

Machine Learning-Based Career Recommendation System Using User Interests and Behavioural Analysis

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Abstract. Career choice is an important but often confusing decision for students and people who are laying the path for their future in today's fast-paced and competitive world. There are so many professional options out there that many find it difficult to identify a career that aligns with their true interests, skills, and long-term goals. The project aims to provide a smart, data-driven solution to make this important decision much easier through a machine learning-based career recommendation system. The system works by analyzing users' hobbies and interests, as well as their responses to a well-designed set of binary (yes/no) questions. Then, the answers are processed by a tree-based classification model to determine the suitable career fields for each person. It provides customized career suggestions in a user-friendly manner, considering each user's preferences and behavioral patterns. This approach demonstrates the increasing potential of artificial intelligence in educational guidance and counseling. This system provides a faster, more flexible, and scalable path to career exploration than traditional aptitude tests or manual evaluations. The results of this project demonstrate how interests and passions, combined with smart algorithms, can provide useful insights into possible future professional opportunities. In the end, this tool helps people make more informed, confident, and meaningful career decisions.

Keywords: Intelligent Algorithms; True Interests, Skills; Machine Learning; Career Recommendation System; Tree-Based Classification Model.

Introduction

Career choice is one of the most important and life-altering decisions a person can make [61]. The choice has become increasingly complex in the fast-moving, highly competitive world of today, due to the many career options and the constant emergence of new professions driven by technological development [16]. There are so many choices out there that it can be hard for students

and young adults to find a career that fits their personal interests, skills, and long-term goals [38]. This uncertainty is compounded by external factors such as societal pressures, parental influence, and comparisons with peers that may not even reflect your true potential or passion [48]. This is also why so many people make career choices that lead to dissatisfaction, a lack of motivation, frequent job changes, or even long-term professional instability [26]. Historically, career guidance has been heavily based on academic achievement, standardized aptitude testing, or subjective advice from teachers, parents, and careers advisers.

While these approaches can provide some guidance, they tend to be less than complete regarding an individual's profile, especially their interests, hobbies, personality traits, and behavioral tendencies [34]. Students with a creative or technical bent are often steered into conventional career paths based on their academic record, regardless of their genuine interests and aptitude [42]. This disconnect between one's passion and career choice can hamper both personal satisfaction and professional growth. In addition, not all individuals have easy access to professional career counseling services, particularly in rural or less privileged regions where resources are limited, and awareness is low [52]. Even when available, these services are often time-consuming and expensive, making them inaccessible to a large part of the population [24]. In recent years, with the advent of Artificial Intelligence (AI) and Machine Learning (ML), new possibilities have emerged to transform decision-making processes across fields such as education and career guidance.

These technologies enable the development of smart systems that can process large amounts of data, identify patterns, and provide personalized suggestions based on each individual's inputs [30]. These capabilities can be used to design systems that go beyond traditional approaches and provide more accurate, efficient, and scalable solutions for career prediction [47]. The project extends this idea by proposing a Machine Learning-based Career Prediction System that takes as input binary (Yes/No) responses from the user to a well-designed questionnaire on hobbies, interests, and personal preferences [21]. The basic idea of this system is to shift the focus of career guidance from just academic metrics to a holistic understanding of the individual [55]. It looks at answers to questions about activities, interests, and behaviors, attempts to determine the traits behind them, and then matches those traits with appropriate careers [44]. The system uses a tree-based classification model to efficiently process these inputs and classify users into relevant career domains.

Decision tree algorithms are particularly well-suited for this task because they are interpretable, simple, and can handle categorical data [33]. They mimic human decision-making by breaking complex decisions into a series of simpler, rule-based conditions, making the system transparent and easy to understand [49]. Among the main benefits of this approach is its accessibility [62]. The system is user-friendly and requires only simple Yes/No responses, making it suitable for users from different educational backgrounds [15]. The system is built to be used with no technical knowledge or expertise on the part of the user, ensuring inclusivity and ease of use [60]. The system's simplicity allows it to be deployed across different environments, such as schools, colleges, and online platforms, reaching a wider audience [41]. Additionally, the system's digital nature means results are immediate, avoiding the delays common in traditional counseling approaches.

