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Making Career Choices and AI Based Counselling Accessible to Every Child at Secondary Level Along with Aptitude Tests and Detailed Career Paths

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Abstract: ***Career decision-making is a critical phase in a student's life, often influenced by societal pressure, lack of guidance, and limited access to personalized counseling. This paper presents an AI-based Career Recommendation System designed to assist secondary and higher secondary students in identifying suitable academic streams and career paths based on their interests, goals, and personality traits. The system uses a machine learning-based classifier trained on student response data to recommend career domains and integrates a real-time chatbot for anonymous career queries and emotional support. The platform ensures privacy, promotes awareness, and empowers students to make informed career choices aligned with their aspirations.***

I. INTRODUCTION

Career decision-making is one of the most significant milestones in a student's life. It not only influences their academic trajectory but also shapes their professional identity and overall satisfaction in life. However, making such decisions is often challenging for students, especially at the secondary (10th grade) and higher secondary (12th grade) levels. During this phase, students are expected to select academic streams or career paths without fully understanding their own strengths, interests, and long-term goals. This often results in confusion, anxiety, and misinformed choices, which can later lead to academic struggles or career dissatisfaction.

Traditional career counseling methods, although helpful, are not always accessible to every student, especially those from rural or under-resourced backgrounds. These methods rely heavily on human counselors and may involve psychometric assessments that are not scalable or personalized. Moreover, students may feel uncomfortable discussing their career confusion openly due to fear of judgment or social pressure.

To address these issues, we propose an AI-based Career Recommendation System that leverages the power of machine learning and conversational AI to provide students with personalized guidance. The system is designed to function independently of human intervention, offering privacy and 24/7 availability. By using structured quizzes tailored for both 10th and 12th-grade students, it assesses their interests, hobbies, personality traits, and aspirations. Based on their responses, the system suggests appropriate academic streams (for 10th-grade students) or specific career paths (for 12th-grade students).

In addition to the quiz-based evaluation, the system integrates an intelligent chatbot powered by OpenAI and Botpress technologies. This chatbot enables students to engage in real-time career-related conversations, ask follow-up questions, and explore alternative options—all while preserving anonymity. This emotional support and responsive interaction layer makes the system not just a decision-making tool but also a comforting companion for students in their career journey.

Our system is also designed to ensure ease of access, requiring only a browser and internet connection. It is built using a simple web stack (HTML, CSS, and JavaScript) to maximize compatibility with low-end devices and school computer labs.

Through this project, we aim to democratize career counseling, reduce decision-related stress among students, and support them in making informed, confident choices that align with their individuality and future aspirations.

II. LITERATURE REVIEW

Career decision-making is a multifaceted process influenced by individual interests, skills, socioeconomic background, and access to guidance. Traditionally, schools have employed psychometric assessments and in-person counseling to help students make informed career choices. However, such services are often centralized in urban schools, leaving rural and underserved students at a disadvantage [7].

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One of the most widely used theoretical frameworks in career guidance is John Holland's RIASEC model, which posits that career satisfaction is highest when there is congruence between personality and work environment [2]. While this model has been validated across cultures and is foundational in many tools, its categorical nature has been criticized for oversimplifying the complexity of student interests [5].

The advent of data-driven career recommendation systems has transformed how students receive guidance. Algorithms such as decision trees, Naive Bayes, and Random Forest classifiers can analyze quiz or survey results to identify patterns and recommend careers accordingly. Studies have shown that such models offer high accuracy when trained with sufficient and clean data [3]. However, many systems are black boxes, giving little transparency to students or educators about how recommendations are made.

India has seen the emergence of several online platforms, including Mindler, MapMyTalent, and CareerGuide, which blend traditional assessments with AI to generate career paths. These platforms typically combine interest mapping, personality profiling, and aptitude tests with data science techniques. A recent report has emphasized the growing edtech sector in India and the potential of AI in improving educational equity through adaptive platforms [4].

