Customized AI Kitchen for India

This project aims to develop an AI Kitchen Model for customized dishes in India. It addresses the challenges of preparing dishes on time at home, going beyond existing AI-based vending machines and coffee/bread makers. The goal is to integrate AI-enabled kitchen functionality with utensil washing, creating a seamless and efficient cooking experience.

Problem Statement

The project tackles the everyday challenge of preparing dishes on time at home. Existing AI-based appliances like vending machines and coffee/bread makers don't cater to the diverse range of dishes people prefer. Additionally, there's a need for automated utensil management, as current washing machines require manual intervention. This project aims to address both issues by integrating AI-enabled cooking with automatic utensil washing.

Problem Statement Deliverables

1 **AI for Customized Dishes**

AI model to cook user-selected dishes, adjusting ingredients based on servings.

2 **Automated Utensils**

Detect right utensils and automatically request from washing machine.

3 **Ingredient Notifications**

Notify users of missing ingredients before cooking.

4 **Non-Microwave Integration**

Option for traditional oven integration with AI Kitchen.

Our Unique Solution

To develop an AI-enabled kitchen model that customizes dishes and manages ingredients, we integrated AI, machine learning, and automation. Here's a concise breakdown of our comprehensive solution:

1. AI Model for Customized Dishes

Objective: Create an AI model to cook user-selected dishes by identifying necessary ingredients and their quantities.

Implementation:

a) Flask-Based Web App: Developed the AIKitchen application.

b) Recipe Dataset: Includes names, ingredients, amounts, servings, and instructions.

c) User Input: Users select a dish and specify servings; ingredient quantities are adjusted automatically.

d) TensorFlow AI Model: Classifies ingredients from uploaded images to identify available ingredients.

e) Image Management: Users can replace or add new images, enhancing control over ingredient detection.

Our Unique Solution

2. Ingredient Availability Notification

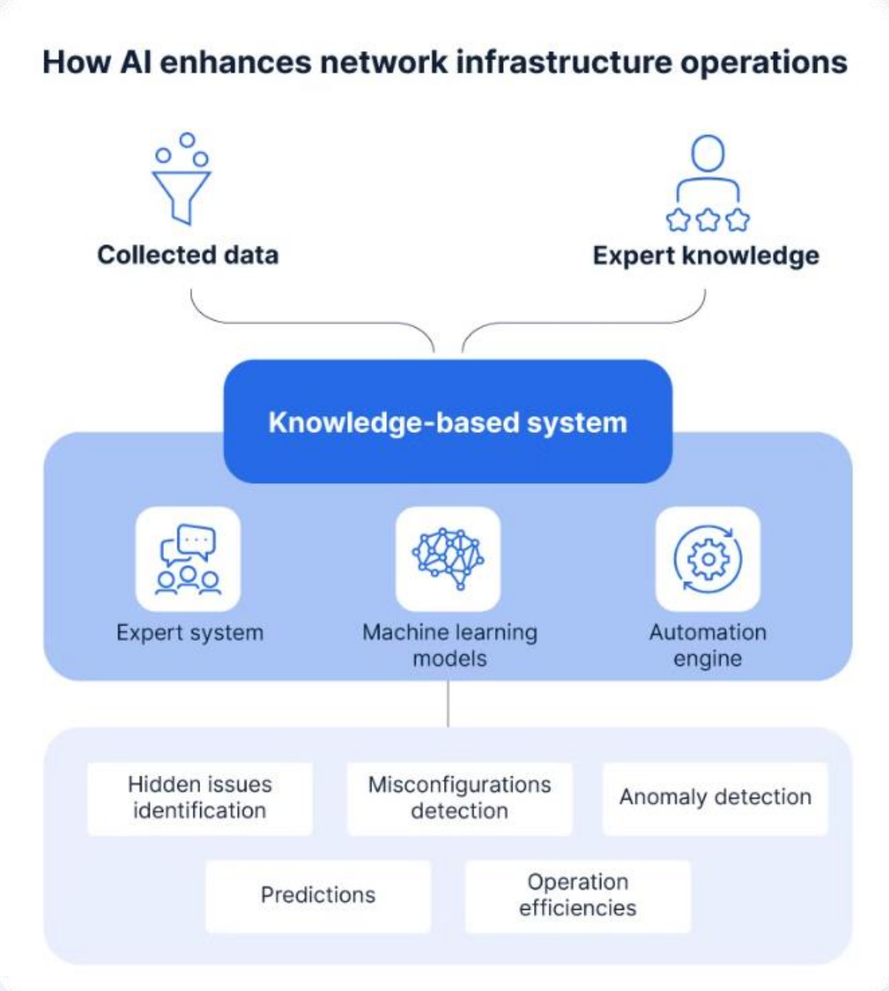
Objective: Notify users about available ingredients and alert if any are missing.

