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Machine Learning Enabled Personalized Career Guidance for School Students

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Abstract
After the tenth grade, students must make a critical decision about their careers, but many are confused by the lack of appropriate and individualized guidance. It can be challenging for students to select the best course of action because traditional career counseling techniques are frequently generic and offer the same recommendations to every student without taking into account their unique interests, abilities, and strengths. As a result, a student-centered career counseling system that offers tailored suggestions is required. With the help of machine learning (ML) techniques, this proposed work seeks to create a customized career guidance platform for schoolchildren, particularly those finishing the tenth grade. Through assessments, the system examines students' interests, skills, subject knowledge, and personalities. It suggests suitable career paths and streams such as Science, Commerce and Arts.

Keywords: *Machine Learning, Personalized Career Recommendation, 10th Grade Students, Stream Selection.*

1. Introduction
About 913,000 students in Tamil Nadu passed the public 10th grade exam in 2025, with a noteworthy 93.08% pass rate [1]. Even with this accomplishment, a lot of students struggle to decide on a suitable academic path after finishing secondary school. Rather than individual aptitude and interest, the majority of decisions are influenced by family pressure, social pressure, or test results. This makes career planning extremely difficult, particularly when trying to develop Machine Learning (ML)-based systems that can provide trustworthy and customized recommendations.

1.1.Difficulties in Career Decision-Making
Currently, there is an imbalance due to the absence of organized career counseling. Students in rural regions face more challenges because of a lack of resources and awareness, whereas students in urban areas may have some access to career counseling. Because of this, a lot of people wind up making poor decisions that can result in unhappiness, subpar academic achievement, and career mismatches.

1.2.Current Initiatives and Their Limitations
There have been attempts in recent years to deal with this problem. Through special columns and counseling programs, initiatives like the Tamil daily Dinamalar have brought attention to the value of career guidance. In a similar vein, the Tamil Nadu government's Naan Mudhalvan program was introduced to give students resources for guidance, skill development, and career awareness. Even though these programs are beneficial, they are still mostly generic and not yet completely customized. This makes it possible for machine learning-based systems to supplement these programs by providing customized recommendations based on each student's unique profile.

2. Literature Survey
The platform suggested by Kumar etal.,[2] combines technology with expert guidance to help students

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make informed career decisions. It offers personalized support, resources, and planning tools.

The career guidance tool proposed by Chithra et al.,[3] gives personalized career recommendations based on psychometric assessments and structured activities. This system combines analytical insights with interactive features to match career suggestions with students' strengths and interests. The career education and development framework introduced by McCowan et al.,[4] is based on a solid theoretical model. It meets school-level career education requirements and is designed to be age-appropriate, easy to understand, and suitable for different grade levels. The machine learning-based system created by Padma et al.[5] uses a Decision Tree algorithm to analyze academic performance, technical skills, interests, and psychometric data. This generates personalized and clear career recommendations. The career planning scale designed by Wang et al.[6] uses structured questionnaires to assess students' interests and abilities. This method helps with informed educational and career choices through theory-driven assessment. The psychometric test analysis framework suggested by Kakade et al.[7] uses validated assessment principles to evaluate personality traits, interests, and cognitive abilities. This provides reliable insights that aid self-discovery and organized career planning.

3. Methodology

Figure 1 shows how the proposed system will work in a structured way. The method includes choosing a language, logging in, assessment modules, and stream suggestions based on machine learning.

3.1. Select Preferred Language

Users pick their preferred language, like English or Tamil, at the start. This feature makes the system easier to use and makes sure that students can use it in their own language, which improves the overall experience for all users.

3.2. Login/Register

To sign up for the system, students make an account with username and password. Users who have signed up can log in to see their profile, tests, and scores. The login module lets each student access assessment features that are unique to them

3.3. Dashboard

The dashboard is the system's main interface. It makes it easy for students to get to tests, see their test history, and use features like the chatbot. It makes it easier to get around and manage activities.

3.4. Psychometric Assessment

Students answer questions about their personality, interests, and behavior in this module. The system looks at the answers to find strengths, preferences, and career interests, which helps it come up with good career ideas.

3.5. Technical Assessment

Students take technical questions about specific subjects to test their academic knowledge and skills. The results help the system figure out what the student is good at and suggest the best academic paths for them.

3.6. View Stream Suggestion

The system uses machine learning to process the data it has gathered after all the tests have been finished. Personalized stream and career suggestions are given to help students make smart choices based on their performance, interests, and skills.

