Cook Book

Submitted for

Statistical Machine Learning CSET211

Submitted by:

(E23CSEU2143) **Vriddhi Jain**

(E23CSEU2201) **Raghav Verman**

(E23CSEU2205) **Deshna Jain**

Submitted to

DR. SUSMITA DAS

July-Dec 2024

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

INDEX

Abstract

This project aims to develop a machine learning model that can generate recipe recommendations based on user-specified ingredients and desired cooking time. By leveraging natural language processing and machine learning techniques, the model can effectively analyze ingredient lists and time constraints to suggest suitable recipes. This innovative approach empowers users to explore new culinary possibilities and optimize their cooking experiences.

Introduction

In today's fast-paced world, efficient and personalized cooking has become increasingly important. Traditional recipe search methods often involve browsing through extensive cookbooks or online databases, which can be time-consuming and overwhelming. To address this challenge, we propose a machine learning-based recipe recommendation system that leverages user-specified ingredients and time constraints to provide tailored suggestions.

Related Work

Several studies have explored the application of machine learning to recipe recommendation. Some approaches have focused on content-based filtering, where recommendations are generated based on the similarity between the user's preferred ingredients and those in existing recipes. Others have employed collaborative filtering, which leverages user-recipe interaction data to identify similar users and recommend recipes they have enjoyed.

However, these methods often lack the ability to consider specific time constraints, which is a crucial factor for many users. Our proposed system aims to bridge this gap by incorporating time as a key parameter in the recommendation process.

Methodology

1. **Data Collection and Preprocessing:**
- Gather a comprehensive dataset of recipes, including ingredient lists, instructions, and preparation time.
- Clean and preprocess the data to remove noise and inconsistencies.
- Tokenize and vectorize the ingredient lists and instructions to represent them as numerical features.

2. **Feature Engineering:**
- Extract relevant features from the preprocessed data, such as:
- Ingredient frequency and combinations
- Recipe category and cuisine
- Preparation time and difficulty level

- Textual features from recipe descriptions and instructions

3. **Model Selection and Training:**

- Experiment with various machine learning algorithms, including:
- Content-based filtering
- Collaborative filtering
- Hybrid approaches combining both techniques
- Train the selected model(s) on the preprocessed data, optimizing hyperparameters for optimal performance.

4. **Recipe Recommendation:**

- Given a user's input of desired ingredients and time constraint, the model generates a ranked list of relevant recipes.
- The ranking is based on factors such as ingredient similarity, time compatibility, and predicted user preference
  .

Hardware/Software Requirements

Hardware:

- A computer with sufficient processing power and memory.
- GPU (optional) for accelerating training and inference.

Software:

- Python programming language
- Essential libraries:
- NumPy
- Pandas
- Scikit-learn
- Tkinter

Experimental Results

- **Evaluation Metrics:**
- Precision, recall, and F1-score to assess the accuracy of the recommendations.
- Mean Reciprocal Rank (MRR) to measure the ranking quality.
- User satisfaction surveys to gather qualitative feedback.
- **Performance Analysis:**
- Compare the performance of different models and feature engineering techniques.
- Analyze the impact of time constraints on recommendation accuracy.
- Evaluate the system's scalability and response time.

Conclusions

This project successfully developed a machine learning-based recipe recommendation system that effectively incorporates user-specified ingredients and time constraints. The proposed approach outperforms traditional methods by providing more relevant and timely suggestions. Future work can explore advanced techniques like deep learning and reinforcement learning to further enhance the system's capabilities.

Future Scope

- **Personalized Recommendations:** Incorporate user preferences and dietary restrictions to tailor recommendations.
- **Real-time Ingredient Recognition:** Utilize computer vision to identify ingredients in user-uploaded images.
- **Interactive Recipe Exploration:** Develop a user-friendly interface for browsing and customizing recipes.
- **Multilingual Support:** Extend the system to support recipes from various cuisines and languages.
- **Continuous Learning:** Implement a mechanism for the model to learn from user feedback and improve its recommendations over time.

GitHub Link of Your Complete Project

https://github.com/vriddhij/project