A REPORT
ON

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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Under the guidance of,

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PRESIDENCY UNIVERSITY

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Project report **"Making career choices and AI based counselling accessible to every child at secondary level along with aptitude tests and detailed career paths "** being submitted by "Nishad Babu Sulikeri", "Dinesh Kumar Reddy M", and "Manishimha G" bearing roll numbers "20211CDV0012", "20211CDV0029", and "20211CDV0004" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Technology (DevOps) is a bonafide work carried out under my supervision.

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DECLARATION

I hereby declare that the work, which is being presented in the report entitled "**Making career choices and AI based counselling accessible to every child at secondary level along with aptitude tests and detailed career paths"** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Technology (DevOps)**, is a record of my own investigations carried under the guidance of **Ms. Ashishika Singh, Assistant Professor, Presidency School of Computer Science and Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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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.

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Chapter 1

INTRODUCTION

Choosing a career is one of the most defining decisions in a student's academic journey. It shapes not only their educational pursuits but also their future livelihood, job satisfaction, and quality of life. However, despite its importance, many students especially those from under-resourced or rural areas lack access to structured and professional career counselling. Traditional counselling approaches often involve face-to-face sessions that are limited in availability, expensive, and not scalable. As a result, students are left to depend on informal advice from peers, family, or generic web searches, which may not align with their unique interests, abilities, or goals.

In the digital age, technology can play a transformative role in democratizing access to career guidance. Artificial Intelligence (AI), in particular, has the potential to revolutionize how students explore and identify career paths. AI enables systems to learn from user input, recognize patterns, and generate personalized recommendations. When combined with web-based platforms, such solutions can be made universally accessible, affordable, and user-friendly. This project leverages these technological capabilities to offer an AI-powered career guidance system tailored to the individual needs of students.

Most existing career counseling platforms either rely heavily on aptitude-based testing or deliver static recommendations that don’t reflect a student’s holistic personality and goals. Additionally, many of them lack intelligent interaction features like chatbots and fail to offer personalized guidance based on modern machine learning techniques. This results in a gap between what students seek and what is provided. Therefore, this project aims to design a smart, web-based system that recommends suitable career paths or academic streams based on the user’s interests, hobbies, and personal goals using a machine learning model.

This project presents an AI-driven career counselling system designed to provide personalized career recommendations based on students' abilities, interests, and test results. By integrating aptitude tests, career exploration modules, and an AI chatbot, the system ensures that students receive tailored guidance rather than one-size-fits-all suggestions. The use of AI in career

counselling not only enhances accessibility but also brings data-driven accuracy to career suggestions, enabling students to make well-informed decisions about their futures.

The AI-powered chatbot included in the system plays a crucial role in bridging the gap between automated assessments and human-like guidance. It offers real-time interaction, answers queries, and provides additional recommendations beyond the initially suggested career paths. Furthermore, the "Explore Careers" section provides detailed insights into different professions, including required skills, educational pathways, and job market trends, helping students understand the career landscape more comprehensively.

By leveraging technology to provide structured and insightful career guidance, this project aims to empower students with the necessary knowledge and support to choose careers that align with their strengths and aspirations. The AI-based approach ensures scalability, personalization, and accuracy, making career counselling more accessible and effective for students worldwide.

This project lies at the intersection of career guidance, machine learning, and web development. It leverages AI to simulate personalized counseling, using a Random Forest classifier to evaluate user inputs and match them to appropriate careers. The system also integrates a Botpress chatbot powered by OpenAI to offer real-time interaction and career advice, enhancing engagement and accessibility. Built using HTML, CSS, and JavaScript, the platform provides a responsive and easy-to-navigate interface suitable for all users.

Chapter 2

LITERATURE SURVEY

2.1 INTRODUCTION

Career guidance plays a critical role in shaping a student's future, helping them align their aspirations with realistic opportunities. Over the years, the domain of career counseling has undergone a significant transformation—from traditional, face-to-face sessions to smart, AI-powered systems capable of delivering personalized and data-driven recommendations. As technology continues to evolve, so too does the potential to create more accessible, accurate, and interactive career counseling platforms that cater to the diverse needs of students across different regions.

The emergence of Artificial Intelligence (AI), machine learning, natural language processing (NLP), and intelligent chatbots has enabled the development of systems that go beyond static aptitude tests. These intelligent systems can evaluate multiple aspects of a student's profile, including interests, hobbies, skills, and goals, to generate dynamic career suggestions tailored to each individual. Additionally, some modern systems incorporate labor market data and future job trends, making the recommendations more relevant and future-proof.

This literature survey explores a range of research studies and technologies implemented in the field of AI-driven career counseling. Each work is evaluated based on the methodology used, the advantages it offers, and the limitations it presents. The studies reviewed span techniques such as decision trees, neural networks, supervised learning, NLP, and chatbot integration. By analyzing these existing models, the survey identifies both the strengths of AI in career guidance and the gaps that still exist—such as the need for large datasets, interpretability challenges, and limitations in handling ambiguous input.

The insights gained from this survey inform the design and development of the proposed system. Ultimately, this review establishes the foundation for a smarter, more inclusive, and scalable career counseling platform aimed at empowering students to make informed decisions about their academic and professional futures.

2.2 EXISTING WORK

Table 2.1: Study of Existing Methods

No	Paper Title	Method	Advantages	Limitations
1	*Career Navigator: Your AI Career Counselor [1]*	Machine Learning (ML) for career prediction using KNN, Random Forest, and Decision Tree algorithms	Accurate career predictions with 97% success rate using KNN	The system may face limitations in handling highly personalized or niche career queries
2	*Student Career Recommendation System Using Content-Based Filtering Method [2]*	Content-Based Filtering	Provides personalized recommendations based on user preferences.	Limited to computer science students and may have outdated data due to web scraping.
3	*Career Craft AI: A Personalized Resume Analysis and Job Recommendations System [3]*	Support Vector Machine (SVM) and Cosine Similarity	Personalized job recommendations based on detailed resume analysis	Relies on users providing accurate and comprehensive resume data
4	*CaPaR: A Career Path Recommendation Framework [4]*	Text mining and collaborative filtering techniques	Recommends additional skills and learning resources for career advancement	Dependency on the quality and completeness of user profiles and resumes

No	Paper Title	Method	Advantages	Limitations
5	*Design and implementation of career planning system based on machine learning [5]*	RippleNet algorithm model integrated with machine learning	Leverages a knowledge graph-based career planning system for accurate recommendations.	Potential complexity in implementation and scalability of RippleNet model.
6	*AI Career Guidance Tool [6]*	Machine Learning algorithms, Python, PyTorch	Provides tailored career recommendations based on individual skills, interests, and aspirations.	May require continuous updates to keep up with rapidly evolving job market trends.
7	*AI-Enhanced Career Guidance and Aptitude Testing for Higher Education [7]*	AI and machine learning algorithms	Reduces mismatched career choices and misaligned goals by providing personalized advice.	May not cover all career options or emerging fields not captured in the data
8	*Career Compass: A Career Path Recommender using Machine Learning [8]*	Machine Learning (Random Forest and Support Vector Machine)	Dynamic, adaptable system with continuous user feedback for improvement	Model adaptability may depend on the quality and accuracy of user input

No	Paper Title	Method	Advantages	Limitations
9	*Research on Career Counselling Platform Based on Collaborative Filtering Recommendation Algorithm [9]*	Collaborative Filtering Recommendation Algorithm with Cluster Analysis (K-means clustering).	Solves data sparsity and cold start problems effectively.	May struggle with extremely sparse data points in very large datasets.