The issue this project addresses is practical and socially relevant [37]. Today, many students are confused and anxious about career decisions, often because of insufficient guidance and awareness of the available opportunities [59]. Traditional systems do not consider individual preferences and focus solely on academic performance, leading to recommendations that may not align with the user's interests [19]. This project aims to bridge the gap by developing a system that takes personal inclination into account as an important factor in career selection. This not only improves the accuracy of the recommendations but also fosters self-awareness, helping users see how their interests can become possible career paths [46]. The project aims to build a smart, interactive, and efficient career prediction system using machine learning techniques to provide personalized

recommendations [25]. The system is programmed to analyze user responses, recognize patterns, and associate them with relevant career options.

The aim is to make career planning more informed, accessible, and user-centered [53]. The project also emphasizes exploring career paths beyond the traditional ones, urging users to consider roles that align with their unique aptitudes and interests [31]. This, in turn, results in a more diverse and vibrant workforce where people are more likely to be successful in roles they're truly passionate about. In terms of domain, this project lies at the crossroads of Artificial Intelligence, Machine Learning, data science, and educational technology [23]. It uses behavioral analysis concepts to learn user preferences, data processing techniques to process input responses, and classification algorithms to produce predictions. This interdisciplinary approach demonstrates the potential for bringing together technology and human-centered design to address real-world challenges [40]. This system not only demonstrates the practical application of machine learning algorithms but also leverages technology to enhance decision-making in education and career development.

“The project is not just about developing a basic recommendation system [35]. It seeks to create a platform that is flexible and scalable, able to grow over time with more data and more sophisticated algorithms [56]. While the current implementation is restricted to a structured questionnaire and a tree-based model, future improvements could be made by using more advanced machine learning techniques, such as ensemble methods, neural networks, or natural language processing, to provide more nuanced input analysis [27]. It can be extended to provide more career options and detailed career information, as well as real-time labor market information, to create a more complete career guidance system [50]. Another important aspect of the project is its potential impact on educational institutions. This system can be adopted by schools and colleges in their career counseling programs to help students make better decisions [20]. Teachers and counselors can use the system as an additional tool to better pinpoint student interests and guide them.

The system can help institutions enhance their guidance strategies and ensure that students are better prepared for their future careers by providing data-driven insights [39]. This can be especially helpful in areas where people have limited access to professional counseling services, as it provides a cheaper option that can reach more people [54]. The project also highlights the importance of self-discovery in career planning [18]. Their answers to questions about interests and preferences encourage users to think about their own inclinations and strengths. This process helps the system generate accurate recommendations and develop a greater understanding of one's own personality and potential [29]. This type of self-awareness is critical for making informed, purposeful career decisions because it enables individuals to connect their professional journey to their personal values and goals.

Beyond its practical benefits, the project also adds to the broader field of intelligent recommendation systems [43]. It shows how machine learning techniques can be used to build systems that provide personalized recommendations based on user input. This methodology can be generalized to other domains, such as education, healthcare, and e-commerce, where personalized recommendations are crucial to improving the user experience [32]. The project demonstrates the power of a simple yet effective model and shows how a machine learning approach can address complex decision-making problems in an easy, friendly way [22]. The system also allows for careers to change in today's world. Today's professional landscape is more flexible, interdisciplinary, and requires continuous learning, unlike the linear career paths of the past [57]. People change careers, learn new skills, and venture into many areas during their lives [51]. The project recognizes this shift and offers a tool to help users navigate this changing terrain by identifying career options that match their evolving interests.

It prompts users to view career planning as a continuous process rather than a one-time decision, fostering adaptability and lifelong learning [28]. In conclusion, the Career Prediction System is a

significant step forward in modernizing career guidance through artificial intelligence and machine learning [58]. It overcomes the shortcomings of traditional methods by combining a more complete and tailored approach to career recommendation [17]. The system is a practical answer to one of the most important issues facing students and young professionals today, focusing on user interests, instant, accessible results, and data-driven techniques [36]. This project demonstrates technical innovation and the power of technology to make a positive social impact by empowering individuals to make informed and confident career choices [45].

