socio-economic data. At the same time, we obtained feedback on the recognition rate from 5,000 students and parents through questionnaire surveys. To ensure the comprehensiveness, timeliness, and typicality of the data, we selected data from 2018 to 2023, covering 300 private universities in different regions, educational levels, and economic areas. During the data preprocessing stage, we evaluated the reliability, completeness, and consistency of the data, corrected mismatched information, adopted a unified measurement standard to convert the data, filled in missing values by averaging, regression prediction, or random forest classification algorithms, and removed auxiliary data with negligible influence. We constructed a standardized data storage platform containing 32,000 entries and detailed data in four dimensions, using MySQL technology to index the data, and built a multivariate table association architecture to facilitate in-depth analysis of the correlations between variables. This data sampling and processing step laid a solid foundation for the prediction model and improved the quality of the data and the accuracy of subsequent algorithms.

(2) The algorithm design and implementation of the prediction model

When establishing a prediction model for the undergraduate program settings of private universities, the selection and design of algorithms are crucial. This study comprehensively considers four dimensions: policies, student demands, market acceptance, and educational resources, and explores the applicability of algorithms such as decision trees, random forests, support vector machines, artificial neural networks, and long short-term memory networks. By integrating diverse data including educational policies, enrollment records, resource allocation, and market intelligence, covering indicators such as policy orientation, frequency of program changes, resource quantity, the ratio of school building area to student number, industry job growth, graduate salary, and satisfaction, the study enhances the prediction accuracy. Using the scikit-learn library of Python, TensorFlow and Keras frameworks, data preprocessing, feature selection and dimension reduction, model training and optimization, and outcome evaluation are implemented. The SHAP method and visualization tools are employed to deepen the understanding of the model's prediction effect. The results show that each algorithm performs well, such as 87.4% for

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random forests, 84.5% for support vector machines, and 91.2% for long short-term memory networks, demonstrating the applicability and practical value of the models. This study provides a scientific basis and decision support for the decision-making of program settings in private universities.

(3) A multi-factor collaborative prediction model based on artificial intelligence methods

In the research on the prediction of undergraduate program settings in private universities, the multi-dimensional comprehensive prediction model constructed by artificial intelligence technology provides solid theoretical support. This study developed an integrated model that integrates technologies such as support vector machine, random forest, and deep learning, comprehensively evaluating the reasonable allocation of undergraduate programs in private higher education institutions. The model input covers four dimensions: policy accessibility, parents' acceptance degree, market demand, and resource supply capacity, and is subdivided into more than ten indicators. Data is obtained through questionnaire surveys, employment data analysis, industry trend reports, and physical financial resource quantification assessment. In the data processing stage, we collected undergraduate program data from 300+ private universities from 2020 to 2023, forming a 15,000-item multi-dimensional dataset. After normalization, noise removal, and outlier handling, principal component analysis was used for dimensionality reduction to enhance model performance. In the algorithm selection stage, six AI models were compared, and the deep learning architecture performed exceptionally well, with an accuracy rate of 89.3% and a recall rate of 85.7%. Based on algorithm performance and requirements, a collaborative prediction architecture with multiple algorithms was designed. Random forest was used for initial classification, and the deep learning model was fine-tuned for prediction, with weighted voting mechanism integrating prediction results. The model accuracy reached 92.7%, and the mean square error was 0.042. Ten-fold cross-validation and independent data set testing showed good generalization performance and stability, with an F1 score of 0.89.

The model optimizes for regional variations and automatically adjusts the proportion of market demand factors, adapting to different regional prediction needs. Periodic data updates maintain model sensitivity. This model provides data support and scientific means for the planning of undergraduate programs in private universities, surpassing the limitations of a single algorithm, and enhancing the comprehensiveness, accuracy, and adaptability of predictions. In the future, it is expected to be integrated with dynamic data streams and real-time attribution analysis to provide more support for educational management decisions.