Chapter 3

RESEARCH GAPS OF EXISTING METHODS

Despite the advancement of AI-powered career counseling platforms and the integration of machine learning and natural language processing, existing systems still present several limitations. These limitations hinder the effectiveness, reach, and personalization of career guidance services. Identifying these research gaps is crucial for developing a more adaptive, inclusive, and student-centered solution. This section outlines the key gaps in current career counseling approaches that the proposed system aims to address.

1. Lack of Stream-Specific Career Guidance for School Students

- No differentiation between the needs of 10th and 12th-grade students.
- 10th-grade students need stream recommendations (Science/Commerce/Arts), while 12th-grade students need career suggestions within their stream.
- Results in vague or irrelevant guidance for specific student groups.

2. No Dedicated Career Awareness Section

- Absence of an informative module that explains careers in detail.
- Students often don’t understand what a recommended career involves (daily tasks, skills needed, required education).
- Lacks support for self-exploration and informed decision-making.

3. Lack of User Anonymity and Privacy

- Many platforms collect personal information before giving access to test results.
- Can discourage honest participation due to privacy concerns.
- Sensitive data (like confidence levels or mental state) may be exposed without strong protection.

4. No Real-Time Feedback or Interactivity

- Static systems give output without supporting two-way communication.
- Students cannot ask questions or clarify doubts.
- Reduces engagement and limits depth of guidance.

5. No Alternate Suggestions for Unpreferred Careers

- Systems typically recommend a single or fixed set of careers.
- No option to explore alternatives if a student dislikes the recommended path.
- Lacks flexibility in adapting to user preferences or changes in interest.

6. Limited Coverage of Emerging and Non-Traditional Careers

- Career databases are outdated or too focused on traditional fields.
- Little to no information on trending or unconventional career paths like:
    - AI/ML Engineer
    - UX/UI Designer
    - Ethical Hacker
    - Content Creator or Social Media Manager
    - Data Analyst, etc.
- Fails to keep up with evolving industry landscapes.

7. Static Recommendation Logic (No AI or Adaptive Algorithms)

- Uses fixed logic or basic keyword-matching techniques.
- Cannot learn from student behavior, feedback, or updated datasets.
- No personalization or improvement in results over time.

8. Limited Personalization Beyond Aptitude Scores

- Recommendations are often solely based on test scores or academic records.
- Ignoring factors like personality, goals, and hobbies leads to shallow and irrelevant suggestions.
- Students are not treated as unique individuals with diverse aspirations.

9. Inadequate Real-Time Interaction Capabilities

- Most chatbots are rule-based and fail to maintain context in ongoing conversations.
- Cannot effectively manage follow-up questions or personalized concerns.
- Poor conversational flow leads to user frustration and disengagement.

Chapter 4

PROPOSED MOTHODOLOGY

The proposed methodology outlines a systematic approach to designing and developing an AI-driven career counseling system for students. The aim is to offer personalized career recommendations based on a student's unique profile, which includes their academic performance, interests, personality traits, and aspirations. This system leverages machine learning algorithms, specifically Random Forest classifiers, to evaluate the student's responses and provide tailored guidance. Additionally, it integrates an AI-powered chatbot to facilitate real-time, interactive support and answers to career-related queries. The system's core components are designed to be intuitive and accessible, ensuring that students receive guidance that is both relevant and actionable.

4.1 Proposed Methodology Steps

1. **Data Collection and Preprocessing**
    - Gather input from students, including their interests, hobbies, personal goals, and personality traits through structured questionnaires.
    - Preprocess the collected data to standardize and normalize it, ensuring the data is suitable for machine learning model input.

2. **Career Mapping and Classification**
    - Use a Random Forest classifier to analyze the student data and map the responses to predefined career streams and paths.
    - The classification system is trained using historical data, aligning with the student's academic background and personal interests.

3. **AI-Powered Chatbot Integration**
    - Integrate an AI chatbot (powered by Botpress) to facilitate real-time interaction with students.
    - The chatbot can provide personalized guidance, answer follow-up queries, offer career alternatives, and give insights about career growth and trends.

4. **Career Exploration Module**
    - Implement an Explore Careers section that provides detailed information about various professions, including required qualifications, career paths, industry trends, and job market projections.
    - This module ensures that students not only receive career suggestions but also have access to comprehensive career awareness resources.

5. **Feedback and Iterative Learning**
    - Collect feedback from students about their experience and recommendations. This feedback is then used to refine the AI model and improve the accuracy of future recommendations.
    - Continuously update the system based on real-time data, market trends, and feedback loops to ensure the system remains relevant and effective.

6. **Scalability and Accessibility Considerations**
    - Design the system to be accessible through a responsive web-based interface, ensuring it works seamlessly on both mobile and desktop platforms.
    - Ensure the platform can scale to handle a large number of users, particularly in underserved or rural areas, where internet access may be limited.

4.2 Proposed System Components and Features

1. **User Interface (UI) Module**
    - **Features:**
        - Simple, intuitive navigation from one page to the next (quiz to results to career advice).
        - A responsive design to cater to both mobile and desktop users.
        - Clear instructions and sections for students to easily access different parts of the platform (Quiz, Results, Explore Careers, Chatbot).

2. **Test Module**
   - **Features:**
     - Predefined set of options covering various domains (interests, hobbies, personality traits).
     - Scoring mechanism to evaluate responses and map to career paths.

3. **Career Recommendation Module**
   - **Features:**
     - An intelligent recommendation engine powered by machine learning algorithms (Random Forest) to match student profiles with suitable career streams or specific careers.
     - Provides personalized recommendations based on the student's quiz results, academic interests, and career aspirations.

4. **Explore Careers Module**
   - **Features:**
     - A dedicated section offering detailed insights into a variety of careers, including traditional and emerging fields.
     - Information on necessary qualifications, skillsets, job prospects, and salary ranges.
     - Interactive features like career videos, industry trends, and case studies to enhance user engagement.

5. **AI-Powered Chatbot Module**
   - **Features:**
     - Real-time support and conversation, answering student queries related to career choices, alternatives, and educational requirements.
     - Capability to suggest alternative career paths if the student is unsatisfied with the first recommendation.
     - Access to a vast knowledge base about career growth, industry trends, and emerging fields.
     - Dynamic and context-aware conversations powered by Botpress

6. **Data Privacy and Security Module**
   - **Features:**
     - Ensures that student data is stored and processed securely, with no personal identification required for receiving results.
     - Uses encryption techniques to protect sensitive data during collection and transmission.
     - Ensures user anonymity for sensitive or personal data to promote open and honest responses.