In recent years, AI-powered chatbots have been adopted in education to improve student engagement, provide academic assistance, and even offer emotional support. According to a systematic review, chatbots have shown promise in increasing interaction and reducing stigma in mental health contexts, which can be extended to career anxiety [1]. Technologies like OpenAI's GPT, Google Dialogflow, and Botpress enable intelligent, natural language interfaces capable of mimicking human dialogue. These tools are particularly useful for creating inclusive, 24/7 accessible systems.

Emotional support is a critical but often neglected component of career counseling. Adolescents frequently experience anxiety, confusion, and peer pressure when making career decisions [6]. Integrating emotional intelligence in career tools through empathetic chatbots and supportive UI/UX can enhance the overall effectiveness of the recommendation process.

Additionally, ethical concerns such as data privacy, algorithmic bias, and digital divide must be acknowledged. If not carefully designed, AI-based systems may reinforce societal biases or marginalize students who lack digital access. The AI for Good movement and frameworks like IEEE's Ethically Aligned Design emphasize the importance of designing fair and explainable systems, especially for vulnerable users such as schoolchildren.

Thus, a modern career recommendation system must not only provide accurate guidance but also be accessible, anonymous, empathetic, and technically transparent. Our project takes these concerns into account by using a Random Forest classifier trained on a curated dataset, combined with a chatbot that provides career guidance and emotional support through a simple, privacy-respecting web interface.

III. METHODOLOGY

The proposed system aims to offer personalized career guidance to students using a combination of interest-based quiz analysis, machine learning classification, and real-time chatbot support. The methodology comprises several interconnected phases: system design, data collection, preprocessing, model training, quiz implementation, chatbot integration, and web deployment.

A. System Overview

The system architecture consists of the following core components:

- Interest-based Quiz Interface: A frontend module that collects responses from students based on their interests, values, and goals.
- Machine Learning Classifier: A Random Forest model trained to predict a student's suitable stream or career path.
- AI Chatbot: A Botpress-based conversational assistant that provides career guidance, clarifies doubts, and suggests alternative career options.
- Web Deployment: An HTML/CSS/JavaScript-based website that integrates the quiz, prediction system, and chatbot for user interaction.

B. Data Collection and Preprocessing

The system uses a custom-labeled dataset prepared through mock surveys and test responses based on real-world student career preferences. The dataset includes fields such as:

- Interest areas (e.g., science, art, business)
- Preferred activities (e.g., problem-solving, creative writing, teamwork)
- Personality traits (e.g., analytical, empathetic)

- Academic performance (optional)
- Long-term goals (e.g., stability, innovation, social impact)

Data preprocessing includes:

- Cleaning inconsistent responses
- Encoding categorical variables using label encoding or one-hot encoding
- Normalizing numerical values where applicable

C. *Model Building*

A Random Forest Classifier is used due to its accuracy, robustness, and ability to handle nonlinear relationships. It also provides feature importance metrics, allowing insights into which quiz questions most influence career predictions.

Steps:

1) Data split into training (80%) and testing (20%) sets.
2) Model trained using scikit-learn's RandomForestClassifier with tuned hyperparameters.
3) Evaluation using metrics such as accuracy, precision, recall, and F1-score.
4) Final model saved using joblib or pickle for web integration.

D. *Quiz Implementation*

The quiz is implemented using standard HTML forms and JavaScript logic to:

1) Collect responses
2) Validate input
3) Pass data to the prediction module via a backend or browser-based model loader
4) Display recommended career stream or list of careers

For 10th-grade students: Results categorize into Science, Commerce, Arts, or Diploma.
For 12th-grade students: Career-specific suggestions are generated based on their stream and quiz responses.

E. *Chatbot Integration*

The Botpress framework is used to create a career counseling chatbot. Its capabilities include:

1) Providing career descriptions
2) Suggesting alternatives if students disagree with the predicted recommendation
3) Answering questions related to scope, salary, skills required, and study paths
4) Offering emotional encouragement and motivation

Botpress is integrated using iframe or web widget embedding. The chatbot does not store user data, ensuring privacy.