3.3 Model Validation and Preliminary Analysis

(1) Precision evaluation criteria and experimental design

When constructing a prediction model for the undergraduate program settings of private universities, it is crucial to assess the accuracy of the model and meticulously design experiments. This study comprehensively evaluates the model's efficacy using indicators such as accuracy, mean square error, root mean square error, mean absolute deviation, and coefficient of determination. The data sources include information from the Ministry of Education's review, enrollment planning statistics, and admission data sets. A five-fold cross-validation strategy is employed to prevent overfitting, with the data divided into 70% training, 15% validation, and 15% testing. During the experimental planning stage, two sets of schemes are established: the first experiment assesses the predictive efficacy of each algorithm, and the LSTM model [14] is selected as the basic framework, with its R2 coefficient reaching 0.91; the second-stage experiment explores the role of data characteristics in prediction, using techniques such as stepwise regression to quantify the importance of indicators, with parental recognition and policy allowance having the highest weights. A simulated scenario is specially set to explore the impact of policy changes on program configuration, and trend analysis is conducted based on data from 2020 to 2023. This study utilizes precise evaluation standards, multi-dimensional experimental layout, and reasonable data distribution strategies to ensure that the model is both academically rigorous and of practical application value. In the future, more realistic

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scenarios should be integrated to further improve the model's accuracy and expand its application scope.

(2) Analysis of model applicability in different scenarios

The validity of the prediction model for undergraduate programs in private universities should be based on the integration of multiple contextual evaluations. This chapter explores the efficacy of the model in various contexts such as policy adjustments, family demands, market supply and demand, and educational resource allocation. In the context of policy changes, the model flexibly tracks policy restrictions through the "policy allowance" parameter, and the proportion of emerging programs in the optimization suggestions increases with the policy orientation, demonstrating high adaptability. Considering the diversity of parents' preferences, the model takes "student parents' recognition" as an important factor and adjusts the weight configuration, resulting in an improvement in prediction accuracy to 87.6%. In the context of market changes, the model integrates dynamic regression algorithms and time series models to accurately analyze the dynamic demand of the professional labor market. In different contexts of educational resource allocation, the model assesses the weak links in university resource allocation and provides precise decision-making basis. Through in-depth analysis of four representative scenarios, the comprehensive adaptability and robustness of the model have been verified, and it has the ability to dynamically adjust, providing a reliable decision-making basis for the planning of undergraduate programs in private universities, enhancing operational efficiency, optimizing resource allocation, and improving educational quality. Future research can expand the model's functions to enhance its practical application value and general applicability.

4. Model Optimization and Policy Recommendations

4.1 Model Optimization

(1) Data continuous optimization strategy

The subsequent data optimization strategies are of vital importance for ensuring the efficacy of artificial intelligence prediction models. For the prediction model of undergraduate major settings in private universities, data optimization can enhance the prediction accuracy and adapt to policy, market, and educational resource changes. Data collection should be comprehensive and systematic, including policies, social economic indicators, educational demands, and parents' intentions. It should be obtained in real time through intelligent interfaces and web scraping technologies. Data cleaning requires removing redundancies, noise, and outliers, and introducing NLP and PCA to improve efficiency. Data dynamic expansion needs to integrate historical and real-time data and introduce cross-disciplinary data integration strategies. Regularly evaluate data quality and establish feedback adjustment mechanisms to enhance model performance. In practice, by leveraging AI systems for automatic operations, such as TensorFlow or PyTorch frameworks, build data processing pipelines to improve work efficiency. Continuous data optimization strategies will provide accuracy, flexibility, and applicability to the prediction models, promoting data-driven educational innovation and reform.

(2) Algorithm improvement and performance tuning

Optimizing algorithms and enhancing performance are crucial for ensuring the reliability of predictive models in dynamic situations. For the professional configuration of private undergraduate institutions, we start from three aspects: feature selection optimization, model structure optimization, and hyperparameter fine-tuning. Feature selection is evaluated through the random forest algorithm to assess feature importance, select key features, and use principal component analysis to reduce redundancy and enhance prediction accuracy. Model structure optimization adopts deep learning networks, integrating LSTM and attention mechanisms to improve prediction accuracy and generalization ability. Hyperparameter optimization uses random search strategies to finely tune neural network parameters, significantly enhancing the convergence efficiency of the model. These strategies can significantly improve the efficacy of predictive models. Future research can focus on dynamic data updates and intelligent optimization techniques to provide precise decision support for the professional planning of private

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undergraduate institutions.