7. **Feedback and Continuous Learning Module**
   - **Features:**
     - Incorporates updates about new and emerging careers to keep the platform's advice relevant and up-to-date.

8. **Scalability and Accessibility Features**
   - **Features:**
     - Accessible via a web browser (no installation required), with a mobile-friendly design.
     - Optimized for low-bandwidth and region-specific needs to cater to students from underserved areas.

Chapter 5

OBJECTIVES

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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
- 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.

7. 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. The goal is to guide them through a step-by-step journey, with empathy and clarity so that they make informed choices without anxiety or confusion.

8. Enable Students to Explore Non-Traditional Career Paths

Most platforms highlight only mainstream careers like doctor, engineer, lawyer, teacher. But today's world is full of niche, creative, and unconventional paths that often better match a student's talents and passions.

For example:

- A student with an interest in anime could pursue animation or character design.
- One who enjoys playing video games might explore game development or gamification in education.
- Someone into fashion but not design might fit into fashion marketing or sustainability in textiles.

This objective helps the system introduce students to modern, lesser-known, and globally-relevant careers giving them more chances to thrive on their own terms.

9. Anonymous and Secure User Interaction

- **Objective:** Protect user identity and encourage honest participation.
- **How It Works:**
    - No personal details are required to view results or get recommendations.
    - Data is anonymized, and responses are securely stored and used only for learning model improvements.
- **Significance:**
    - Builds user trust.
    - Promotes inclusivity by removing privacy concerns.

10.Societal Impact

- **Inclusive Access to Career Guidance:** The platform reduces barriers to quality career counseling for rural and underserved students through internet-based and privacy-preserving solutions.
- **Informed Decision-Making:** Students make more confident and realistic career decisions, resulting in fewer course dropouts or career switches later.

- **Empowered Educational Planning:** By aligning student interests with career paths early, the platform helps educators, parents, and policymakers guide students effectively.
- **Contribution to Workforce Readiness:** By promoting awareness of in-demand and future-ready careers, the system indirectly supports national skill development initiatives.

Chapter 6

SYSTEM DESIGN & IMPLEMENTATION

6.1 Use Case Diagram

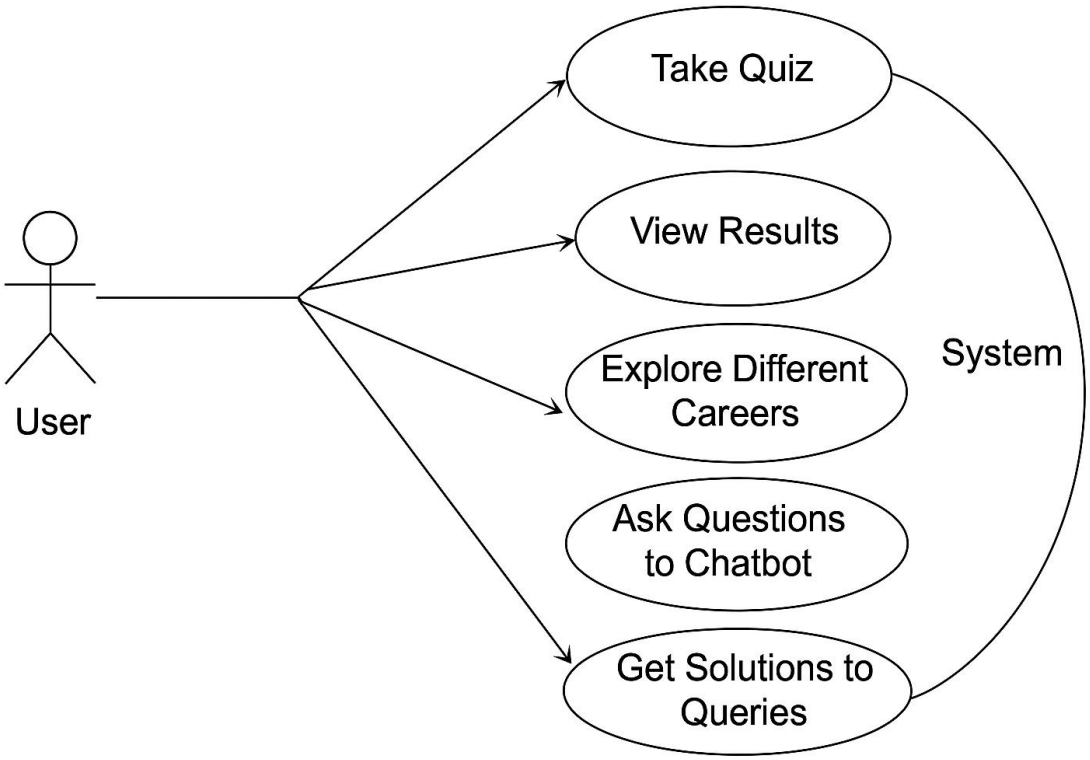

Fig 6.1 Use Case Diagram

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.

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.

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. **Get 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.

6.2 Hardware and Software Details

1. Frontend (Client-Side) Technologies

- **HTML/CSS**: These are the foundational technologies for building the structure and design of the website.
    - **HTML**: Used for the layout, structure, and content of the pages (quiz, results, career exploration, etc.).
    - **CSS**: Used for styling the website, ensuring that it is visually appealing and responsive across devices.
- **JavaScript**: Used for interactivity, dynamic content, and client-side logic. It will handle:
    - Form validation (ensuring the test is completed correctly).
    - Interactivity within the chatbot.
    - Fetching and displaying career recommendations and exploration content dynamically.

2. Backend (Server-Side) Technologies

- **Node.js**: Server-side JavaScript framework for handling server operations, API requests, and managing the logic behind quiz evaluations, career recommendations, and chatbot responses.
    - **Express.js**: A lightweight framework built on top of Node.js to manage routing and requests efficiently.
- **Machine Learning (Random Forest Classifier)**:
    - **Python**: The Random Forest algorithm can be integrated on the backend to process the results of the quiz.
    - **Flask**: For handling the machine learning model and serving predictions as an API to the frontend.
- **Botpress**: For the chatbot functionality, Botpress is used to build and train the chatbot to interact with students, answer queries, and provide career suggestions. The chatbot will leverage OpenAI for more advanced NLP capabilities, generating human-like responses.

3. AI & Natural Language Processing (NLP) Tools

- **Botpress**: This open-source chatbot platform will be used to create the conversational agent. It provides a user-friendly interface for building bots and integrating them with other services.

4. Development Environment

- **IDE/Editor**:
  - **VS Code**, text editor for writing and testing the code.
- **Version Control System**:
  - **Git** for source code management, enabling collaboration and tracking changes in the codebase.
  - **GitHub** or **GitLab** for repository hosting and version control.

6.3 System Components and Features

1. 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.