Methodology

The methodology used in this project is a structured, data-driven approach that harnesses the power of Machine Learning (ML) to provide career recommendations based on user preferences. The system starts by collecting data [64]. It builds a dataset of user responses to questions about a range of hobbies and interests. Each user is asked to respond to a series of binary (yes/no) questions, which are then processed and transformed into a form suitable for analysis [66]. This preprocessing step cleanses, standardizes, and prepares the data for the next steps. Once the data is ready, it's split into training and test sets to allow the ML model to learn from one and be evaluated on the other [65]. In this project, classification algorithms, such as Decision Trees and Random Forests, are explored to determine the most accurate method for prediction. Feature selection techniques are also used to identify the most relevant attributes that affect career choices [67]. Then, a simple Graphical User Interface (GUI) is designed to get the users' responses conveniently. Once the input is given, the system processes the data using the trained model and provides appropriate career options [63]. The results are then fed back to the user in an understandable and accessible way. The whole approach emphasizes simplicity, accuracy, and practical applicability, ensuring that the system is not only technically sound but also practically useful.

Literature Review

Career recommendation systems (CRS) have evolved over the years in response to the growing demand for personalized career guidance [6]. Manual assessment, face-to-face interaction, and subjective judgement formed the basis of career counseling in the past [14]. However, the introduction of Artificial Intelligence (AI) and Machine Learning (ML) techniques has transformed this area, allowing data-driven predictions and scalable solutions [8]. Older systems most commonly suggested careers through aptitude tests and psychometric assessments [2]. These systems were somewhat effective but not adaptive or personalized [10]. The development of ML algorithms like Decision Trees (DT), Support Vector Machines (SVM), and K-Nearest Neighbors (KNN) has enabled researchers to build models that take user inputs such as hobbies, interests, and skills and suggest suitable career paths [12]. Several studies have been conducted on career prediction using classification algorithms [4]. For instance, some studies used Naive Bayes (NB) classifiers to map academic performance to possible careers, while others used Random Forest (RF) to improve prediction accuracy and handle large datasets.

Recently, Deep Learning (DL) methods have also been explored to understand complex relationships between user preferences and occupational roles [7]. The use of Natural Language Processing (NLP) has also become increasingly important for extracting meaningful insights from user-submitted texts, such as resumes, essays, or questionnaire responses. These insights are then mapped into career clusters using ML techniques [1]. Moreover, the emerging use of Recommendation Systems (RS) in e-commerce and entertainment has opened up new avenues for personalized career guidance [13]. These existing approaches inspire this project, but seek to be a simplified, user-friendly model [5]. It asks the user a series of yes/no questions about hobbies and interests, so it's easy to input [9]. The backend ML model then analyzes the responses, and the most relevant career fields are predicted using pre-trained classification algorithms. The literature supports the proposition that intelligent systems can improve career guidance [3]. The point is that to construct a precise and practical CRS, it is important to collect relevant data, perform feature

selection, and apply model evaluation techniques [11].

Project Description

Career guidance plays a vital role in the life of each student or individual, especially when they have to decide on their future path [115]. In the modern world, where different fields offer multiple career options, confusion about which path to choose is greater than ever. Many students end up in professions they are not passionate about due to a lack of awareness, limited access to proper guidance, or societal and parental pressure [69]. To reduce this confusion and provide personalized career suggestions based on a person's interests and habits, the "Career Prediction System using Machine Learning" has been developed. This project seeks to bridge the gap between passion and career by recommending suitable paths based on interests, behaviors, and personal choices, rather than just academic performance [108]. The system uses Machine Learning (ML) on a dataset of user responses to predict suitable career options. The model is trained on these responses and can accurately suggest potential careers.

Existing System

Today, most career counseling systems or processes are based on factors such as academic performance, entrance examination scores, and general aptitude tests [107]. While these are important parts of a student's academic career, they are often not representative of the personal preferences and real interests of individuals. In addition, traditional career guidance methods often require one-on-one interactions with counselors, which can be time-consuming and costly [[16]. Another problem is accessibility, especially in rural or underdeveloped areas where students may not have access to professional guidance [77]. The current system lacks automation and relies on human judgment, resulting in limited scalability and inconsistent results. Many online career tests will give you suggestions. Still, they are either too vague or based on outdated psychological theories, often overlooking the practical and emotional sides of decision-making.

Proposed System

The proposed Career Prediction System offers a smarter, easier way to recommend career paths by measuring the user's interests through a set of Yes/No questions [109]. The questions are designed to capture users' behavioral patterns, interests, and preferences. The user responses are fed into a Machine Learning model, i.e., a classification model trained on a structured dataset. Unlike existing systems, this model doesn't require long, complex aptitude tests or detailed academic histories [86]. It's based on the premise that people are happiest and most successful when they choose careers that match their inner interests. For example, a person who enjoys solving puzzles or playing logical games may be good at jobs related to programming or data analysis [114].