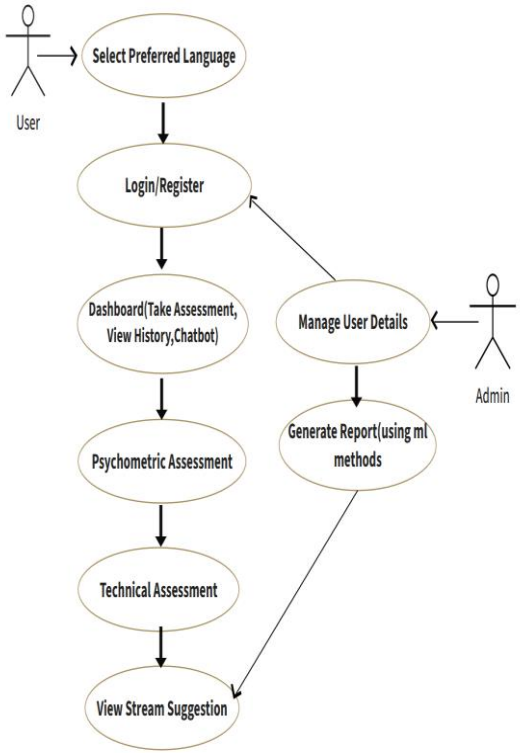

Figure 1 Proposed Career Guidance System

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4. Results and Discussion

4.1.Results

A standardized questionnaire measuring students' logical, mathematical, scientific, reading, and technical skills was used to gather the dataset. Following preprocessing, the gathered data was separated into training and testing datasets. The classification model for academic stream recommendation was trained using the Random Forest method. The model's performance was assessed using previously unseen data after training. Based on the students' overall traits, the model consistently predicted which streams they should be placed in.

4.2.Discussion

The outcomes demonstrate that the Random Forest model can handle student data with multiple attributes and classify streams.Its ensemble structure enhances prediction stability and lessens overfitting. Balanced decision-making is supported by the use of both technological and psychometric characteristics. The results of the experiment show that the suggested method can be used for data-driven academic stream recommendations.

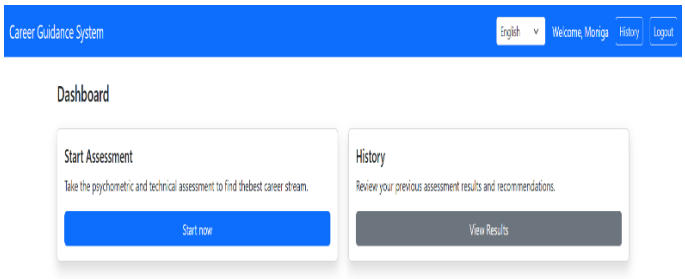

Figure 2 Dashboard (English)

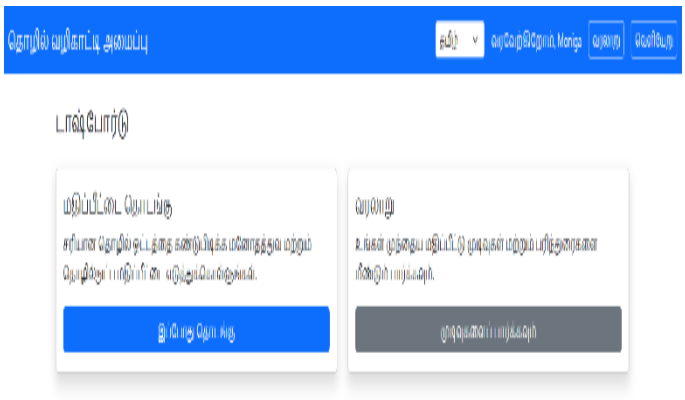

Figure 3 Dashboard (Tamil)

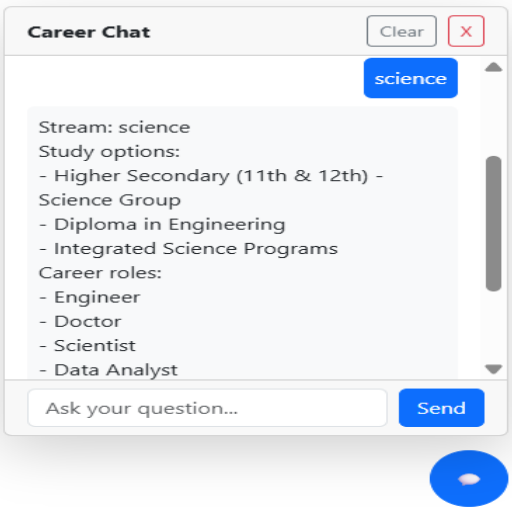

Figure 3 Chatbot

The suggested system's English dashboard interface, which offers access to assessments, history, and other user features, is shown in Figure 2. The career chatbot interface is shown in Figure 3, which offers career positions and study possibilities tailored to a particular stream based on the system's recommendations. The Tamil dashboard interface, which allows users to access all functionalities in Tamil, is depicted in Figure 4.