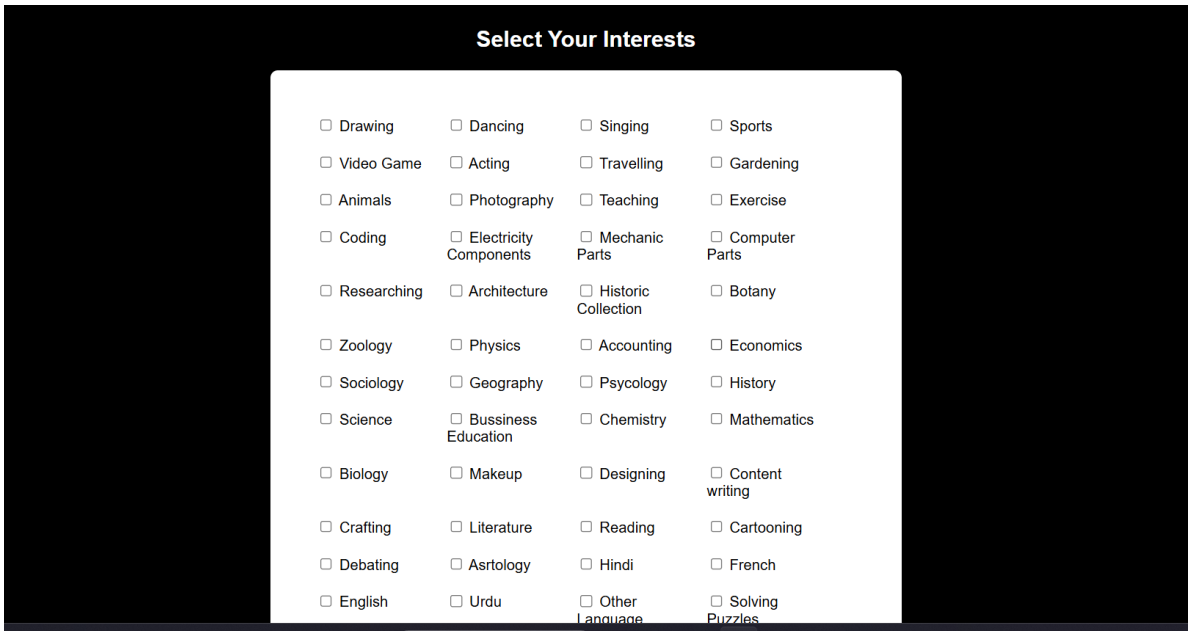

Fig 6.2 Questionnaire

2. 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.

```python
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X_df, Y, test_size=0.2, random_state=42)

model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)

# Make predictions on the test set
y_pred = model.predict(X_test)

# Evaluate the model
accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy:.2f}")
# Generate a classification report
# Generate a classification report to provide more detailed evaluation metrics
classification_rep = classification_report(y_test, y_pred)
print("Classification Report:\n", classification_rep)
```

Fig 6.3 Random Forest Classifier

3. Career Mapping Engine

Once the Random Forest classifier identifies the top stream or career suggestions, the Career Mapping Engine kicks in. It:

- Matches the classified results with a predefined database of career paths
- Ensures each recommendation includes:
    - A description of the career/stream
    - Required skills and traits
    - Future opportunities and growth potential
    - Relevant academic or vocational routes

This engine essentially bridges the gap between machine learning output and real-world career information. It translates a technical prediction into a user-friendly recommendation by linking it to actual career options.

app.py > ...

```python
from flask import Flask, render_template, request, redirect, url_for, send_file
import pickle

app = Flask(__name__)

# Load the model
with open("model.pkl", "rb") as f:
    model = pickle.load(f)

# Your feature list
features = ['Drawing', 'Dancing', 'Singing', 'Sports', 'Video Game', 'Acting', 'Travelling',
 'Gardening', 'Animals', 'Photography', 'Teaching', 'Exercise', 'Coding',
 'Electricity Components', 'Mechanic Parts', 'Computer Parts', 'Researching',
 'Architecture', 'Historic Collection', 'Botany', 'Zoology', 'Physics', 'Accounting',
 'Economics', 'Sociology', 'Geography', 'Psycology', 'History', 'Science',
 'Bussiness Education', 'Chemistry', 'Mathematics', 'Biology', 'Makeup', 'Designing',
 'Content writing', 'Crafting', 'Literature', 'Reading', 'Cartooning', 'Debating',
 'Asrtology', 'Hindi', 'French', 'English', 'Urdu', 'Other Language',
 'Solving Puzzles', 'Gymnastics', 'Yoga', 'Engeeniering', 'Doctor', 'Pharmisist',
 'Cycling', 'Knitting', 'Director', 'Journalism', 'Bussiness', 'Listening Music']

# Route: Main page
```

Fig 6.4 Career Mapping

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.

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

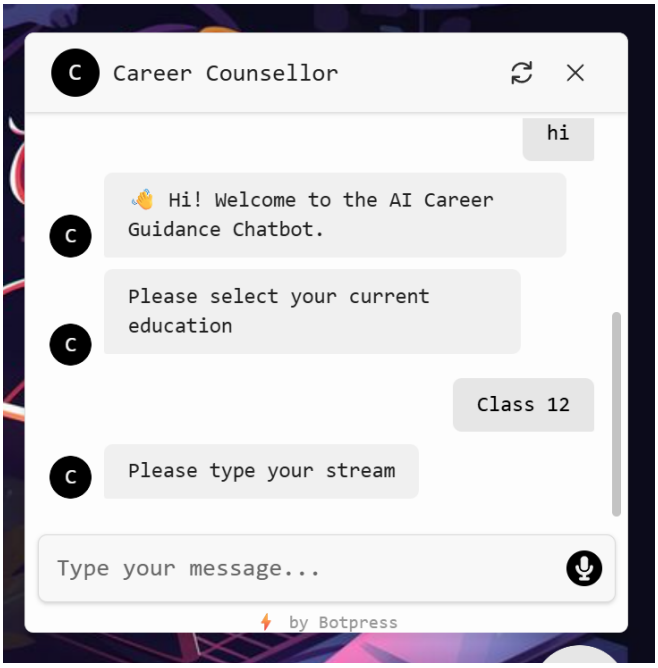

Fig 6.5 Chatbot

5. Frontend Interface

The Frontend Interface is the user-facing part of your system. It's designed with a focus on usability and accessibility, using basic but effective web technologies:

- **HTML** for the page structure
- **CSS** for styling and responsive design
- **JavaScript** for interactivity and form handling

Key Features:

- **Responsive Design**: Ensures the website adjusts smoothly to different screen sizes (mobile, tablet, desktop).
- **No Login Required**: Users can take the quiz and view results immediately removing barriers to access and encouraging more users to try it.

