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Software Requirement Specifications

"ML Based Intelligent Career Counseling System Using Personality and Interest Analysis"

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Summary

This project develops an ML-based intelligent system designed to recommend suitable career paths based on an individual's personality traits and interests. The system collects user responses through a structured questionnaire inspired by psychometric and interest-based assessments. Using machine learning algorithms, it analyzes personality patterns and correlates them with career success data to generate personalized career recommendations. The model learns from datasets mapping psychological profiles to professional roles, helping students and professionals make data-driven career decisions. The system will be deployed as an interface for accessibility.

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1. Introduction

This Software Requirements Specification (SRS) document outlines the functional and non-functional requirements, as well as the use cases, for the ML-based Career Recommendation System. The primary objective of the project is to develop an intelligent system that recommends suitable career paths based on an individual's personality traits and interests. The system collects user responses through a structured questionnaire derived from psychometric and interest-based assessments. Using machine learning algorithms, the system analyzes patterns in personality profiles and correlates them with career success data to generate personalized recommendations. Once trained, the model will be integrated into an accessible interface, enabling users such as students and professionals to provide their responses and receive data-driven career guidance in real time.

1.1. Purpose

The purpose of this project is to develop a machine learning-based intelligent system that recommends suitable career paths based on an individual's personality traits and interests. The system will collect user responses through a structured questionnaire and analyze them using trained machine learning models to identify patterns and correlations with successful career outcomes. Once trained, the model will be integrated into an interactive interface, allowing users to provide their inputs and receive personalized career recommendations in real time. This system aims to assist students and professionals in making informed, data-driven decisions about their career paths.

1.2. Scope

The scope of this project involves developing a machine learning-based career recommendation system that analyzes user personality traits and interests to suggest suitable career paths. While the predictive model may leverage existing machine learning algorithms and libraries, it will be trained and fine-tuned using datasets that map psychological profiles to professional roles. The final system will be integrated into an interactive web interface, enabling users to answer a structured questionnaire and receive personalized career recommendations in real time. The application is designed to be user-friendly and accessible, providing actionable guidance for students and professionals without requiring specialized knowledge in data science or psychology.

1.3. Product Perspective

The developed career recommendation module will serve as a core component of an intelligent guidance system. It will act as a machine learning–driven backend service, where user responses to a structured questionnaire are analyzed to generate personalized career recommendations. The module will integrate seamlessly with a web-based interface, providing users such as students and professionals with an intuitive platform to input their personality traits and interests and receive actionable guidance. Once trained and fine-tuned, the model will deliver real-time, data-driven career suggestions, enabling users to make informed decisions without requiring specialized knowledge in machine learning or psychology.

1.4. User Characteristics

End-users, such as students, job seekers, or professionals, will interact with the web application by completing a structured questionnaire to provide information about their personality traits, interests, and preferences. The system is designed to be user-friendly, ensuring that users with minimal technical knowledge can easily navigate the interface and submit their responses. With just a few simple steps, users will be able to input their data and instantly receive personalized career recommendations. The goal is to provide an accessible tool that empowers users to make informed, data-driven career decisions without requiring specialized expertise in machine learning, psychology, or data analysis..

1.5. Proposed Technologies

The proposed project will leverage the following technologies:

1. **Machine Learning Algorithms:** Supervised learning models, such as Logistic Regression, Decision Trees, or Random Forests, to analyze user personality traits and interests and generate accurate career recommendations.
2. **Python:** The primary programming language, using libraries like scikit-learn, pandas, and NumPy for data preprocessing, model training, and prediction.
3. **Web Technologies (HTML, CSS, JavaScript):** To build a responsive and user-friendly web interface where users can complete questionnaires and receive real-time career recommendations.

2. Requirements

The system will allow users to provide responses to a structured questionnaire through a web interface, after which the machine learning model will analyze the inputs and generate personalized career recommendations. Users can view the suggested career paths along with a confidence score or ranking, helping them understand the suitability of each recommendation. The system will handle data preprocessing, including encoding categorical responses and normalizing input values, to ensure accurate model predictions. Additionally, the web application will provide an interactive and user-friendly experience, allowing users to complete multiple assessments and receive instant recommendations without requiring any technical expertise. The model will be trained on a custom dataset mapping personality traits and interests to career outcomes to ensure reliable and generalized recommendations across different user profiles.

2.1. Function Requirements

The functional requirements of the project define the essential features and operations that the system must perform to achieve its objectives. These requirements focus on the key functions that will be implemented in the career recommendation system. The system will enable users to complete a structured questionnaire, which will then be analyzed by a machine learning model to generate personalized career recommendations. The results, along with confidence scores or rankings for each recommended career path, will be presented to users in an intuitive and interactive interface. The system will handle preprocessing of user inputs, such as encoding categorical responses and normalizing values, to ensure accurate predictions. Additionally, the web application will allow users to complete multiple assessments and receive instant recommendations. Overall, these functional requirements form the backbone of the project, guiding development and ensuring all critical tasks are efficiently performed to meet user expectations.

2.1.1. User Input Questionnaire

- **Id:** FR001
- **Title:** User Input Questionnaire
- **Description:** The system shall allow users to complete a structured questionnaire capturing their personality traits, interests, and preferences.

