Software Requirements Specification

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Water FootPrint Calculation

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Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose

The water footprint helps us understand for what purposes our limited freshwater resources are being consumed and polluted. The impact of it depends on where the water is taken from and when if it comes from a place where water is already scarce, the consequences can be significant and require action

1.1 Document Conventions

Fonts and Styling:

Italic: *Used for placeholders, variables, or emphasis.*
Bold: *Used for section headings, key terms, or to highlight important points.*
Monospace: *Utilized for code snippets, file names, or terminal commands.*

A defined process for reviewing and approving the SRS is outlined, including roles and responsibilities of stakeholders involved.

1.2 Intended Audience

Policy Makers: *Those involved in formulating water management policies at local, regional, and national levels.*

Environmentalists: *Individuals and organizations concerned with water conservation and sustainability.*

Researchers: *Scholars and scientists studying water usage patterns and their impact on the environment.*

Technologists*: Professionals interested in leveraging digital technologies for environmental monitoring and awareness.*

*General Public: Citizens seeking to understand their role in water conservation efforts and make informed choices***.**

1.3 Reading Suggestions

Policy Makers: *Focus on sections detailing the implications of water footprinting and potential policy interventions.*

1.2 **Environmentalists:** *Pay close attention to discussions on the environmental impact of water consumption and pollution.*

1.3 **Researchers:** *Explore data analysis and methodologies used in calculating water footprints.*

1.4 **Technologists:** *Investigate the proposed digital solutions and technological frameworks suggested for water footprinting.*

1.5 **General Public:** *Engage with user-friendly app and website descriptions to grasp practical applications and implications for personal choices.*

1.1 Product Scope

1.2 **Description of the Software:** *We focus on developing a user-friendly app or website may be developed which can provide the water footprints of different items/ final products we use in daily life by feeding little inputs or just by scanning through the camera like Google lens.*

1.3 **Purpose:** These innovations can contribute to a more accurate assessment of water footprints, better water resource management, and increased awareness of the importance of water conservation in addressing global water challenges.

1.4 Objectives and Goals:

The water footprint measures the amount of water used to produce each of the goods and services we use. The water footprint helps us understand for what purposes our limited freshwater resources are being consumed and polluted. The impact of it depends on where the water is taken from and when if it comes from a place where water is already scarce, the consequences can be significant and require action. The increase in the amount of non-available water due to pollution and scarce groundwater level has added more water footprints, at the community as well as at the personal levels. An increased water footprint directly affects the health and future of the citizens. Preventing severe drought in water-stressed areas is only going to be possible if water is used with more care and efficiency, this can be done if we have readily available data on water footprints. Hence by using digital technologies like AI, Big Data, Blockchain, etc, and computer languages, a user-friendly app or website may be developed which can provide the water footprints of different items/final products we use in daily life by feeding little inputs or just by scanning through the camera like Google lens.

1.5 References

Document Title: *Water Footprint Assessment Manual, The water footprint: water in the supply chain.*

Author: *Hoekstra, A.Y., Chapagain, A.K., Aldaya, M.M. and Mekonnen, M.M. (2011) Earthscan, UK.*

Date: *March 2010, issue 93 and in 2008.*

Source or Location: *https://www.waterfootprint.org/water-footprint-2/what-is-a-water-footprint/*

2 Overall Description

The water footprint calculation project encompasses a sophisticated system designed to assess and quantify the water usage associated with various items. Leveraging object detection technology and machine learning algorithms, the project offers users an intuitive platform, accessible through both a website and a mobile application, to scan items and obtain detailed water footprint calculations.

2.1 Product Perspective

At its core, the project operates within a dynamic technological ecosystem, integrating with essential components such as object detection systems and machine learning models. Its seamless interaction with these systems is pivotal for delivering accurate and insightful water footprint assessments.

2.2 Product Features

The key features of the water footprint calculation project include:
•**Object Detection:** *Utilizing advanced object detection algorithms, the system accurately identifies and classifies items scanned by users.*
•**Water Footprint Calculation:** *A machine learning model, specifically a Random Forest algorithm, processes the characteristics of identified items to calculate their water footprints.*
•**User Interface:** *The website and mobile application offer user-friendly interfaces, allowing users to easily scan items, input data, and access water footprint results.*

2.3 User Classes and Characteristics

The project caters to diverse user classes, including environmentally conscious individuals, researchers, policymakers, and businesses seeking to understand and mitigate their water usage impact. Users may vary in technical proficiency, ranging from casual consumers to experts in water resource management.