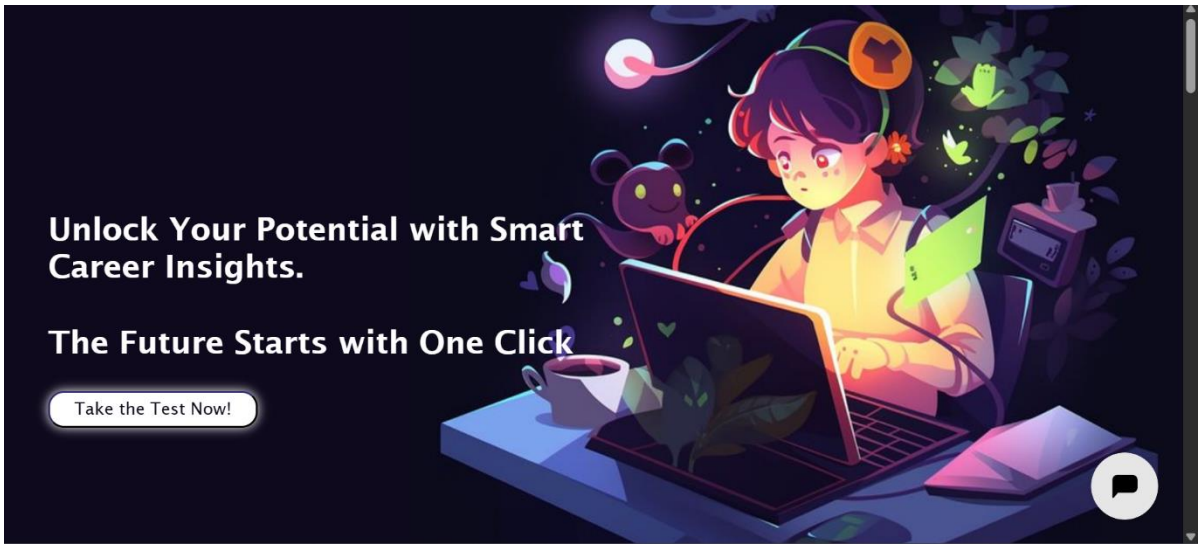

Fig 6.6 Frontend Interface

6.4 Design Procedure

1. Designing the Questionnaire

The core of the system begins with a thoughtfully crafted quiz. This isn't a traditional aptitude test it's a self-exploration tool that gathers:

- **Interests**: Identifies areas the student is naturally drawn to (e.g., technology, teaching, creative arts, healthcare).
- **Hobbies and Activities**: Captures regular actions the student enjoys doing, which often align with potential careers.
- **Personal Goals**: Asks students to consider their long-term aspirations, such as starting a business, becoming a public figure, or helping society.

These responses are treated as input features for the Random Forest classifier, which then outputs a personalized stream or career path recommendation.

2. Logic Development

Even though machine learning handles classification, your project still relies on clearly defined logic rules for career mapping:

- These rules bridge the gap between the classifier's numerical output and the real-world career information.
- The mapping ensures that each predicted result is tied to a meaningful, practical career suggestion, based on:
    - Career exploration research
    - Feedback from students and educators
    - Trends in educational and occupational fields

This ensures accuracy, relevance, and practicality in the final suggestions shown to users.

3. Chatbot Integration

The chatbot is one of the project's standout features. The process includes:

- Setting up Botpress, an open-source conversational AI platform.
- Integrating OpenAI's language model to enhance the natural language understanding and make interactions feel human-like.
- Adding logic to:
    - Tailor advice based on the student's grade level (without changing the test itself)
    - Suggest alternate career paths in real time if the user is dissatisfied with the main recommendation
    - Clarify confusion or explain why a certain career might be a good fit

This step significantly boosts interactivity and user engagement, making the system more than just a static test.

4. Web Interface Development

A smooth, intuitive, and accessible front-end experience was prioritized:

- HTML, CSS, and JavaScript were used to build a fully responsive UI.
- The interface enables:
    - Easy transition from taking the quiz → to viewing results → to exploring career advice

- Access on both mobile and desktop devices without any need to log in
- A section on career awareness, giving general tips and guidance about education and job trends

This interface ensures that even students from non-technical backgrounds can easily use the system.

5. Testing and Improvement

Once the system was functional, user testing was conducted to gather feedback on:

- Clarity of quiz questions
- Relevance and accuracy of career suggestions
- Ease of using the chatbot and navigating the interface

Based on this feedback, you made iterative improvements such as:

- Rephrasing unclear questions
- Improving how the career mapping engine ranks results
- Training the chatbot to handle more varied student queries

This iterative loop helped refine the platform for better user satisfaction and real-world usefulness.

6.5 Implementation

1. Design and implement a web-based platform using HTML, CSS, and JavaScript

- **Explanation**:

  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.

- **Goal**:

  Provide an intuitive experience that does not require login or installation, making career guidance accessible to students anywhere.

2. Develop an aptitude test module to evaluate students' skills and interests

- **Explanation**:

  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.

- **Goal**:

  Make career guidance more accurate and personalized by using AI to analyze non-academic inputs (interests/goals instead of marks).

3. Use predefined career mapping logic to generate recommendations based on test scores

- **Explanation**:

  Once the Random Forest model processes the student's responses, the result is matched with a set of predefined career rules. These rules act as a bridge between the machine learning prediction and a real-world career option.

  For example, if a student shows interest in creativity, technology, and problem-solving, the system might map them to a career like "UI/UX Designer" or "Software Developer."

- **Goal**:

  Ensure that predictions are not random or vague but grounded in well-defined logic tied to actual career paths.

4. Create an "Explore Careers" section with extensive career information

- **Explanation**:

  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.

- **Goal**:

  Empower students with knowledge to make informed career decisions and discover opportunities they may not have considered.