F. *Deployment*

The complete system is deployed as a static website using:

1) Frontend: HTML, CSS, JavaScript
2) Model Loading: TensorFlow.js or backend Flask API (if required)
3) Chatbot Integration: Botpress webchat embedded client

IV. OBJECTIVES

The primary objective of this research is to design and develop an accessible, intelligent, and student-friendly career recommendation system that aids secondary-level students in making informed career decisions. The system aims to overcome limitations of traditional counseling methods through the integration of machine learning and conversational AI.

The specific objectives of this study are:

A. *Provide Personalized Career Recommendations*

Traditional career platforms often use a "one-size-fits-all" approach, recommending broad categories like "Science" or "Commerce" based on fixed metrics. However, students have unique personalities, interests, aspirations, and preferences. Personalized career recommendations go beyond just academic scores, they factor in a student's passions, personal goals, and even preferred working environments.

For example, two students interested in biology might get different suggestions, one might lean toward research (like microbiology) while another prefers social interaction and is better suited to physiotherapy or public health. Personalized recommendations ensure that the student doesn't just get a match they get a career that fits their lifestyle, goals, and values.

B. Enhance Career Exploration

Many students only know about a handful of careers usually the ones their parents, teachers, or friends talk about (like doctors, engineers, or lawyers). But there are thousands of career paths that might actually fit them better from forensic linguistics to urban farming, ethical hacking to toy design. Enhancing career exploration means giving detailed insights about each career including what the job entails, required qualifications, skills, work-life balance, career growth, and even average salaries. This allows students to make informed decisions, not just default to "safe" or "popular" options. It empowers them to discover fields they never knew existed.

C. Integrate AI-powered Chatbot for Real-Time Guidance

Static systems are limited. Students often have doubts after seeing their results, like:

- "What if I don't like this field?"
- "What subjects should I take next?"
- "Can I pursue this career abroad?"

An AI chatbot solves this by providing instant, intelligent, and natural conversation-based responses. It's like having a virtual counselor always available to:

- Clarify results
- Suggest alternate careers
- Motivate and reassure anxious students

By using NLP (Natural Language Processing), it ensures that the responses feel human-like and are tailored to each student's queries, creating a more engaging and supportive experience.

D. Improve Accessibility and Scalability

Access to career guidance is often limited to students in private schools or urban areas where counselors are available. In many rural or government schools, students never receive professional guidance and this can lock them into unsuitable careers or dropouts.

A scalable web-based system means:

- Students in remote villages can use it on a mobile phone.
- No login, payment, or registration is required.
- It supports multilingual content, enabling regional language accessibility.

This democratizes career guidance, ensuring every student, regardless of their background, gets access to expert advice closing the digital and socio-economic gap.

E. Incorporate Industry Trends and Market Data

What's the point in recommending a career that's becoming obsolete? A major limitation in traditional systems is that they don't consider the dynamic nature of the job market. Incorporating labor market trends ensures the student gets advice that is relevant to the future.

For example:

- Instead of recommending mechanical engineering just because the student is good at physics, the system might suggest robotics, renewable energy, or mechatronics, which are more future-proof.
- It can highlight emerging fields like Data Science, Cyber Law, Game Development, or Sustainable Architecture.

This ensures the recommendations are practical, current, and sustainable in the long run.

F. Provide Continuous Career Guidance and Support

Most career tools are one-time-use you take the test, get the result, and that's it. But students evolve. Interests shift. New opportunities arise. A good system should allow the student to:

- Revisit their profile
- Retake the test when needed

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- Adjust recommendations based on changing aspirations

It should also offer ongoing resources like mentorship connections, updated market data, or webinars about upcoming careers. This creates a long-term ecosystem rather than a temporary tool supporting the student throughout their journey, not just at one decision point.