2.4 Operating Environment

The water footprint calculation project operates in a digital environment conducive to web and mobile applications. Compatibility with various devices, browsers, and operating systems ensures widespread accessibility. Additionally, the project's reliance on cloud-based resources facilitates scalability and efficient data processing.

2.5 Regulatory Compliance

In adherence to regulatory standards and best practices, the project prioritizes data privacy and intellectual property rights. Compliance measures, such as GDPR for data privacy protection and licensing agreements for intellectual property, safeguard user information and uphold legal obligations.

2.6 Scalability and Extensibility

Designed with scalability and extensibility in mind, the project accommodates future growth and evolution. Cloud-based infrastructure enables seamless scalability to handle increased user demand, while the modular architecture allows for the integration of new features and improvements over time.

2.7 Future Enhancements

Potential future enhancements may include:
•Enhanced Object Detection: Continued refinement of object detection algorithms to improve accuracy and expand item recognition capabilities.
•Advanced Machine Learning Models: Integration of more sophisticated machine learning techniques to provide more nuanced water footprint calculations.
•Collaborative Features: Implementation of collaborative features, such as sharing and comparing water footprint data among users or organizations.

3. External Interface Requirements:

3.1 User Interfaces:

•The system shall provide a user-friendly web interface accessible via standard web browsers.
•The web interface shall include options for initiating object detection, viewing water footprint results, and accessing additional functionalities.
•A mobile application shall be developed for iOS and Android platforms, providing similar functionality to the web interface.
•User interfaces shall support multiple languages and provide localization options for international users.

3.2 Hardware Interfaces:
•The system shall utilize the camera functionality of compatible devices, such as smartphones, tablets, and computers, for object scanning.
•Hardware interfaces shall be compatible with commonly used camera APIs and drivers to ensure broad device support.
•The system shall not have specific hardware requirements beyond those necessary for running the web interface or mobile application.

3.3 Software Interfaces:
•The system shall integrate with external databases or APIs to access product information relevant to water footprint calculation.
•APIs shall be utilized for retrieving data such as product details, production processes, and water usage statistics from external sources.
•Integration with cloud-based services may be required for data storage, processing, or hosting web applications and APIs.

3.4 Communications Interfaces:
•The system shall communicate with external servers or services via standard HTTP(S) protocols for data retrieval and processing.
•Secure communication channels shall be established using encryption protocols to protect sensitive information during transmission.
•The system shall support asynchronous communication patterns to handle concurrent user requests and data processing tasks efficiently.
•Integration with push notification services may be implemented to provide real-time updates to users regarding system status or water footprint calculation results.
These external interface requirements outline the interaction points between the Water Footprint Calculation system and its surrounding environment, including user interfaces, hardware components, software systems, and communication channels. Each interface requirement is essential for ensuring seamless integration and functionality of the system within its operational context.

4. System Features:

4.1 System Feature 1: Object Detection

•**Description:** *This feature enables the system to identify various items through image recognition technology.*

•**Requirements:**
•The system shall utilize trained machine learning models for object detection.
•Users shall have the option to initiate object detection through the web interface or mobile application.
•Object detection shall be performed in real-time or near real-time, providing immediate feedback to users.
•Detected items shall be classified accurately with a minimum confidence threshold of 90%.
•The system shall support detection of a wide range of common household items, including food products, beverages, and personal care items.

4.2 System Feature 2: Water Footprint Calculation

•**Description:** *This feature calculates the water footprint of detected items based on predefined metrics and data sources.*

•**Requirements:**
•The system shall retrieve relevant data for water footprint calculation from external databases or APIs.
•Water footprint calculation shall consider factors such as water usage during production, transportation, and disposal phases.
•Calculated water footprint values shall be based on scientifically validated methodologies and industry standards.
•Users shall have access to detailed breakdowns of water footprint components, including virtual water usage and geographical distribution.
•Water footprint calculation algorithms shall be transparent and reproducible for validation purposes.