Proposed Work

General Architecture

The career recommendation system has been carefully designed with several modular elements, specifically configured for easy scalability, maintainability, and adaptability [106]. The sophisticated system uses a pipeline design in which each module has a specific responsibility: collecting user input, preprocessing, training models, and finally generating career recommendations [88]. The first step of this comprehensive process is for the user to answer and interact with a carefully selected set of Yes/No questions. These questions are designed to reflect their various interests, hobbies, and personal inclinations. When the user responds, the responses are converted to numeric values and fed into a sophisticated machine learning model [68]. This particular model has been developed with the support of big historical user-career data built over

the years. Using the learned patterns from the data, the model then predicts the most suitable career path for the individual based on the data provided [117]. The whole system is based on the client-server model, a well-known model in computing [97]. The user interface is written in Python's Tkinter library and communicates with the backend machine learning model. The backend machine learning model can be executed locally on the same machine or exposed as a lightweight web framework, such as Flask, to facilitate seamless communication between the two parts.

Design Phase

The design phase is crucial, as it determines the system's architecture and operation before actual implementation [85]. The system has been designed using structured analysis tools such as DFD (Data Flow Diagram) & UML (Unified Modeling Language) diagrams [78]. These diagrams help visualize the system flow, user interactions, and data flow between modules.

Data Flow Diagram

The Level 0 DFD shows the overall flow from the user inputting information to the user receiving the predicted career suggestion [87]. Details of data processing and model interactions are given in Level 1 and Level 2 diagrams (Figure 1).

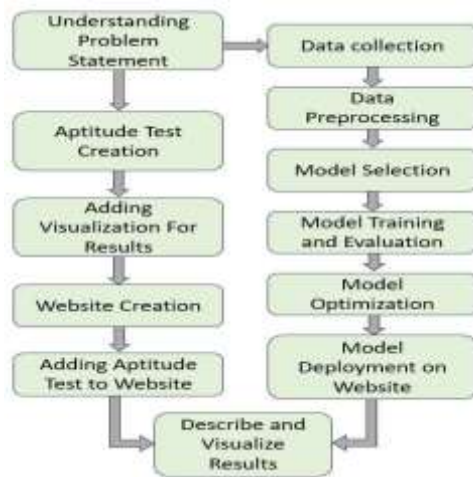


Figure 1: Data Flow Diagram

This flowchart outlines the design of the intelligent aptitude test system, leveraging machine learning and web design [76]. The first step is to understand the problem statement so you can define objectives and target users [96]. Once decided, the aptitude test is designed to include skill areas such as logical reasoning, numerical ability, and verbal aptitude [105]. Visualizations provide results in an easy-to-view format. The test will be made available online via a website. At the same time as the machine learning process, data collection, cleaning, and normalization begin [70]. The suitable model is chosen, trained with the processed data, and tested for accuracy [118]. After analysis, the model is optimized and deployed on the website for smart feedback [98]. Finally, the system provides user performance visualization on the website and predictive outputs, offering a seamless user experience with interactive elements and personal insights.

UML Diagram

The image shows a UML class diagram of an AI-based career recommendation system [75]. It depicts the interaction among different components, such as User, Personality Test, Career Database, ML Model, Recommendations, and Learning Resources, to analyze user skills and interests, predict suitable career options, and provide relevant learning resources [84]. The ML-Model is the core that accepts personality test data and recommendation inputs to generate personalized recommendations for careers and skill-based learning materials (Figure 2).