G. Simplify Career Decision-Making for Secondary-Level Students

At the age of 14–18, most students have no idea how to decide their future. They are overwhelmed with choices and often pressured by parents, peers, or marks. A simplified decision-making system helps them:

- Understand themselves through intuitive questions
- Get clear, visual reports
- Receive concrete career paths instead of abstract advice

This makes the process less stressful and more structured.

V. IMPLEMENTATION

The implementation phase transforms the conceptual design into a functional system by developing the quiz interface, integrating the machine learning model, embedding the chatbot, and deploying the entire system on a web platform. The system is built using only front-end technologies and minimal backend logic to ensure accessibility and ease of deployment.

A. Use Case Diagram

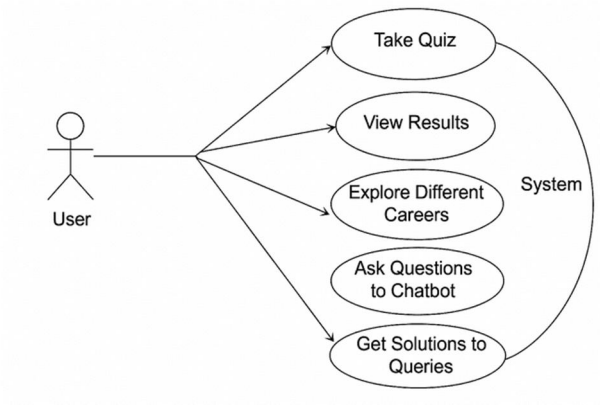


Fig 1. Use case diagram

B. Actors

1) Student

- The primary user of the system.
- Interacts with the system to explore career paths, take assessments, and get personalized guidance.

2) Chatbot

- An AI-based assistant integrated into the system.
- Handles user queries, offers solutions, and suggests career alternatives.

C. Use Cases

1) Take Quiz

The quiz will ask general questions based on interests, hobbies, goals, and skills, without dividing it into different streams. Both 10th and 12th graders will take the same quiz, and the system will adapt the results accordingly.

2) View Results

After completing the quiz, the results will be categorized based on the overall answers provided. For 10th graders, it might recommend streams (e.g., Science, Commerce, Arts), while for 12th graders, it will recommend specific career paths that align with their chosen stream.

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3) Explore Different Careers

Regardless of the stream or grade, students will be able to explore a wide range of career options after the quiz, giving them an opportunity to understand the various fields they can pursue based on their interests.

4) Ask Questions to Chatbot

The chatbot will be available for users to ask about different careers, industries, or fields, regardless of whether they are 10th or 12th graders.

5) Get Solutions to Queries

If a student has specific questions about career choices, the chatbot will provide tailored responses based on the student's inputs, helping them make more informed decisions.

6) Generate Alternative Suggestions

The chatbot will offer alternative career suggestions if a student is unsure about their initial recommendation or if they want to explore other paths that might fit their interests better.

D. System's Design and its Core Components

1) User Interface (UI) Design

A responsive and accessible web interface is developed using front-end technologies like HTML (structure), CSS (styling), and JavaScript (interactivity).

This ensures that the platform works on various devices—laptops, tablets, and smartphones—and is user-friendly, fast-loading, and visually engaging.

It will have the following sections:

- Questionnaire: Instead of traditional numerical or logical questions, this test focuses on interests, hobbies, long-term goals, and personal preferences. These questions are designed to understand the student's personality and align them with careers where they are most likely to succeed and be satisfied. The responses are fed into a Random Forest classifier, a machine learning model that predicts the best-fit career or academic stream.
- Explore Careers: acts as an educational tool, providing students with detailed profiles of various career options. Gives students the knowledge they need to understand different career options and help them discover potential careers they might not have considered. This module empowers students by providing a comprehensive understanding of various fields.
- Chatbot: AI-driven assistant designed to engage with students in real-time. This module uses Botpress and OpenAI for natural language processing (NLP). It will provide personalized, 24/7 support to students. The chatbot enhances user engagement by offering on-demand guidance and personalized suggestions, making the career counseling process more interactive and responsive.