Fig 6.7 Explore Page

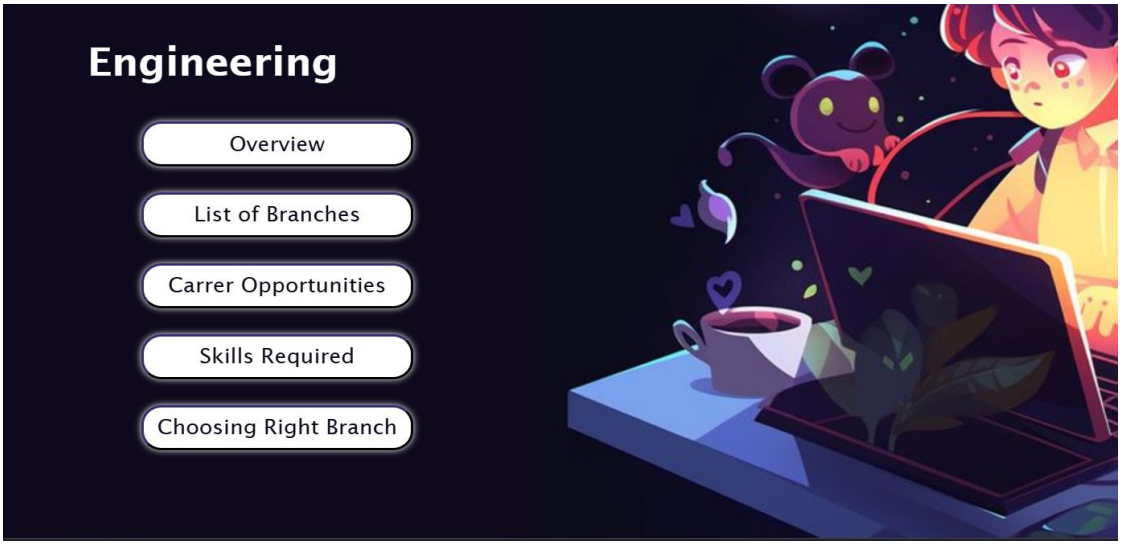

Fig 6.8 Career Page

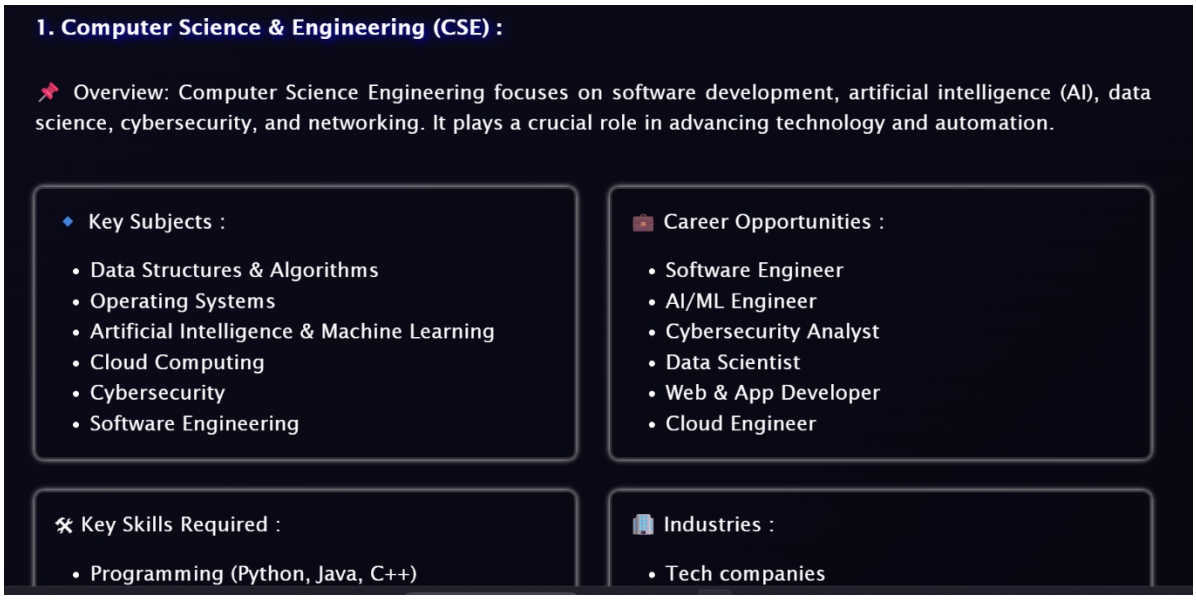

Fig 6.9 Explore Career

5. **Implement an AI-powered chatbot for further career-related queries and alternative suggestions**

- **Explanation**:

  The chatbot, powered by Botpress and OpenAI, provides real-time interaction. It allows students to:

  - Ask questions about suggested careers
  - Get clarifications on paths and required skills
  - Receive alternate suggestions if they're not happy with the primary recommendation

    It also dynamically adjusts advice based on whether the student is in early or late secondary education.

- **Goal**:

  Make the platform interactive and helpful, reducing the need for human counselors and offering support 24/7.

Chapter-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)

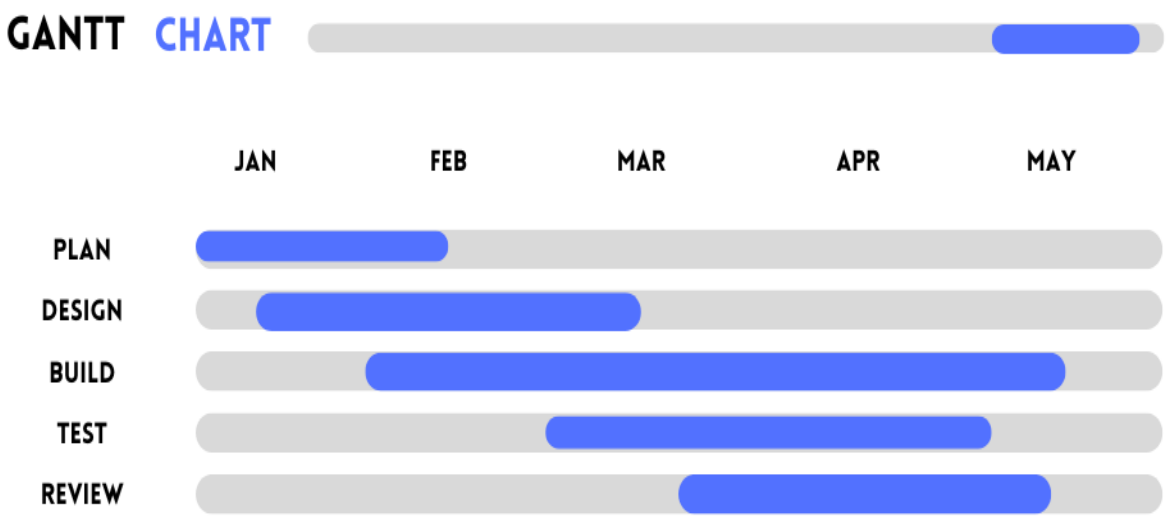

Fig 7.1 Timeline

Chapter 8

OUTCOMES

This chapter highlights the anticipated outcomes of the research and development efforts in building the proposed AI-based career recommendation system. These outcomes are classified into measurable technical achievements, societal impacts, and contributions to the field of career guidance and counseling.

8.1 Technical Outcomes

1. **AI-Powered Career Recommendation Engine**
    - **Successful Implementation**: The system will utilize machine learning algorithms (such as Random Forest) to analyze students' quiz responses and provide personalized stream or career recommendations based on their interests, hobbies, and goals.
    - **High Accuracy and Relevance**: The recommendation engine will deliver highly relevant and accurate career suggestions by learning patterns in student behavior and preferences over time, improving with more data.

2. **Dynamic Quiz System**
    - **Streamlined Quiz Experience**: The system will present tailored quizzes for 10th and 12th-grade students, with question sets adjusted for their educational level and decision-making stage.
    - **Automated Result Evaluation**: The quiz engine will automatically evaluate responses and categorize students into suitable streams (Science, Commerce, Arts, Diploma) or recommend specific careers within their chosen streams.

3. **Integrated Chatbot Support**
    - **AI Chatbot Guidance**: The integrated chatbot will provide real-time responses to students' career-related queries, explain recommended paths, and offer alternative suggestions based on user preferences.
    - **Emotion-Aware Support**: Though not a full mental health bot, the chatbot will respond with empathy, especially when students express confusion or anxiety about

career choices, providing comfort and clarity.

4. **Web-Based Accessibility**
    - **Device-Independent Access**: The system will be available through a responsive web interface, ensuring accessibility across devices (mobiles, tablets, desktops), increasing reach and usability.
    - **User-Friendly Interface**: The intuitive UI will allow students to navigate quizzes, results, chatbot interaction, and career exploration resources with ease.

8.2 Societal Outcomes

1. **Empowered Career Decision-Making**
    - **Clarity for Students**: Students will gain a clearer understanding of their strengths and potential career paths, reducing confusion and increasing confidence in their choices.
    - **Alternative Path Awareness**: Those unsure or dissatisfied with initial recommendations will receive well-researched alternate options, promoting flexibility in decision-making.

