

Food Explorer Application

A Semantic Web-Based Food Recommendation System

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1 Executive Summary

The Food Explorer is a semantic web-based application designed to empower users to discover, filter, and receive personalized dish recommendations based on cuisine, dietary preferences, allergen constraints, and nutritional requirements. Built using Owlready2 for ontology management and Gradio for an intuitive user interface, the application leverages a robust food ontology to provide accurate and tailored culinary suggestions. The enhanced user interface features a visually appealing food-themed design with a subtle background pattern, vibrant orange accents, and modern typography, ensuring an engaging and accessible user experience. This proposal outlines the project's objectives, features, technical implementation, and benefits.

2 Project Objectives

The Food Explorer aims to:

- Provide a user-friendly platform for exploring global cuisines, filtering dishes by specific criteria, and receiving personalized recommendations.
- Utilize semantic web technologies to model food-related data, enabling precise querying and reasoning.
- Deliver an aesthetically pleasing interface with a food-inspired design to enhance user engagement.
- Support diverse dietary needs, including vegan, vegetarian, gluten-free, and keto diets, while accounting for allergens and nutritional profiles.
- Ensure scalability and maintainability for future enhancements, such as additional cuisines or dietary preferences.

3 System Features

The Food Explorer offers three core functionalities, each accessible via an intuitive tabbed interface:

3.1 Search Dishes

- Allows users to select a specific dish from a dropdown menu to view detailed information, including cuisine, dietary suitability, allergens, ingredients, nutrition, preparation time, and spiciness.
- Supports an option to display all dishes with customizable information fields.

3.2 Filter Dishes

- Enables users to filter dishes based on cuisine, diet, allergen-free requirements, maximum preparation time, maximum calories, and spiciness preference.
- Provides sorting options by dish name, preparation time, or calorie content for tailored results.

3.3 Recommend Dish

- Offers personalized dish recommendations based on user preferences for diet, allergen avoidance, and spiciness.
- Uses a scoring mechanism to prioritize dishes that best match user criteria.

3.4 User Interface Enhancements

- Features a food-themed background pattern with a warm gradient, evoking an appetizing aesthetic.
- Incorporates vibrant orange and soft peach color schemes, with modern typography using the Inter font.
- Includes card-like styling for outputs, rounded buttons with hover effects, and a responsive layout for improved usability.

4 Technical Implementation

4.1 Ontology Design

- **Technology:** Owlready2 (Python library for ontology management).
- **Structure:** The ontology includes classes for Cuisine, Diet, Allergen, Dish, Ingredient, and Nutrition, with properties such as `hasCuisine`, `suitableFor`, `containsAllergen`, `hasIngredient`, `preparationTime`, `isSpicy`, `hasNutrition`, `calories`, `protein`, and `carbs`.
- **Reasoning:** Rules infer dietary suitability (e.g., vegetarian, vegan, gluten-free) based on allergen and ingredient data.
- **Data:** Pre-populated with 10 cuisines, 6 diets, 6 allergens, 14 ingredients, and 13 dishes with corresponding nutritional profiles.

4.2 User Interface

- **Framework:** Gradio, a Python library for creating web-based interfaces.
- **Design:** Custom CSS with a food-patterned background orange-based color palette, and Inter font for readability.

- **Components:** Dropdowns, sliders, checkboxes, radio buttons, and markdown outputs, styled with shadows, rounded corners, and hover effects.
- **Layout:** Tabbed interface with three sections (Search, Filter, Recommend), optimized for clarity and responsiveness.

4.3 Development Environment

- **Language:** Python 3.x.
- **Dependencies:** owlready2, gradio.
- **Storage:** Ontology saved as `food_ontology.owl` in OWL format.

5 Benefits

- **User-Centric:** Simplifies dish discovery for users with specific dietary needs or preferences.
- **Visually Appealing:** The food-themed design enhances engagement and creates a welcoming experience.
- **Scalable:** The ontology-based approach allows easy addition of new dishes, cuisines, or dietary rules.
- **Educational:** Provides detailed nutritional and allergen information, promoting informed food choices.
- **Accessible:** The intuitive interface is suitable for users of all technical backgrounds.

6 Conclusion

The Food Explorer application combines semantic web technology with a visually appealing, user-friendly interface to deliver a powerful tool for culinary exploration. Its ontology-driven approach ensures accurate and flexible dish recommendations, while the enhanced design with a food-themed background elevates the user experience. This application, running on Gradio, is ready to serve food enthusiasts seeking personalized culinary recommendations.