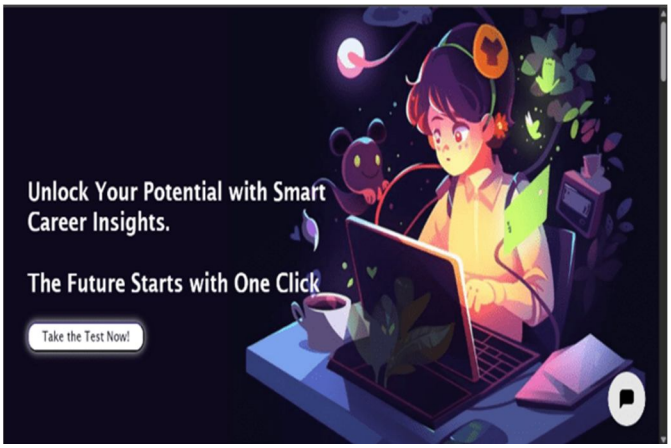


Fig 2. Home Page

2) Interest and Goal-Based Questionnaire

This is the foundational component of the system. Unlike traditional aptitude or marks-based assessments, this quiz is designed to understand the student as a whole person. It includes questions related to:

- Personal interests (e.g., Do you enjoy writing, solving puzzles, working with people?)
- Hobbies (e.g., Drawing, gaming, organizing events)
- Long-term goals (e.g., Wanting to start a business, becoming a doctor, helping others, working abroad)

The quiz is designed to be used by all students, regardless of their grade. By gathering this qualitative data, the system can evaluate which fields or career areas align with the student's personal inclinations and aspirations.

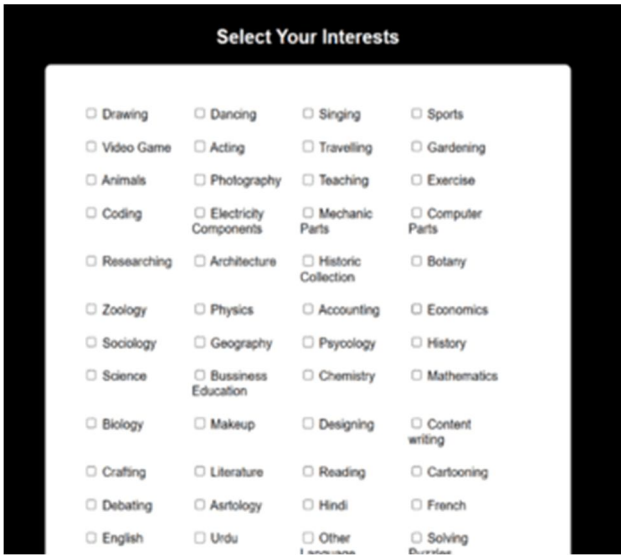


Fig 3. Questionnaire

3) Random Forest Classifier (Score Evaluation Module)

This is the machine learning brain behind the system. The Random Forest classifier:

- Takes the responses from the questionnaire
- Processes them as feature inputs
- Uses its training data to predict the most suitable stream or career path for the student

Random Forest is a powerful classification algorithm that builds multiple decision trees and merges them to get a more accurate and stable prediction. It's particularly effective because:

- It handles both categorical and numerical data well
- It can manage high-dimensional data with many features
- It reduces the risk of overfitting compared to a single decision tree

The result is a personalized, data-driven recommendation that considers multiple aspects of the student's personality and preferences