4.3 System Feature 3: Result Presentation

•**Description:** *This feature presents the calculated water footprint of detected items in a clear and user-friendly manner.*

•**Requirements:**
•The system shall display water footprint results to users via the web interface or mobile application.
•Water footprint results shall include the total water footprint value for each detected item.
•Users shall have the option to view detailed breakdowns of water footprint components, such as blue water, green water, and grey water usage.
•Water footprint results shall be presented using intuitive visualizations, such as charts or graphs, to enhance user understanding.
•Users shall be able to save or export water footprint reports for future reference or sharing purposes.

4.4 System Feature 4: User Management

•**Description:** *This feature allows administrators to manage user accounts and access permissions within the system.*
•**Requirements:**
•*The system shall support user registration and authentication mechanisms for accessing restricted functionalities.*
•*Administrators shall have the ability to create, update, and delete user accounts as needed.*
•*User roles and access permissions shall be defined to control access to sensitive data and functionalities.*
•*Password policies shall be enforced to ensure the security of user accounts, including minimum length and complexity requirements.*
•*User sessions shall be managed securely to prevent unauthorized access or session hijacking.*
These system features provide a detailed description of the core functionalities of the Water Footprint Calculation project, including object detection, water footprint calculation, result presentation, and user management. Each feature is essential for achieving the project's objectives and delivering a comprehensive solution to users.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

Data Processing and Response Times:
Landing Page Load Time: *The landing page should load in less than 3 seconds after a user opens the app.*
Data Collection Page Load Time: *The data collection page should load in less than 2 seconds after a user navigates from the landing page.*
Water Footprint Calculation Time: *The system should calculate the water footprint of a product within 5 seconds after a user submits their data on the data collection page.*
Data Visualization Page Load Time: *The data visualization page should display the results within 3 seconds after the water footprint calculation is complete.*

Scalability:
The system should be able to handle 100 concurrent users without significantly impacting response times.
This is a basic scalability requirement to accommodate a moderate number of users. The specific number of users will depend on the expected usage of the application.

Availability:
The system should be available 99% of the time (uptime).
This is a high availability target, meaning minimal downtime for critical systems. The specific uptime requirement will depend on the business needs and how crucial it is for the application to be constantly accessible.

5.2 Safety Requirements

Data security: *The application should collect and store lots of datas securely. This might involve encrypting sensitive information and following best practices for data access control. prevent crashes that could lead to data loss. It should also provide informative messages to users in case of Database crashes.*

Data Quality and Availability : : *This application uses the data from database.If essential data is missing or unreliable, it may be challenging to proceed with a meaningful water footprint assessment. So we need to take datas from authorised company,books or research paper.*

Misinterpretation of results: *The application should present the water footprint calculation results in a clear and understandable way to avoid misinterpretation by users.*

Changing Environmental Factors: *Rapid changes in environmental conditions, such as climate change or shifts in water availability, can affect the accuracy and relevance of your water footprint assessment.*

5.3 Software Quality Attributes

Usability:

Ease of Use: *The application focus on developing a user-friendly app or website may be developed which can provide the water footprints of different items/ final products we use in daily life by feeding little inputs or just by scanning through the camera like Google lens.*

Accessibility: *This app should support local languages, this will ensure pan-India usage and sensitize the people about the water footprints of items they use in daily life.*

Performance:

Responsiveness*: The application should respond to user interactions quickly. For instance, the time to load the landing page should be less than 3 seconds on a device with average specifications. Similarly, the data visualization page should display the results within 6 seconds after the water footprint calculation is complete.*

Reliability:

Uptime: *The application should be available for use a high percentage of the time. You can set a specific target uptime, such as 99.5%.*

Maintainability:

Modular Design: *The application should be designed with a modular architecture to allow for easier maintenance and future updates.*

Code Clarity: *The code should be well-documented, use clear naming conventions, and have a low cyclomatic complexity score (which indicates how easy it is to understand and modify the code).*

6. Other Requirements

Target users and usage patterns:

Think about the expected number of users and how often they will be using the application. This will help determine how much load the system needs to handle.

Data complexity:

Consider the size and complexity of the data that the system will process. This can affect the processing time and resource usage.