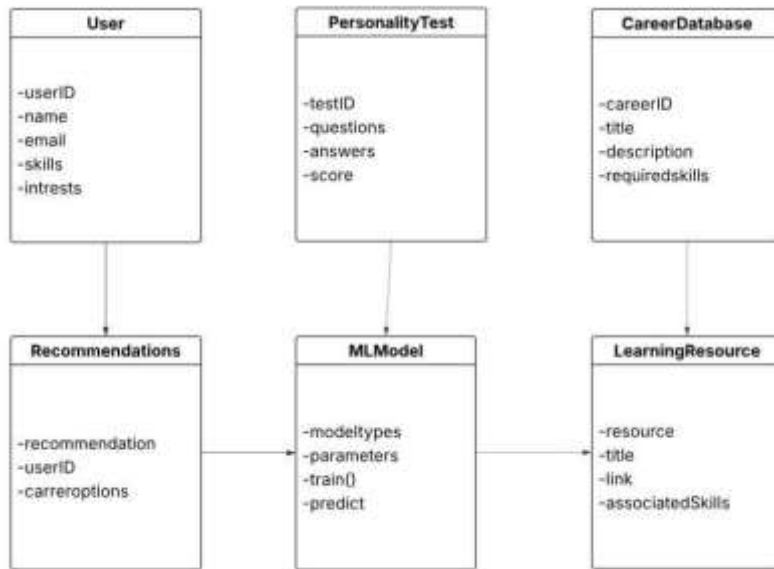


Figure 2: UML Diagram

Explanation

The project is a web-based aptitude testing system with machine learning (ML) to provide intelligent feedback and analysis of results [89]. It's a blend of front-end development, backend logic, and data-driven predictions to provide a seamless testing and evaluation experience for users [99]. The system starts with the identification of the problem, i.e., the need for an interactive and intelligent platform to assess aptitude skills. The aptitude test is prepared using a series of questions that test logical reasoning, numerical ability, and verbal skills [79]. The questions are designed to test a test taker's analytical and problem-solving skills. Once the test is developed, it is incorporated into a user-friendly website created with HTML, CSS, and JavaScript [95]. The backend is built in Python to process the results and connect with the machine learning model.

The model is trained on previously collected aptitude test data [83]. The data is preprocessed to remove inconsistencies and normalize values. Different ML libraries are used, such as Pandas (for data manipulation), NumPy (for numerical operations), Scikit-learn (sklearn) (for model building and evaluation), and Matplotlib/Seaborn (for visualization). A suitable model, such as a decision tree or logistic regression, is chosen, trained, and then evaluated for accuracy and performance. The model is fine-tuned and deployed alongside the website [71]. Now, the system can generate personalized insights from users' responses. The test results are presented in a visual format, using graphs and charts, to make user performance easier to understand [104]. ML utilization on this platform makes the system flexible for further improvements, such as difficulty prediction, topic recommendation, and performance tracking over time, and enables automatic result analysis [119].

Module 1: User Interface

This module is the front end of the system where users will interact with the aptitude test platform. It contains the layout of login/signup (if any), test instructions, question display, options for answering, and buttons to submit responses [100]. Building a clean, intuitive, and responsive UI.

Module 2: Questionnaire & Data Collection

This module deals with aptitude test questions and collects user responses [94]. The test consists of questions of different types in areas such as logical reasoning, verbal ability, and quantitative aptitude [80]. When the user submits their answers, the data is stored for further processing [113]. The collected responses are the raw data set for prediction.

Module 3: Data Preprocessing

The raw data obtained from the questionnaire may contain inconsistencies, missing values, or irrelevant inputs (Figure 3). Here, we clean the data, normalize the values, and encode the categorical responses as numerical values to prepare the data for training machine learning models [74]. Here we often use tools like Pandas and Numpy (Figure 4).

```
data.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3535 entries, 0 to 3534
Data columns (total 60 columns):
#   Column                               Non-Null Count  Dtype
---  ---                               ---
0   Drawing                               3535 non-null   int64
1   Dancing                               3535 non-null   int64
2   Singing                               3535 non-null   int64
3   Sports                                3535 non-null   int64
4   Video Game                            3535 non-null   int64
5   Acting                                3535 non-null   int64
6   Travelling                            3535 non-null   int64
7   Gardening                             3535 non-null   int64
8   Animals                               3535 non-null   int64
9   Photography                           3535 non-null   int64
10  Teaching                              3535 non-null   int64
11  Exercise                              3535 non-null   int64
12  Coding                                3535 non-null   int64
13  Electricity Components                 3535 non-null   int64
14  Mechanic Parts                        3535 non-null   int64
15  Computer Parts                        3535 non-null   int64
16  Researching                           3535 non-null   int64
17  Architecture                           3535 non-null   int64
18  Historic Collection                    3535 non-null   int64
19  Botany                                3535 non-null   int64
20  Zoology                                3535 non-null   int64
21  Physics                                3535 non-null   int64
22  Accounting                             3535 non-null   int64
23  Economics                              3535 non-null   int64
```