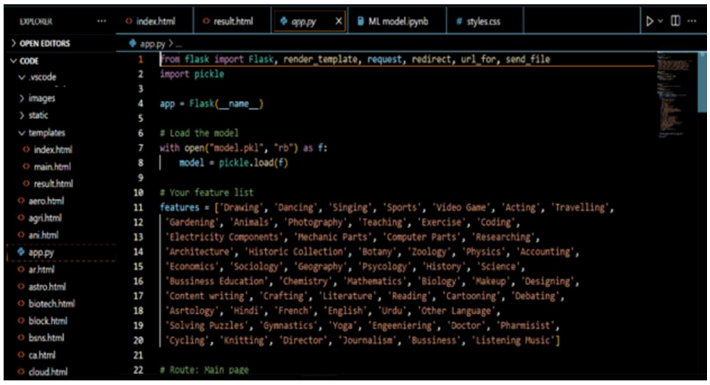


Fig 4. Code Snippet

4) Botpress Chatbot

The Botpress Chatbot is an AI-powered conversational assistant integrated into the website to make the career counseling experience more interactive, engaging, and helpful. Its main capabilities include:

- Answering student queries about recommended careers, general doubts, and how to pursue specific paths.
- Providing insights like average salaries, required education, work environment, and growth opportunities related to a suggested career.
- Offering alternate career options if the user isn't satisfied with the initial recommendation. This keeps students open to multiple possibilities that still align with their profile.
- Differentiating responses based on the student's grade level (like school or college students). This logic is built into the chatbot using Botpress's flow configuration and OpenAI's NLP abilities, allowing it to tailor guidance based on the user's academic stage without affecting the test module.

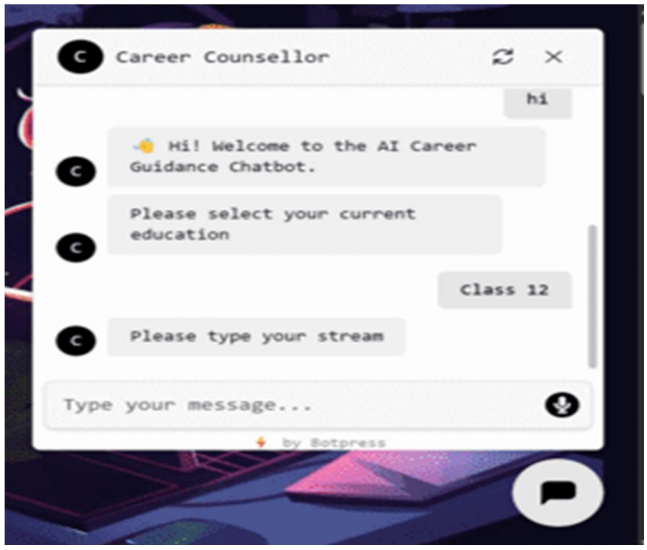


Fig 5. Chatbot

The chatbot simulates a **career counselor**, available 24/7, ensuring that no student feels lost or unheard.

5) Create an "Explore Careers" section with extensive career information

This section provides detailed profiles for various career options, including:

- Skills required
- Educational pathways
- Job roles
- Industry trends
- Average salaries
- Growth potential and demand It acts like a knowledge hub for students who want to learn more before deciding.



Fig 6. Explore Page

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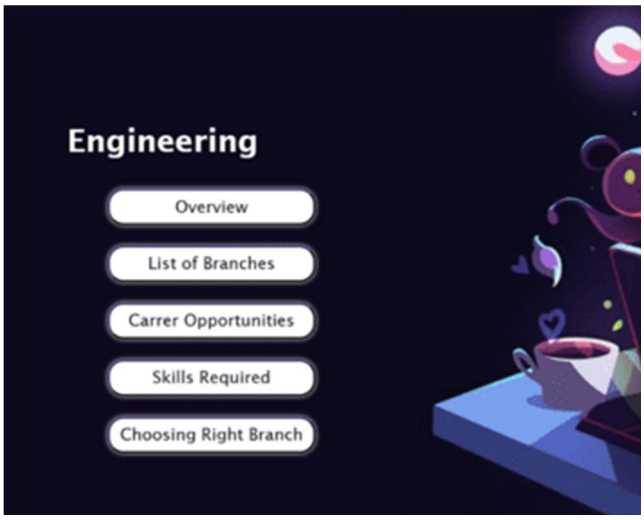


