Project Proposal

Group Members:

21K-3555 Hammad Ali

21K-3561 Muhammad Ali

21K-3621 Wajdan Mustafa

Project Title:

FAST-Khurak: Recipe-Based Recommender System

Project Overview

Topic:

Development of a personalized recipe recommender system utilizing content-based and rule-based AI techniques for improved culinary experience and dietary suitability.

Objective:

To design and implement a hybrid recommender system that suggests recipes based on individual user preferences such as cuisine type, course, diet, preparation time, ingredients, and kitchen resources. The system aims to enhance user experience by providing accurate, safe, and diverse culinary suggestions.

Project Description

In the digital age, the need for intelligent personalization is paramount, especially in everyday tasks like meal planning. FAST-Khurak seeks to address this need by providing users with recipe recommendations tailored to their taste, time, ingredients, and dietary needs. Using a hybrid approach that merges content-based filtering and rule-based logic, this system analyzes various recipe attributes and user constraints to generate suitable suggestions.

The scope of the project includes:
- Analysis of recipe features (cuisine, course, diet, prep time, etc.)
- Incorporating user-specific rules (allergies, dietary restrictions, available utensils)
- Evaluation using a real-world dataset and performance metrics

AI Approach and Methodology

AI Techniques to be Used:

1. Content-Based Filtering: Uses cosine similarity, TF-IDF, and one-hot encoding to compare user preferences with recipe features (cuisine, course, diet, prep time, etc.)
2. Rule-Based Filtering: Custom logic to enforce rules such as allergen avoidance, available utensils, and dietary restrictions.
3. Natural Language Processing (NLP): For preprocessing ingredients and user queries (if expanded to free-text inputs).
4. Evaluation Metrics: Precision, recall, F1-score, and confusion matrix analysis to assess performance.

Heuristic Design:

- Similarity Heuristics: Recipes are ranked by similarity score based on selected features.
- Rule Prioritization: Hard constraints (e.g., allergies) override soft preferences (e.g., cuisine).
- Fallback Logic: If no exact match is found, suggest the next best option based on similarity and rule compliance.

Complexity Analysis:

For n recipes and m features:
- Content-based similarity: O(n * m) per recommendation
- Rule application: O(n) filtering before or after similarity
Optimization: Vectorized operations and index-based retrieval reduce overall computation time.

Implementation Plan

Programming Language:

Python — Chosen for its strong support for data science, machine learning, and rapid prototyping.

Libraries and Tools:

- Pandas, NumPy – Data manipulation
- Scikit-learn – Machine learning and similarity calculations
- NLTK / spaCy – (optional) for advanced text processing
- Flask / Streamlit – For developing the web-based interface
- Matplotlib / Seaborn – For data visualization
- Jupyter Notebook – For initial experimentation and EDA

Milestones and Timeline:

Project planning and literature review | Week 1
Dataset exploration and preprocessing | Week 2–3

Implementation of content-based system | Week 4–5
Implementation of rule-based components | Week 6
Integration and interface design | Week 7
Evaluation and result analysis | Week 8
Final testing and user feedback | Week 9
Documentation and report writing | Week 10

References

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3. N. Kundu, "Recipe-Based Recommender System: An Introduction," Medium, 2020. https://link.medium.com/SDBZvkUnPzb
4. Dataset Source: https://www.kaggle.com/datasets/campusx/5000-indian-cuisines-datasetwith-images