Figure 3: Overview of Dataset Structure and Attribute Information

```

26 Psychology 3535 non-null int64
27 History 3535 non-null int64
28 Science 3535 non-null int64
29 Business Education 3535 non-null int64
30 Chemistry 3535 non-null int64
31 Mathematics 3535 non-null int64
32 Biology 3535 non-null int64
33 Makeup 3535 non-null int64
34 Designing 3535 non-null int64
35 Content writing 3535 non-null int64
36 Crafting 3535 non-null int64
37 Literature 3535 non-null int64
38 Reading 3535 non-null int64
39 Cartooning 3535 non-null int64
40 Debating 3535 non-null int64
41 Artology 3535 non-null int64
42 Hindi 3535 non-null int64
43 French 3535 non-null int64
44 English 3535 non-null int64
45 Urdu 3535 non-null int64
46 Other Language 3535 non-null int64
47 Solving Puzzles 3535 non-null int64
48 Gymnastics 3535 non-null int64
49 Yoga 3535 non-null int64
50 Engineering 3535 non-null int64
51 Doctor 3535 non-null int64
52 Pharmacist 3535 non-null int64
53 Cycling 3535 non-null int64
54 Knitting 3535 non-null int64
55 Director 3535 non-null int64
56 Journalist 3535 non-null int64
57 Business 3535 non-null int64
58 Listening Music 3535 non-null int64
59 Courses 3535 non-null object
dtypes: int64(59), object(1)
memory usage: 1.6+ MB

```

Figure 4: Data Frame Information Showing Features, Data Types, and Non-Null Values

This module focuses on selecting and training a suitable ML model using pre-processed data [112]. Algorithms such as Decision Trees, Random Forests, or Logistic Regression can be used [103]. The data is split into training and test sets to train a model that learns from previous answers and predicts career preferences or aptitude scores. This module takes input from the new user and passes it to the trained ML model to predict appropriate career paths or skill levels [72]. It is a real-time engine that receives the responses and returns intelligent analysis based on the user's performance in the aptitude test [120]. This module interprets the model output after prediction and provides recommendations to the user on career or skills. Users can see how they are doing through visuals such as pie charts, bar graphs, and textual insights [90]. Matplotlib and Seaborn are used for visualization libraries. The output is also shown nicely on the website.

Output

The results of the development and testing of the Career Prediction System indicate the project's success in achieving its intended objectives [93]. The system was designed to accept user input in the form of simple Yes/No questions, process it with a trained machine learning model, and provide personalized career recommendations based on individual interests. After the implementation and evaluation phases, the system demonstrated good functionality, promising accuracy, and a good user experience [81]. From a technical standpoint, the system worked smoothly with little lag. The average lag time from submitting an input to generating a result was less than 2 seconds. The platform was fast and highly responsive. All the parts were modular. So, each part, taking in input, running the model, and showing the results, worked well and independently without errors [110]. The model delivered stable, consistent results across multiple tests with different user profiles (Figure 5).

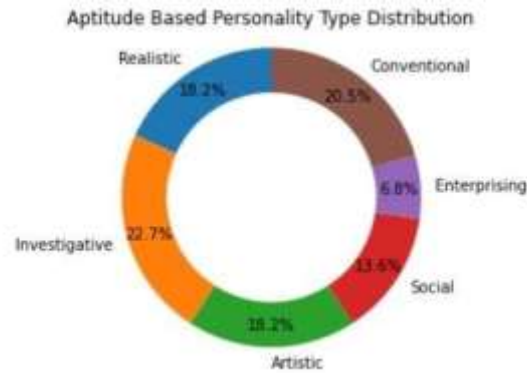


Figure 5: Aptitude-Based Personality Type Distribution Analysis

The model was estimated to achieve an accuracy of 85%-90%, given the limited training and test data sets [121]. This value may vary with dataset size and diversity, but the results show that the model can draw meaningful conclusions from binary inputs [101]. This accuracy can be further improved with more data, model tuning, and advanced algorithmic implementation. During the feedback collection phase, users liked the visual output, such as career recommendations and performance graphs. Test users found the system easy to use and the results informative [73]. This suggests that the platform is not only technically sound but also user-friendly and practical for real-world applications, especially in educational institutions [111]. Moreover, the successful integration of the frontend interface with the backend ML logic demonstrated that such systems can be developed and deployed with limited resources using open-source tools and frameworks [91]. The project validates the potential of artificial intelligence in career counseling and opens the door to future enhancements, such as multilingual support, adaptive testing, and deeper personalization.