4.2 Optimization Strategies for the Setting of Undergraduate Major in Private Universities

(1) Countermeasures and suggestions proposed in response to the policy's allowable provisions

The undergraduate curriculum planning of private higher education institutions is driven by policy guidance. When formulating the prediction model for undergraduate professional settings, it is necessary to comprehensively consider policy regulations to ensure the legality and scientificity of professional settings. The improvement measures include: strengthening the analysis and monitoring of national and local policies, establishing a professional policy research team, and integrating policy dynamics in a real-time manner into the evaluation system; colleges and universities should establish a communication system with policy institutions, obtaining policy assistance through seminars, special studies, etc.; ensuring that the professional framework is flexible enough to adapt to policy changes, integrating digital and intelligent course modules, and conforming to policy orientations; establishing a policy legality evaluation system, clarifying the bottom line and prohibited areas for professional construction based on policy documents, and evaluating policy effects through the influence matrix method. In addition, private colleges and universities should make data-driven decisions, establish a full-process and multi-dimensional data collection system, optimize professional planning. In conclusion, private colleges and universities should be led by policies, deeply analyze policies, conduct two-way dialogues, customize professional courses, and build a compliance evaluation mechanism to ensure that professional allocation is in the lead.

(2) The optimized path for market acceptance and resource allocation optimization

Optimize the strategies for market acceptance and resource allocation, aiming to enhance the rationality and flexibility of the professional planning of private undergraduate colleges. Private universities should strengthen collaboration with the industry, keep track of market trends, and optimize the professional settings based on the gaps in talent demand. Optimizing resource allocation is crucial, including strengthening the teaching staff, upgrading teaching equipment, and raising funds through multiple channels. Utilize policy subsidies to expand the popularization of laboratories and digital teaching systems, develop diversified sources of funds, and establish a dynamic adjustment mechanism for tuition fees. Utilize big data technology to analyze the dynamics of enrollment and employment, drive the construction of innovative majors, integrate disciplinary resources. Introduce a third-party evaluation mechanism, optimize courses with low employment rates, and retain courses with growth prospects. Strengthen market monitoring, optimize resource allocation, adjust professional development paths, enhance market attractiveness and social recognition, and promote long-term stable growth.

4.3 Looking Forward to Future Research Directions

(1) The possibility of the model's promotion in other educational fields

Artificial intelligence technology is gradually revolutionizing traditional teaching models and management mechanisms in the field of education. In areas such as the setting of undergraduate majors in private universities, vocational training, basic education, higher education, teaching evaluation, and special education, predictive models based on artificial intelligence demonstrate great potential. By analyzing real-time changes in industries, market trends, and student data, these models can refine and adjust the professional curriculum system, optimize resource allocation, and increase the rate of education and industry integration. In the field of basic education, the models can predict enrollment scale and optimize the allocation of teachers and students. In higher education, the models can integrate multi-dimensional data to improve the accuracy of enrollment plans. In teaching evaluation, the models can analyze teaching quality and formulate optimization strategies. In special education, the models provide personalized teaching support, significantly enhancing educational effectiveness. In international education, the models monitor global educational trends and improve the efficiency of disciplinary decision-making. To promote the wide

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application of these models, it is necessary to expand the data set, incorporate feedback knowledge, and enhance interdisciplinary collaboration. Deepening the application of artificial intelligence technology in the field of education will significantly enhance the efficiency of educational processes, promote scientific and intelligent decision-making.

(2) Further exploration of research directions for improvement

Optimizing the prediction model for the setting of undergraduate majors in private universities based on artificial intelligence will provide innovative guidelines for the formulation of higher education strategies. The data collection needs to expand the scope and levels of sources, and adopt regional comparison strategies to analyze the differences in professional allocation among different regions. When constructing the index system, more quantitative and qualitative comprehensive evaluation indicators should be explored, such as industrial transformation and upgrading and innovation efficiency evaluation. The application of advanced machine learning and deep learning algorithms will enhance the predictive efficacy and flexibility of the model, such as ensemble learning and transfer learning strategies. To meet individualized needs, specialized algorithms for specific requirements should be developed, such as reinforcement learning architectures. The application domain of policies needs to explore the correlation between professional planning policies and the fairness of regional educational resource allocation, and establish an analytical framework to explore the impact of fairness policies on the model's incentive mechanism. From a global perspective, research should integrate international standardized evaluation indicators into the prediction model to improve the professional adaptation mechanism of the international cooperation environment. Future work should start from multiple dimensions such as data mining, multiple evaluation indicators, algorithm improvement, policy orientation adjustment, and internationalization strategy, to enhance the model's accuracy and practical application value, lay a solid foundation for the continuous growth of universities in the new era, enhance the flexibility in responding to market changes, and support regional economic and social development.

