IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 7, July 2025

DOI: 10.17148/IJARCCE.2025.14716

Support college major selection for high school students by using the Machine Learning algorithm

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Abstract: Nowadays, choosing a specialization is a crucial decision for students, especially in determining their career path. Decision-making is an essential life skill that involves gathering information, generating alternatives, evaluating options, and reaching a decision. This research design for students at the final stage of secondary school to assist them in choosing their desired discipline of study. The research will use the Support Vector Machine (SVM) to examine the criteria for selecting university specialties that are best suited for each student's needs, interests, and strengths. It will also provide a chance for students to explore potential outcomes and opportunities associated with those specialties, helping them make informed decisions that will shape their future. Understanding the different steps in the decision-making process will help students make informed choices that will shape their future.

Keywords: Specialization, Students, Decision, University, Future, SVM.

INTRODUCTION

University education is an integral and basic part of most people preparing for working life. However, placement of students into the appropriate university, college, or discipline is of paramount importance for university education to perform its role. In this study, various explainable machine learning approaches were tested to predict students' right undergraduate specialization (major) before admission at the undergraduate level based on the current on their high school grades and preferences, Today, higher education institutions face considerable difficulties, such as admission processes, student strength, and selections of student specializations [1]. Student specialization selection is an area of educational research that has received little attention, although it is critical in recognizing students' interests and preparing them for a future career [2]. Student specialization is a worldwide educational problem that needs to be investigate.

RESEARCH PROBLEMS

The undergraduate specialization (major) is an important research topic because an incorrect undergraduate specialization selection affects students' academic lives, learning, and careers. Students in every country face challenges in selecting the right undergraduate specialization. From the time students decide to continue their higher education, they are confront with decisions concerning their education, many of which can be challenging. When students attend college, they choose a specialization based on several factors, such as their friends, parents, future opportunities, and, most importantly, the student advisory center. Some students are not fully aware of the importance of their academic abilities and job market demands. They may depend on others' opinions, which may lead to the incorrect and unsuitable specialization selection. If a student chooses an unsuitable academic specialization, continues to have low grades, and fails to raise his or her CGPA within a year, the student will be dismiss from college.

The applicant has a slight knowledge of the specialties.

- The effect of the different parties on the applicant's determination process of choosing a specialty.
- The non-existence/absence of appropriate guidance or system that answers the applicant's frequent questions related to the specialties.

Research Objectives

- To give an abundant information about the different specialties that future university have from the specialties page.

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- To provide several suggestions on the suitable specialty for the applicant depending on the given requirements grades, secondary path and test result.
- To give the applicants the answers they need to their repeated questions related to the specialties by the chat bot assistance.

Conceptual Framework

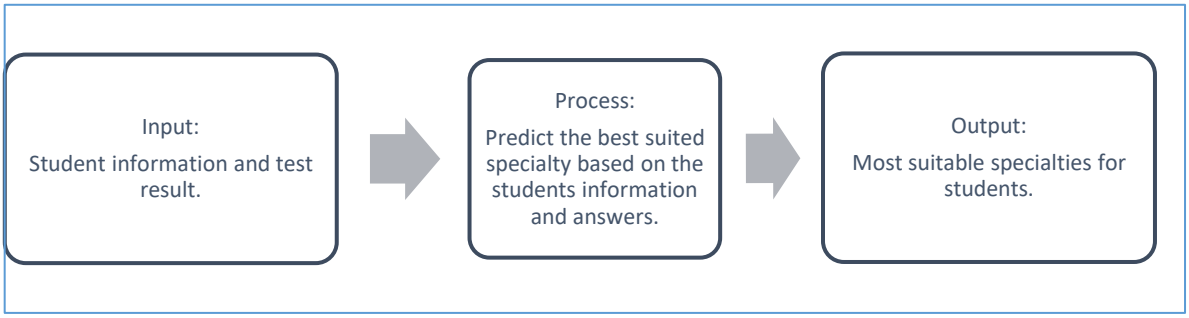

Figure (1.1) Conceptual Framework

Related Studies

Determination systems have played an important role in education. One of these systems is a Markov Chain Collaborative Filtering Model for Course Enrollment Determinations by [4]. Another Determination system is course recommender system using association rules by [5].

There are also, number of studies that have addressed the major selection problem. One of these studies is a Prototype Rule-based Expert System with an Object-Oriented Database for University Undergraduate was proposed by [6]. The study highlighted the importance of using an expert system supported by an object-oriented database [7].

In Saudi Arabia, each university requires specific criteria in order to accept students. These criteria made based on two factors: 1) the outcome of student's qualification exams and 2) overall high school grades. The student must consider these calculations when selecting a specialization. Thus, in this paper, a Fuzzy-Based Determination System (FDS) is propose to aid students in choosing a suitable specialization. This system designed using Fuzzy Expert System (FES) [7].