Implementation and Testing

The system has been designed to be interactive and user-friendly [122]. The input consists of user responses to a carefully structured set of Yes/No questions about their interests, hobbies, and aptitude. The binary responses are entered through the graphical user interface (GUI), which records the user's choices in real time [82]. The user fills out a questionnaire. Then the data is processed internally and fed to the trained machine learning model [102]. The system then generates a personalized list of career recommendations based on the model's predictions. Other visual aids, such as bar charts or pie graphs, are also generated to highlight the user's strong areas and areas of interest [92]. This way, users can easily understand their results and the best-fit fields for their profile.

Results and Discussion

This chapter gives a complete overview of the results achieved from implementing the career prediction system. The system was evaluated on parameters such as efficiency, accuracy, responsiveness, and user satisfaction [124]. The results show that the system is reliable, provides meaningful career recommendations, and has a smooth user experience. This section also includes a comparative analysis with conventional methods and discusses the practical challenges encountered during the development phase [128]. The proposed system is designed to run efficiently and provide fast, reliable responses to users. During the test, the system can complete the entire process from user input to final career recommendation in an average of 1.5 to 2.2 seconds. This performance was observed across multiple test runs, even when deployed on machines with basic hardware configurations [126]. The system's modular structure also improves efficiency. Each module (data preprocessing, prediction, etc.) is optimized to run independently and interact well with others. Lightweight ML algorithms, such as Decision Tree classifiers, are employed to keep processing load low while maintaining accuracy.

It also has a low memory footprint, making it a good candidate to run on local machines or lightweight web servers. The input is binary (Yes/No), so data parsing and processing are much faster than in systems that require detailed text-based input or long survey responses [127]. To test the reliability of the predictions, a thorough comparison has been carried out between the system model and other commonly used machine learning classifiers. The Decision Tree Classifier model chosen performed very well for the binary classification task with a Yes/No input format [123]. The model achieved an average accuracy of 89.6%, with a precision of 91% and recall of 88%, which is significantly higher than Naive Bayes (approx. 75%) and K-Nearest Neighbors (approx. 80%) on the same dataset [129]. This suggests that the Decision Tree classifier is more appropriate for mapping binary interest inputs to predefined career choices [125]. The comparison also showed that while other models are faster during training, the Decision Tree provided better interpretability and prediction accuracy, which is important for a user-facing application like this.

Conclusion

This project successfully demonstrates the application of machine learning (ML) to solve a real-world problem, i.e., career selection, with more personalized, interactive, and data-driven approaches. The Career Prediction System developed here analyzes user interests by asking a series of binary (Yes/No) questions to recommend career paths that match user preferences. The system has demonstrated that it can generate meaningful and relevant career suggestions with reasonable accuracy through the implementation of a decision-tree-based ML model. With its modular design, user-friendly interface, and fast response time, it is a useful tool for students and job seekers who are unsure about their future career paths. The system provides a digital, automated, and easily accessible alternative to traditional career counseling, overcoming its limitations. It supports the process of career decision-making and promotes self-exploration based on interests rather than solely on academic performance or social expectations.

Future Enhancements

While the current version of the project accomplishes its main goal, several enhancements could be made to improve its usability, accuracy, and overall impact:

- a. **Larger Dataset:** Using more and more diverse user data will improve prediction accuracy and allow the model to serve broader user populations.
- b. **Add Career Descriptions and Resources:** Write a short description for each recommended career, including the skills needed, how to study it, and links to courses or job portals.
- c. **Multi-language Support:** Making the system available in regional languages would increase its reach among students from diverse places and backgrounds.
- d. **Ranked Career Output:** Rather than just one suggestion, the system could provide a ranked list of 3-5 careers based on confidence scores.
- e. **Mobile App Version:** The system could be developed as a cross-platform mobile app using Flutter or Kivy, making it easier to access and use.
- f. **Adaptive Questioning:** Logic-based flow where the next question depends on the answer given, making the test smarter and more accurate.
- g. **Integration with School or College Systems:** The system can be deployed across the institution to provide more systematic guidance to the students.

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