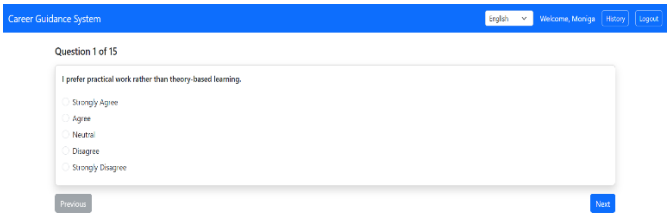

Figure 5 Psychometric Test

The psychometric assessment interface, which uses Likert-scale questions to assess students' preferences, interests, and personality traits, is depicted in Figure 5.

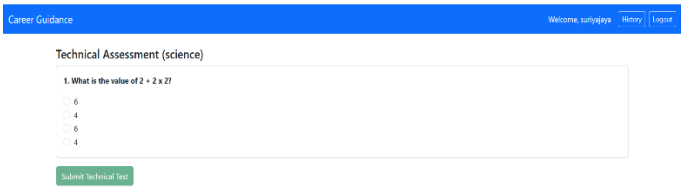

Figure 6 Technical Test

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The technical assessment module intended to gauge subject knowledge and analytical skills is shown in Figure 6. The chatbot interface for immediate user assistance is represented by the circle icon.

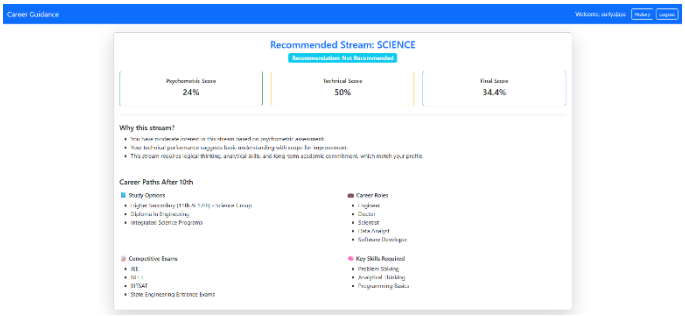

Figure 7 Recommdation Provided by This Proposed System.

The final recommendation page describing the recommended academic stream based on the combined evaluation analysis is shown in Figure 7.

Metric	Decision Tree	Random Forest
Accuracy	83% (Moderate)	96.67% (High)
Precision	0.82	0.96
Recall	0.81	0.96
F1-Score	0.81	0.96
F1-Score	0.81	0.96

Figure 7 Decision Tree Vs Random Forest

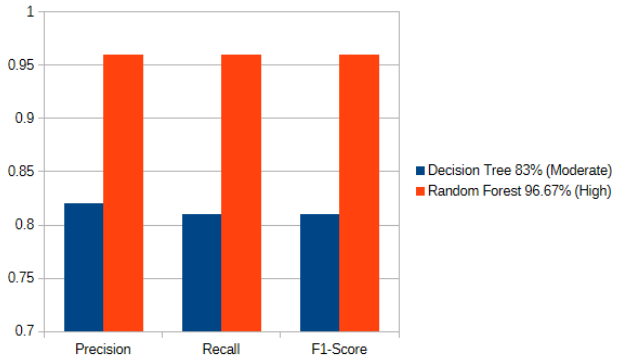

Figure 8 Comparison of Decision Tree And Random Forest

The Random Forest classifier outperformed the Decision Tree and Random Forest models in terms of accuracy, precision, recall, and F1-score, as shown in Figure 8

Conclusion

This work addressed the shortcomings of conventional and broad career counseling approaches by proposing a machine learning-enabled tailored career advising system for schoolchildren. Based on each student's unique replies and performance, the system combines technical evaluation with psychometric assessment to produce tailored career recommendations. The created framework offers an organized approach to evaluating student contributions and assigning them to appropriate academic or professional pathways. The technology facilitates systematic and scalable career coaching for school-level kids by integrating machine learning techniques. All things considered, the suggested model shows how machine learning may be used to create a customized career counseling platform that helps students make wise educational choices.

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