Another paper represents an approach for developing ontology-based recommender system improved with machine learning techniques to orient students in higher education. The proposed recommender system is an assessment tool for students' vocational strengths and weaknesses, interests and capabilities. The main objective of our ontology-based recommender system is to identify the student requirements, interests, preferences and capabilities to determine the appropriate specialization and university for each one [8].

The basic idea of the proposed system is that based on Holland Codes and RIASEC, which refers to Mr. John Holland's six personality types:

Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E) and Conventional (C) [9].

Holland Code (RIASEC) is a Carrier Choice Theory that is help in choosing work or an education program environment that matches, or is similar to one's personality, will most likely lead to selection success and student satisfaction.

METHODOLOGY

Robustness:

- If, while saving data, an error occurs, the previously-saved data must be preserved. Only after saving is successful should the previous version of the data be eliminated.
- Users should not be permitted to enter invalid data; when an attempt is made to enter invalid data, users should be prompted with an error message and offered the opportunity to fix it.

Functional Requirements:

- The Agent should be able guide the applicant to the most suited specialty based on their quizzes results and university requirements.
- Be able to generate and print quiz results and Determination results.
- Maximizing graduation and lowering drop-out rates.

Usability: the Agent should be easy to interact with

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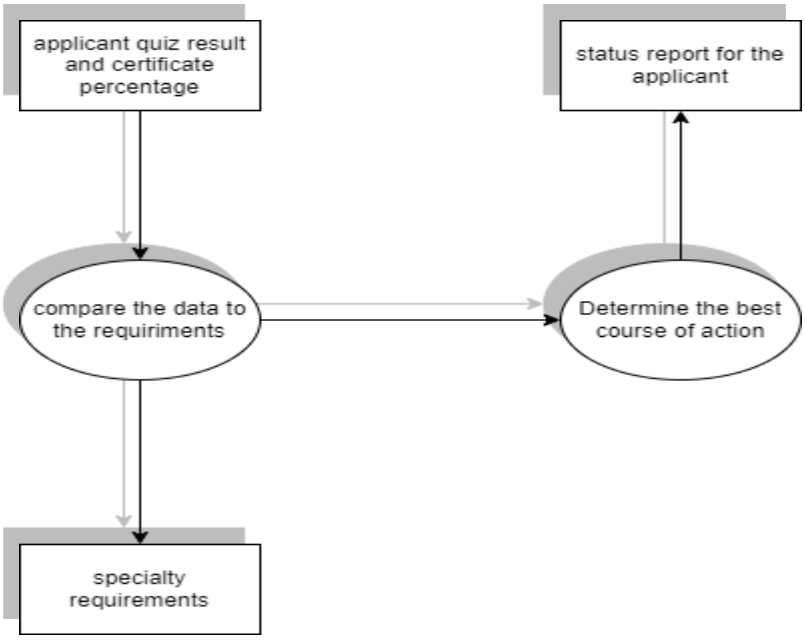
- Legal/regulatory requirements: the Agent must follow Higher ministry of education & the Government of Sudan rules and practices.
- Reliability.
- Performance: the Agent should be reliable have minimal to no lags and deliver the required outcome.

This Section will explain the different aspects of the proposed Agent in term of the design of the Agent and the interfaces, method of work and the different diagrams and models that clarify how the Agent works.

Functional-Oriented Pipe-lining

- Input:
  - Student quizzes
  - Data to calculate Applicant results and specialty requirements to provide suggestions
- Processes:
  - Match Applicant data with relevant specialty elements
  - Structure decision parameters with applicant data
  - Determine the best solution to the problem
- Output:
  - Status report for Applicant
  - Quizzes results.

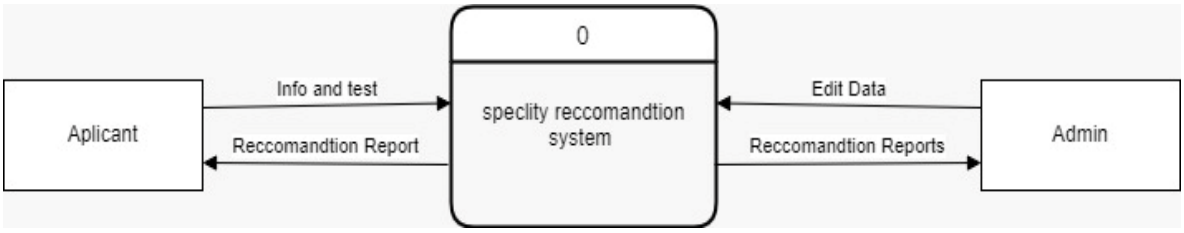
1.