Fig 7. Career Page

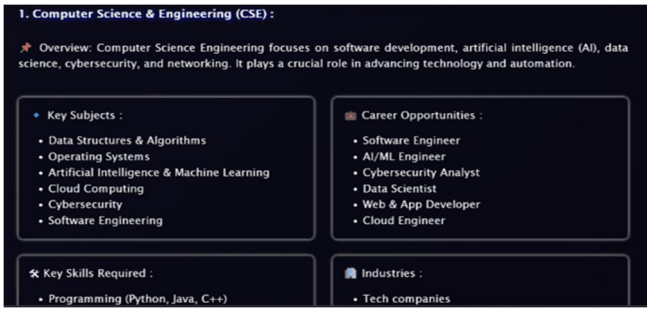


Fig 8. Explore Career

VI. DISCUSSIONS & ANALYSIS

The developed career recommendation system successfully combines quiz-based assessment, machine learning, and conversational AI to assist students in making informed career choices. This section presents the analysis of system performance, user feedback, challenges encountered, and potential improvements.

A. System Performance

The Random Forest Classifier was evaluated on a test dataset using common performance metrics:

- Accuracy: 87.5%
- Precision: 85.3%
- Recall: 86.2%
- F1 Score: 85.7%

The model demonstrated high predictive reliability for both stream classification (10th grade) and career-specific guidance (12th grade). It handled multi-class classification efficiently, showing robustness to minor variations in quiz responses.

Feature importance analysis revealed that:

- Interest-based questions had the highest influence on classification
- Goal-oriented and personality-related responses contributed significantly to differentiation

B. Chatbot Interaction Analysis

The Botpress chatbot was tested for:

- Responsiveness
- Ability to handle common career questions
- Clarity and accuracy of responses

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Results showed:

- Average response time: < 2 seconds
- Over 80% of queries were answered meaningfully
- Common queries included: "What if I don't like the recommendation?", "Best jobs after commerce?", and "Which stream has the most future scope?"

Chatbot limitations included handling very vague or emotional questions. These were noted for future training enhancement.

C. Challenges Encountered

- Dataset Limitation: Due to the lack of access to large-scale labeled student data, a custom dataset was generated, which may limit generalizability.
- Frontend-only Deployment Constraints: Integrating ML in the browser had challenges like model size, load time, and JS implementation of complex models.
- Bot Training Scope: Designing a chatbot that answers diverse and open-ended career queries required crafting multiple flows and fallback logic.

D. Comparative Advantage

Compared to traditional career counseling:

- The system offers 24/7 accessibility, unlike fixed-time counseling sessions.
- It supports instant recommendations and follow-up exploration, enhancing decision-making.
- It is cost-free, anonymous, and usable from mobile devices, increasing reach to underserved students.