2.1.2. Career Recommendation Generation

- **Id:** FR002
- **Title:** Display Recommendation Results
- **Description:** The system shall display recommended career paths along with confidence scores or rankings for each option.

2.1.3. Display Recommendation Results

- **Id:** FR003
- **Title:** Career Recommendation Generation
- **Description:** The system shall analyze user responses using the trained machine learning model to generate suitable career recommendations.

2.1.4. Input Preprocessing

- **Id:** FR004
- **Title:** Input Preprocessing
- **Description:** The system shall preprocess user responses, including encoding and normalization, to ensure accurate model predictions.

2.1.5. User Interaction

- **Id:** FR005
- **Title:** User Interaction
- **Description:** The system shall provide a user-friendly web interface allowing users to submit multiple questionnaires and view recommendations in real time.

2.1.6. Model Training

- **Id:** FR006
- **Title:** Model Training
- **Description:** The system shall allow training of the machine learning model on a custom dataset mapping personality traits and interests to career outcomes to ensure accurate and generalized recommendations.

2.2. Non-Functional Requirements

*Non-functional requirements define the overall qualities and constraints of the system, focusing on how the career recommendation system performs rather than what it performs. These requirements ensure that the system is reliable, efficient, and user-friendly. The system should be highly **responsive**, providing career recommendations in real time with minimal delay after users submit their questionnaire responses. It must be **scalable**, capable of handling multiple users simultaneously without performance degradation. **Accuracy and reliability** of the predictions are critical, ensuring that the machine learning model produces consistent and trustworthy recommendations across different personality profiles and interest combinations. The system should maintain a high level of **usability**, offering an intuitive web interface that requires minimal technical knowledge to operate. Additionally, the application must adhere to **Maintainability and extensibility**, allowing future updates to the model, questionnaire, or interface with ease. **Security and privacy** of user responses must also be ensured, even if no sensitive personal information is stored. Overall, these non-functional requirements guide the design and deployment of the system to provide a robust, efficient, and user-friendly career recommendation experience.*

3. Use Cases and Flow of Processes

Use cases describe how users interact with a system to achieve specific goals, translating functional requirements into practical scenarios. In this project, the primary actors are end-users who complete personality and interest questionnaires and the system, which handles input collection, data preprocessing, career recommendation generation, and result display. These use cases help the development team understand critical processes and allow stakeholders to visualize the system's operation in real-world scenarios.

3.1. Complete Questionnaire

ID	UC001
Name	Complete Questionnaire
Requirement(s)	FR001, FR004
Actor(s)	User
Precondition	<i>The user has access to the web application and is ready to provide responses.</i>
Postcondition	<i>The user's responses are collected and preprocessed for analysis.</i>

Basic Flow	<ol style="list-style-type: none"> 1. <i>The user navigates to the questionnaire section of the web app.</i> 2. <i>The user answers questions related to personality traits, interests, and preferences.</i> 3. <i>The system validates responses for completeness and correctness.</i> 4. <i>The system preprocesses the inputs, encoding categorical values and normalizing data.</i>
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3.2. Generate Career Recommendations

ID	UC002
Name	Generate Career Recommendations
Requirement(s)	FR002, FR004, FR006
Actor(s)	User, System
Precondition	<i>The user's questionnaire responses have been successfully collected and preprocessed.</i>
Postcondition	<i>Personalized career recommendations are generated.</i>
Basic Flow	<ol style="list-style-type: none"> 1. <i>The system analyzes the preprocessed user data using the trained machine learning model.</i> 2. <i>The system generates a ranked list of suitable career paths based on personality and interest analysis.</i> 3. <i>The system calculates confidence scores or suitability rankings for each recommendation.</i>

3.3. Display Recommendations

ID	UC003
Name	Display Recommendations
Requirement(s)	FR003, FR005
Actor(s)	User, System
Precondition	<i>Career recommendations have been generated by the system.</i>

Postcondition	<i>Users can view personalized career recommendations.</i>
Basic Flow	<ol style="list-style-type: none"> 1. <i>The system displays recommended career paths along with confidence scores or rankings.</i> 2. <i>The user reviews the recommendations.</i> 3. <i>The user can choose to retake the questionnaire or explore alternative career suggestions.</i>

3.4. Repeat Assessment

ID	UC004
Name	Repeat Assessment
Requirement(s)	FR001, FR002, FR003, FR005
Actor(s)	User
Precondition	<i>The user has completed one round of the questionnaire and received recommendations.</i>
Postcondition	<i>Users can perform multiple assessments efficiently without restarting the application.</i>
Basic Flow	<ol style="list-style-type: none"> 1. <i>The user initiates a new questionnaire session.</i> 2. <i>The system repeats input collection, preprocessing, analysis, and recommendation display.</i> 3. <i>Updated recommendations are presented in real time.</i>

4. References

1. Noor F., "**ML based intelligent career recommendation system**," GitHub Repository. <https://github.com/Noor2444/career-recommendation-system>.
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3. Google, "**Colaboratory**," Google Colab. <https://colab.google/>.