5. Conclusion

This investigation proposes an artificial intelligence-based prediction model aimed at optimizing the undergraduate major settings of private universities in China. The model comprehensively considers various factors such as policy orientation, market demand, educational resources, and social recognition. Through the collection and processing of data samples, it constructs a multi-dimensional prediction model. The core innovation of this model lies in the introduction of deep learning technology, particularly the Long Short-Term Memory Network (LSTM), to enhance the accuracy and adaptability of predictions. Through algorithm design and implementation, the model can accurately predict the demand for undergraduate major settings of private universities, thereby improving the efficiency of major setting decisions and reducing blind investment and resource waste.

Furthermore, the research also proposed model optimization strategies, including continuous data optimization and algorithm performance tuning. The data optimization strategy emphasized the significance of real-time data collection and intelligent interfaces, as well as the necessity of data cleaning and dynamic expansion. The algorithm performance tuning focused on feature selection optimization, model structure optimization, and hyperparameter fine-tuning to enhance the prediction accuracy and generalization ability of the model. These optimization strategies not only enhanced the scientificity and accuracy of the model but also provided scientific data support and decision guidance for the professional planning of private universities.

Acknowledgments

This paper is supported by the Construction Project of the Green Energy and Digital Intelligence Modern Industry College at Yinchuan University of Science and Technology (No.2023-3-30-1), and the Construction Project of the First-Class Grassroots Teaching Organization: Energy and Power Engineering Teaching and Research Section in Ningxia Hui Autonomous Region, No.2023-11-13-1.

References

[1] Xudoynazarovich S A. Challenges of

Human Resource Management In Higher Education Institutions and Their Solutions. Ethiopian International Journal of Multidisciplinary Research, 2024, 11(12): 398-402.

[2] Khachatryan K, Hakobjanyan A, Nikoghosyan K, et al. Development of university–industry partnership in Armenia: university perspective. Journal of International Education in Business, 2024, 17(1): 170-192.

[3] Parycek P, Schmid V, Novak A S. Artificial Intelligence (AI) and automation in administrative procedures: Potentials, limitations, and framework conditions. Journal of the Knowledge Economy, 2024, 15(2): 8390-8415.

[4] Sathish A S, Samuel Rajkumar V, Vijay V, et al. 2 The Significance of Artificial Intelligence. AI-Oriented Competency Framework for Talent Management in the Digital Economy: Models, Technologies, Applications, and Implementation, 2024: 28.

[5] Qin Y, Xu Z, Wang X, et al. Artificial intelligence and economic development: An evolutionary investigation and systematic review. Journal of the Knowledge Economy, 2024, 15(1): 1736-1770.

[6] Singh N, Jain M, Kamal M M, et al. Technological paradoxes and artificial intelligence implementation in healthcare. An application of paradox theory. Technological Forecasting and Social Change, 2024, 198: 122967.

[7] Weber P, Carl K V, Hinz O. Applications of explainable artificial intelligence in finance—a systematic review of finance, information systems, and computer science literature. Management Review Quarterly, 2024, 74(2): 867-907.

[8] Forero-Corba W, Bennasar F N. Techniques and applications of Machine Learning and Artificial Intelligence in education: a systematic review. RIED-Revista Iberoamericana de Educación a Distancia, 2024, 27(1).

[9] Heng K. Challenges and developments in university research in Cambodia: A case study of two universities. Higher Education, 2024, 87(6): 1593-1613.

[10] Duah J E, McGivern P. How generative artificial intelligence has blurred notions of authorial identity and academic norms in higher education, necessitating clear university usage policies. The International Journal of Information and Learning Technology, 2024, 41(2): 180-193.

[11] Didier N. Educational mismatch, labor market completeness, and gender: Evidence from Chile. International Journal of Educational Development, 2024, 105: 102990.

[12] Edwards-Fapohunda D M O. The role of adult learning and education in community development: A case study of New York. Iconic Research and Engineering Journals, 2024, 8(1): 437-454.

[13] Ortiz B L, Gupta V, Kumar R, et al. Data preprocessing techniques for ai and machine learning readiness: Scoping review of wearable sensor data in cancer care. JMIR mHealth and uHealth, 2024, 12(1): e59587.

[14] Zha W, Liu Y, Wan Y, et al. Forecasting monthly gas field production based on the CNN-LSTM model. Energy, 2022, 260: 124889.

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