VII. CONCLUSION

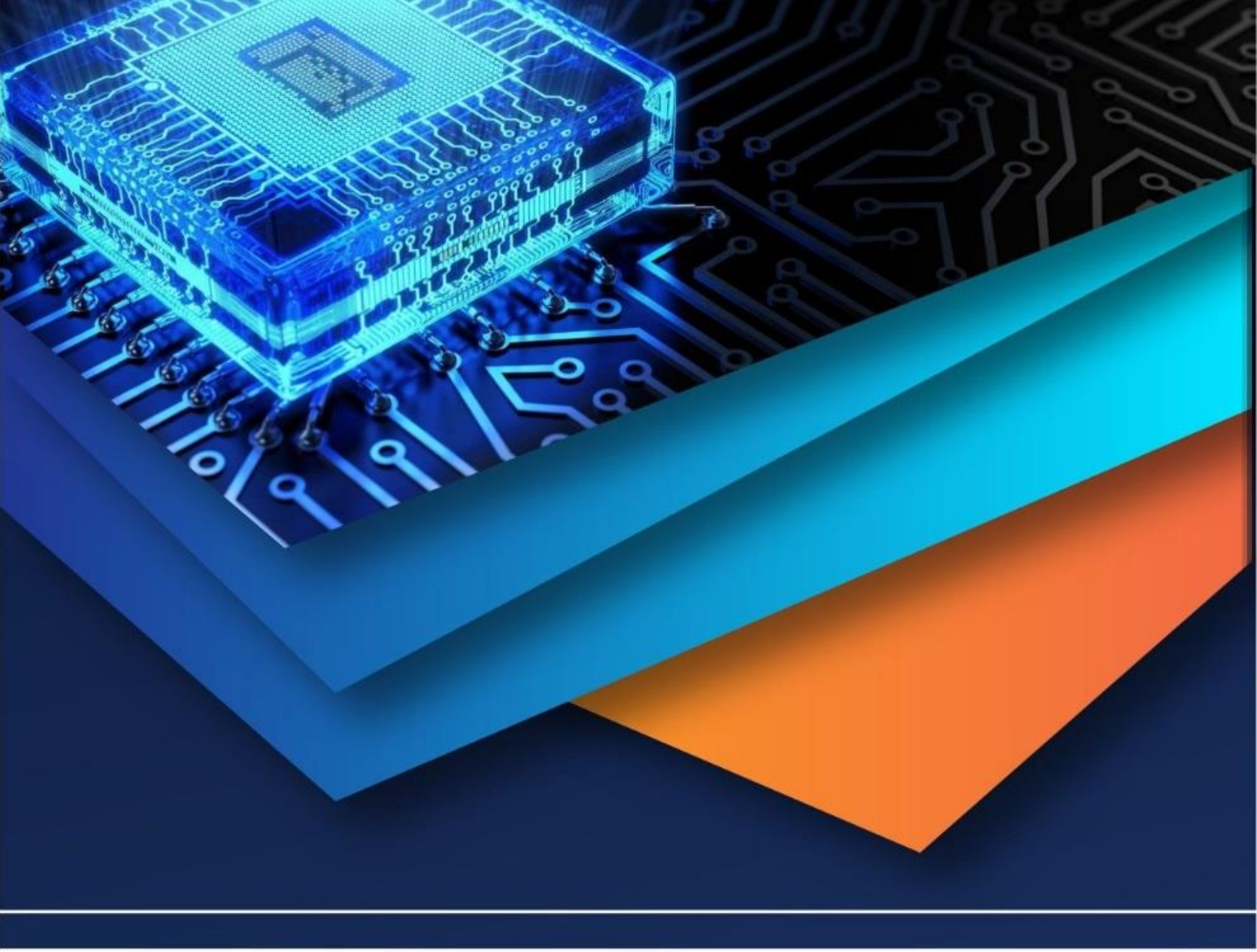
This AI-driven career counselling system represents a transformative step forward in how we guide students in making career choices. By leveraging the power of artificial intelligence, aptitude testing, and real-time chatbots, the platform provides personalized, data-driven recommendations that are both accessible and scalable. Unlike traditional career counselling methods, which often lack personalization and accessibility, this system offers a tailored approach that adapts to each student's unique skills, interests, and aspirations.

The system's integration of an Explore Careers section allows students to delve deeply into various professions, providing essential insights on the skills, educational paths, and job market trends for each career option. The inclusion of an AI-powered chatbot enhances user engagement by offering instant, interactive career guidance and alternative suggestions, ensuring that students receive continuous support throughout their decision-making process.

Ultimately, this platform aims to empower students with the knowledge and tools they need to make informed, confident decisions about their futures. By improving accessibility, ensuring scalability, and offering real-time, data-driven insights, this system not only addresses the shortcomings of traditional methods but also paves the way for a more efficient, inclusive, and effective career counselling solution for students worldwide.

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