Figure(3.1) Functional-Oriented Pipe-lining

Relationships Model

Data-flow Diagram Level 0



Figure(3.2) Data-flow Diagram Level 0

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Table(3.4) Agent Guidance Table

Agent Guidance	
Actors	Applicant, Administrator
Description	An applicant can participate in the quizzes with a certificate percentage and will deploy the results, mentioned below. Specialty Information can be checked by the Students/applicant and reports including quiz results can be produced. Students/applicants can view future opportunities Students/applicants can view information about specialty To verify if a specialty can be enrolled by the applicants: • The certificate percentage must be higher than the specialty percentage required • Applicants must have a scientific certificate for certain specialties The verification phase will be done by the Admin.
Data	User Login Details Student information and quiz results. Data to compare Student quiz results and certificate details to provide suggestions
Stimulus	User command issued by Actors
Response	Applicant Reports Status report for Applicant

RESULTS AND DISCUSSION

Items	**Users**	**IN**
The Agent allows it's user to know all information about the specialties	4.43	SA
The chat-bot to answer all applicant questions	4.8	SA
Understanding the test	4.5	SA
Output the test result to know most likely specialty the applicant is suited in	4.2	SA
Average	4.48	SA

Usability: The ability of the Agent to be easily learned and used.

Table (4.2) Usability Results Table

Items	**Users**	**IN**
The Agent easy to use and understand	4.8	SA
The Agent UI (User interface) is friendly	4.5	SA
Average	4.65	SA

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Reliability: The ability of the application to give consistent and unfailing results.

Table (4.3) Reliability Results Table

Items	Users	IN
The Agent is free from errors	4.0	SA
The results of the Agent are correct	4.1	SA
Average	4.1	SA

Efficiency: The ability of the application to provide stability and to respond.

Table (4.4) Efficiency Results Table

Items	Users	IN
The Agent performs and finish tasks within 1 second (bear in mind your internet speeds)	4.2	SA
The Agent does not lag when running	4.6	SA
Average	4.4	SA

Interpretation of Result:

Functionality

With an average of 4.48, the functionality results are mostly positive with good scores. This shows that the research did its job, this mainly proves that the research meets its functionality

Usability

The average score is 4.65, which means the UI is user-friendly and users can use it and work with it easily. Having straightforward and easy-to-use UI can carry or spoil the user experience making the application utterly unusable

Reliability

The score is 4.1, this shows that the Agent is running flawlessly and doing its tasks with ease correctly and doing what is expected from the user

Efficiency

With a score of 4.4, this rise in score is proof that the Agent is fast and lightweight. With the previous one having an above-average score, it shows that the Agent is not as efficient as its reliability since it may have different results than the desired

Conclusion

This Agent is developing for applicants who are confused or having trouble choosing a specialization. The Agent will provide them with the support and guidance they need to select a specialty that is right for them. Furthermore, it will reduce the likelihood that they will change specialties during their studies. The Agent is designed to provide assistance with resolving the above issues and achieving the set objectives.

Recommendations

Throughout this study, we examine the most effective methods of assisting a range of new applicants in selecting a specialty, which in turn facilitates the identification of a career goal for the individual. It will also be possible to resolve the above-mentioned problems, which will make it possible for us to achieve the desired outcomes.

REFERENCES

[1]. Mengash, . Mengash, H.A. Using Data Mining Techniques to Predict Student Performance to Support Decision Making in University, .JCIT July 2024.

[2]. K. Alshaikh, N. Bahurmuz, O. Torabah and Alzahrani, Alshaikh, K.; Bahurmuz, N.; Torabah, O.; Alzahrani, S.; Alshingiti, Z.; Meccawy, may 2024 M. Using Recommender Agents for Matching.

[3]. google, "https://en.wikipedia.org/wiki/The_Future_University_(Sudan)," [Online].

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[4]. Z. Z. (. Elham S.Khorasani, Elham S.Khorasani, Z. Z. (2016). A Markov Chain Collaborative Filtering Model For Course Enrollment Determination. IEEE International Conference On Big Data(Big Data), Pp.3484-3490.
[5]. E. A. (. Narimel Bendakir, Narimel Bendakir, E. A. (2006). Using Association Rules for Course Determination. In Proceedings of the AAAI Workshop on Educational Data Mining., pp. pp. 31-40..
[6]. M. A. (. Ahmar, Ahmar, M. A. (2012). A Prototype Rule-based Expert Agent with an Object-Oriented Database for University Undergraduate Major Selection.
[7]. "https://pdfs.semanticscholar [Online].
[8]. https://www.careerkey.org/fit/personality/holland-code-assessment-riasec, (2018) [Online].
[9]. H. E. K. I. L. Charbel Obeid, research Papers/ontology recommender%20Agent.pdf" Mar 2022.