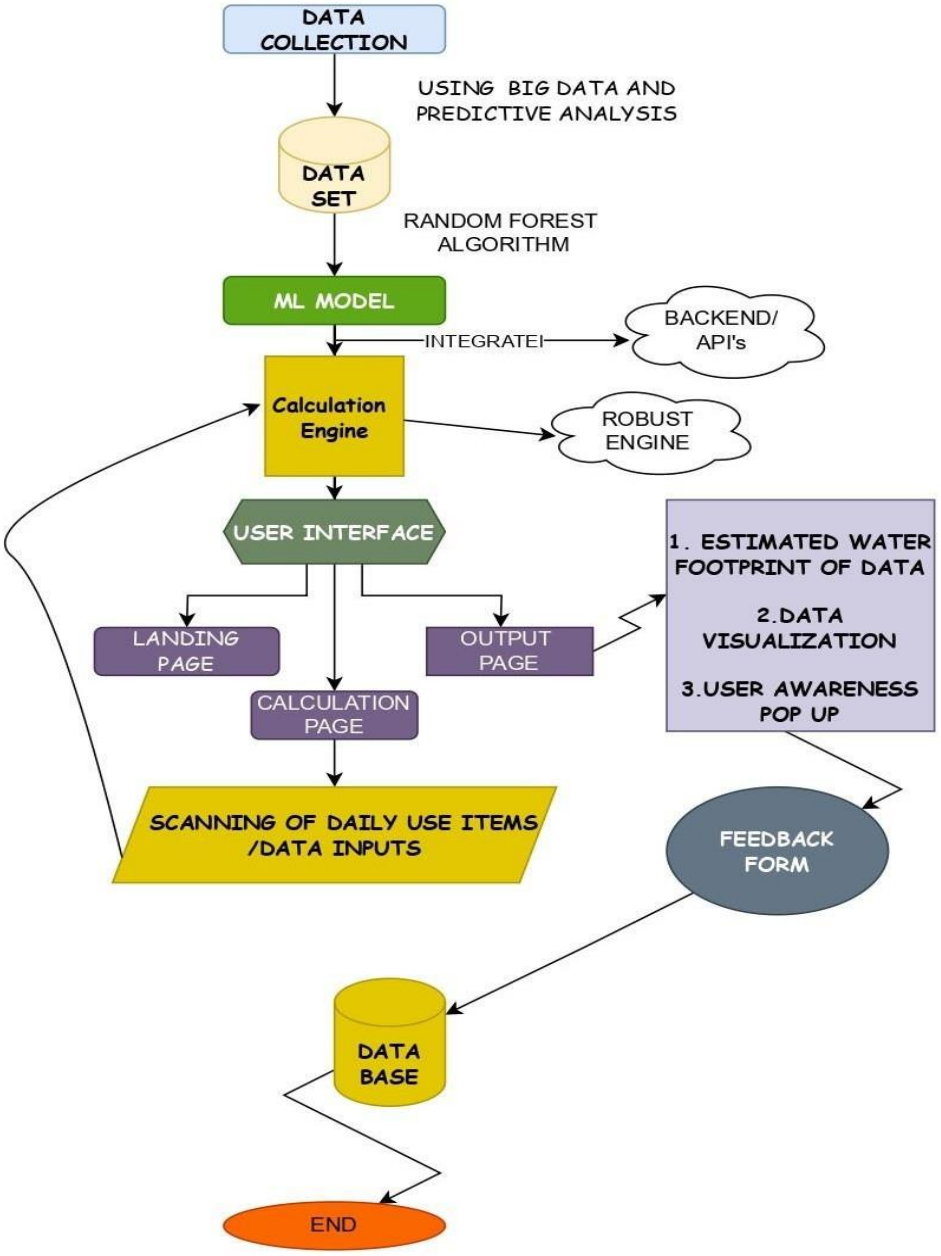
Hardware limitations:

If there are any limitations on the hardware that will be used to run the application, these need to be factored into the performance requirements.

Appendix A: Glossary

Term: API (Application Programming Interface)
Definition: A set of protocols, definitions, and tools that allow for communication between different software applications.

Appendix B: Analysis Models


DATA COLLECTION
USING BIG DATA AND PREDICTIVE ANALYSIS
DATA SET
RANDOM FOREST ALGORITHM
ML MODEL
INTEGRATEI
BACKEND/ API's
Calculation Engine
ROBUST ENGINE
USER INTERFACE
1. ESTIMATED WATER FOOTPRINT OF DATA
2.DATA VISUALIZATION
3.USER AWARENESS POP UP
LANDING PAGE
OUTPUT PAGE
CALCULATION PAGE
SCANNING OF DAILY USE ITEMS /DATA INPUTS
FEEDBACK FORM
DATA BASE
END

PROTOTYPE