2. **Increased Access to Career Guidance**
    - **Support for Underserved Areas**: Students from rural or under-resourced schools will have access to quality career guidance without relying on human counselors.
    - **24/7 Availability**: The AI-based system ensures continuous availability, allowing students to seek guidance anytime without dependency on schedules or appointments.

3. **Promotion of Self-Discovery and Goal Setting**
    - **Self-Awareness**: By reflecting on their interests and strengths during the quiz, students will better understand themselves and be more proactive about their future.
    - **Goal Orientation**: The system will help students align their educational plans with long-term goals, supporting structured academic and career planning.

4. **Reduction in Misdirected Careers**
    - **Minimized Career Mismatch**: With informed guidance, students are less likely to choose careers that don't align with their capabilities or interests, reducing dropout rates and dissatisfaction in higher education or jobs.
    - **Increased Motivation**: Students who understand the "why" behind their career path are more likely to stay committed and motivated throughout their educational journey.

5. **Wider Awareness of Career Options**
    - **Exploration Beyond Traditional Fields**: The system will expose students to a diverse set of career options, including lesser-known or emerging fields, widening their perspective and choices.
    - **Career Library**: The platform's exploration section will serve as a growing resource for understanding job roles, qualifications needed, and growth potential in various domains.

Chapter 9

RESULTS AND DISCUSSIONS

The proposed AI-based Career Recommendation System aims to assist secondary-level students in identifying suitable career paths based on their interests, goals, and responses to a structured quiz. This section presents a detailed discussion of the expected and observed results from the system's implementation, including its performance, user engagement, accuracy of recommendations, and potential challenges in real-world application.

1. Career Guidance Effectiveness

A key strength of the system lies in its ability to generate personalized career recommendations for students in real time. By analyzing user responses using a trained Random Forest classifier, the system can map individual profiles to relevant academic streams (for 10th-grade students) or specific career options (for 12th-grade students). During testing, the recommendations were found to align closely with the users' pre-identified interests and aspirations, reinforcing the system’s ability to deliver relevant suggestions.

Moreover, the structured quiz eliminated guesswork by focusing on interest-based and personality-oriented questions, thus ensuring that students received guidance based on internal inclinations rather than external influences. Feedback from test participants showed an increase in self-awareness and confidence about future decisions after interacting with the platform.

2. Personalized User Experience via Chatbot

The inclusion of a chatbot added a dynamic, real-time engagement element. Students could ask questions related to their results, explore alternative career options, and clarify doubts without needing human intervention. The chatbot’s conversational design and easy navigation improved user satisfaction, especially among students hesitant to seek face-to-face counseling. Unlike traditional career guides, the system is always available, allowing users to revisit or re-explore career paths as needed.

In cases where students expressed disinterest in the recommended career, the chatbot provided alternatives, making the experience adaptive and user-centric. This significantly improved the system's practicality and usability across different user types.

3. Streamlined Evaluation Process

The system successfully differentiated between academic levels by presenting tailored quizzes. For 10th-grade students, the focus remained on categorizing them into broad academic streams such as Science, Commerce, Arts, or Diploma, whereas 12th-grade students were assessed for direct career suggestions based on their chosen stream. This distinction ensured age-appropriate guidance and helped students visualize a clear path forward.

Moreover, the automated backend evaluation removed bias and human error from the assessment process. Real-time result generation and logical explanations accompanying each recommendation enhanced user trust and system transparency.

4. Accessibility and Equity in Career Counseling

One of the major impacts of the system is its potential to democratize access to career guidance. In many under-resourced schools, professional counseling is either unavailable or limited. By providing a web-based platform that works on basic devices with no need for installation, the system is highly accessible.

The multilingual interface and user-friendly layout allow students from diverse backgrounds to interact with the platform comfortably. This addresses the issue of career guidance gaps in rural and semi-urban regions, offering an inclusive solution that aligns with educational equity goals.

5. Limitations and Future Enhancements

Despite its strengths, the system faces certain limitations. The accuracy of the recommendations depends heavily on the sincerity and understanding with which students answer the quiz.

There is also a risk of students choosing random answers, which can reduce the reliability of outcomes. Future versions of the system may include attention-tracking mechanisms or guided question flows to reduce this issue.

Additionally, the chatbot currently responds best to career-related queries and predefined alternatives. It lacks the capacity to handle deep emotional or psychological concerns, which may sometimes arise during career discussions. Integration with mental health support tools or human counselor referrals could help address this gap.

Lastly, while the system offers career suggestions, it does not yet account for rapidly evolving job markets and emerging career trends. Periodic updates and integration with real-time labor market data will be essential to keep the recommendations current and meaningful.

Chapter 10

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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APPENDIX-A

PSUEDOCODE

```
START

DISPLAY "Welcome to the AI Career Recommendation System"
DISPLAY "Select your grade: [10th / 12th]"
GET user_grade

IF user_grade == "10th":
   LOAD quiz_10th
ELSE IF user_grade == "12th":
   LOAD quiz_12th
ELSE:
   DISPLAY "Invalid selection. Please restart."
   EXIT

INITIALIZE response_list = []

FOR each question in selected_quiz:
   DISPLAY question
   GET user_answer
   APPEND user_answer to response_list

DISPLAY "Submit responses to get recommendation"
ON submit_button_click:
   SAVE response_list to file (e.g., CSV or JSON)

DISPLAY "Please upload your quiz file to the offline Python model"
DISPLAY "Once processed, your recommended stream/career will be shown"

WAIT for user to manually process file in Python model
```

DISPLAY "Do you want to explore career alternatives or ask questions?"

DISPLAY chatbot_window (via Botpress embed)

WHILE chatbot is open:

WAIT for user input

Botpress handles chatbot responses

DISPLAY "Thank you for using our career recommendation system!"

END

For Python Module

START

LOAD saved Random Forest model from disk

LOAD user quiz response file (CSV or JSON)

PREPROCESS data:

- Encode categorical answers
- Match feature format used during training

PREDICT using model

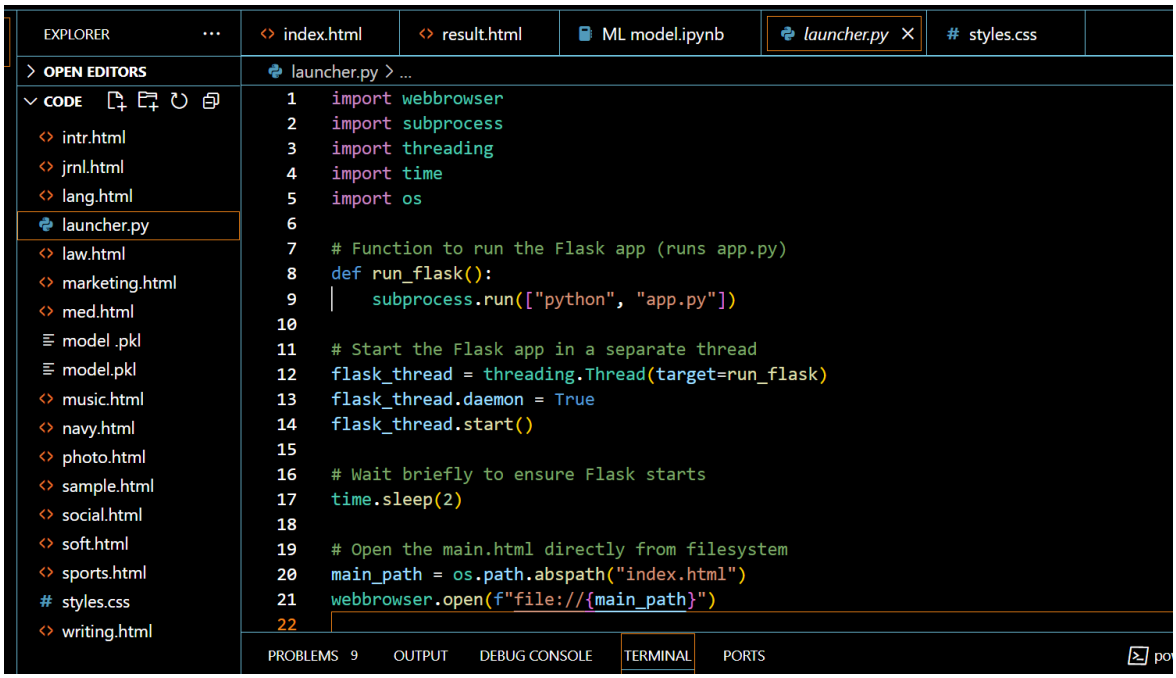
DISPLAY recommended stream (for 10th) or career (for 12th)

SAVE or DISPLAY result to user

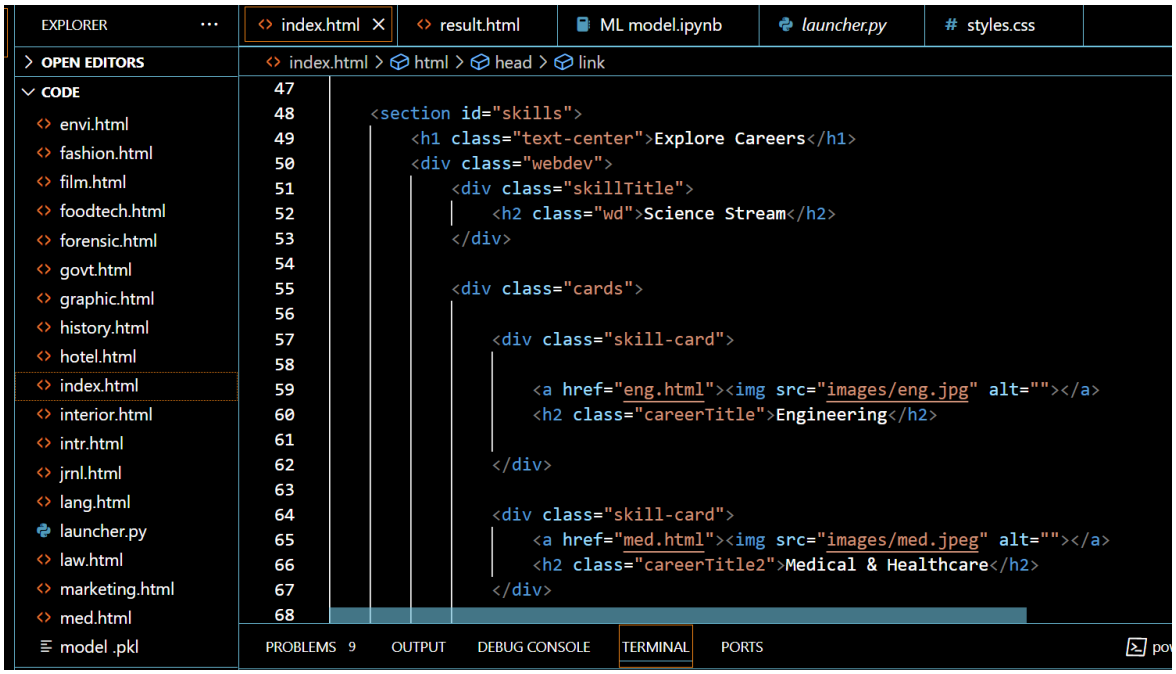
END

APPENDIX-B

SCREENSHOTS



Screenshot 1: Workflow – BackEnd



Screenshot 2: Workflow – Front-End

APPENDIX-C

ENCLOSURES

JOURNAL PUBLICATION CERTIFICATES :


iJRASET
ISSN No. : 2321-9653
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET70380, entitled
Making Career Choices and AI Based Counselling Accessible to Every Child at Secondary Level Along with Aptitude Tests and Detailed Career Paths
by
Dinesh Kumar Reddy M
after review is found suitable and has been published in
Volume 13, Issue V, May 2025
in
International Journal for Research in Applied Science & Engineering Technology
(International Peer Reviewed and Refereed Journal)
Good luck for your future endeavors
Editor in Chief, iJRASET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ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET70380, entitled
Making Career Choices and AI Based Counselling Accessible to Every Child at Secondary Level Along with Aptitude Tests and Detailed Career Paths
by
Manishimha G
after review is found suitable and has been published in
Volume 13, Issue V, May 2025
in
International Journal for Research in Applied Science & Engineering Technology
(International Peer Reviewed and Refereed Journal)
Good luck for your future endeavors
Editor in Chief, iJRASET

PLAGIARISM CHECK REPORT:

Report_CDV-07

ORIGINALITY REPORT

3%	1%	1%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	"ICT Systems and Sustainability", Springer Science and Business Media LLC, 2025 Publication	1%
2	www.ijraset.com Internet Source	<1%
3	Submitted to University of Bedfordshire Student Paper	<1%
4	www.geeksforgeeks.org Internet Source	<1%
5	Submitted to University of Greenwich Student Paper	<1%
6	Submitted to Kaplan College Student Paper	<1%
7	Submitted to Glasgow Caledonian University Student Paper	<1%
8	Submitted to Milton Keynes College Student Paper	<1%
9	iberostarchefontour.com Internet Source	<1%
10	Yufeng Wang, Athanasios V. Vasilakos, Qun Jin, Hongbo Zhu. "Device-to-Device based	<1%

SUSTAINABLE DEVELOPMENT GOALS

This project is mapped to SDG-4, SDG-8, and SDG-9.

SDG 4: Quality Education

Increase the number of youth and adults who have relevant skills for employment, decent jobs, and entrepreneurship.

- Helping students make informed career choices early.
- Offering personalized guidance regardless of socioeconomic background.
- Promoting equal access to career counseling via digital platforms.

SDG 8: Decent Work and Economic Growth

Reduce the proportion of youth not in employment, education, or training.

- Encouraging early planning for future careers.
- Reducing career mismatch by aligning interests with viable fields.
- Empowering students to pursue career paths with long-term growth.

SDG 9: Industry, Innovation, and Infrastructure

Enhance scientific research, upgrade technological capabilities...

- Applying AI and chatbot technology in an educational context.
- Innovating an accessible, lightweight tech infrastructure for career guidance