Implementation:

a) Comparison System: Matches needed recipe ingredients with those identified via image classification.

b) Notification System: Alerts users about missing ingredients before cooking.

AI Model for Customized Dishes



1

Recipe Dataset

A dataset of recipes is utilized, containing details such as recipe names, ingredients, amounts, servings, and instructions. This dataset serves as the foundation for the AI model's training.

2

User Input

Users can select a dish and specify the number of people to cook for. The application adjusts the ingredient quantities accordingly, ensuring the recipe is scaled to the desired serving size.

3

Ingredient Classification

The AI model, built using TensorFlow, classifies ingredients from uploaded images, helping to identify what ingredients are available in the user's kitchen. This allows the system to determine which ingredients need to be purchased.

4

Recipe Adaptation

Based on the identified ingredients, the system adapts the recipe, providing users with instructions tailored to the available ingredients. This ensures users can cook the dish even if they don't have all the original ingredients.

Ingredient Availability Notification

The system compares the ingredients needed for the selected recipe with those identified in the user's kitchen via image classification. A notification system is in place to alert users about any missing ingredients, ensuring they are informed before starting the cooking process. This feature helps users avoid unnecessary trips to the grocery store and ensures they have all the necessary ingredients on hand.

Key Features

User-Friendly Interface

A web-based interface allows users to select dishes, upload ingredient images, and receive detailed cooking instructions. The interface is designed to be intuitive and easy to use, even for users who are not familiar with AI technology.

Dynamic Ingredient Scaling

Automatically adjusts ingredient quantities based on the number of servings specified by the user. This feature ensures that the recipe is scaled appropriately for the desired number of people.

Real-Time Notifications

Alerts users about ingredient availability and provides guidance on missing items. This feature helps users plan their shopping trips and ensures they have all the necessary ingredients on hand.

AI Model Flowchart / Architecture Diagram

1

Data Collection

Gather a diverse dataset of recipes, ingredient images, and user preferences to train the AI model.

2

Image Classification

Utilize a convolutional neural network to classify ingredients from user-uploaded kitchen images.

3

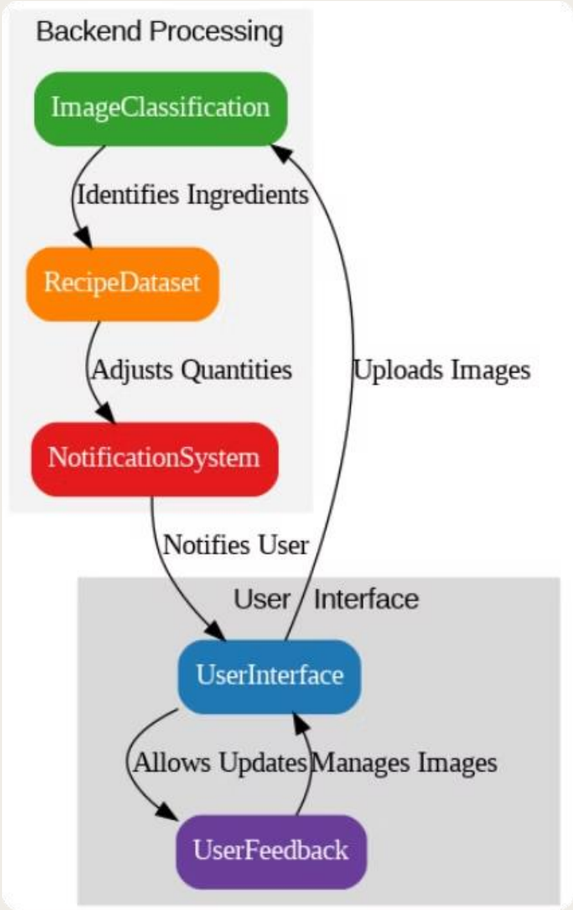
Recipe Adaptation

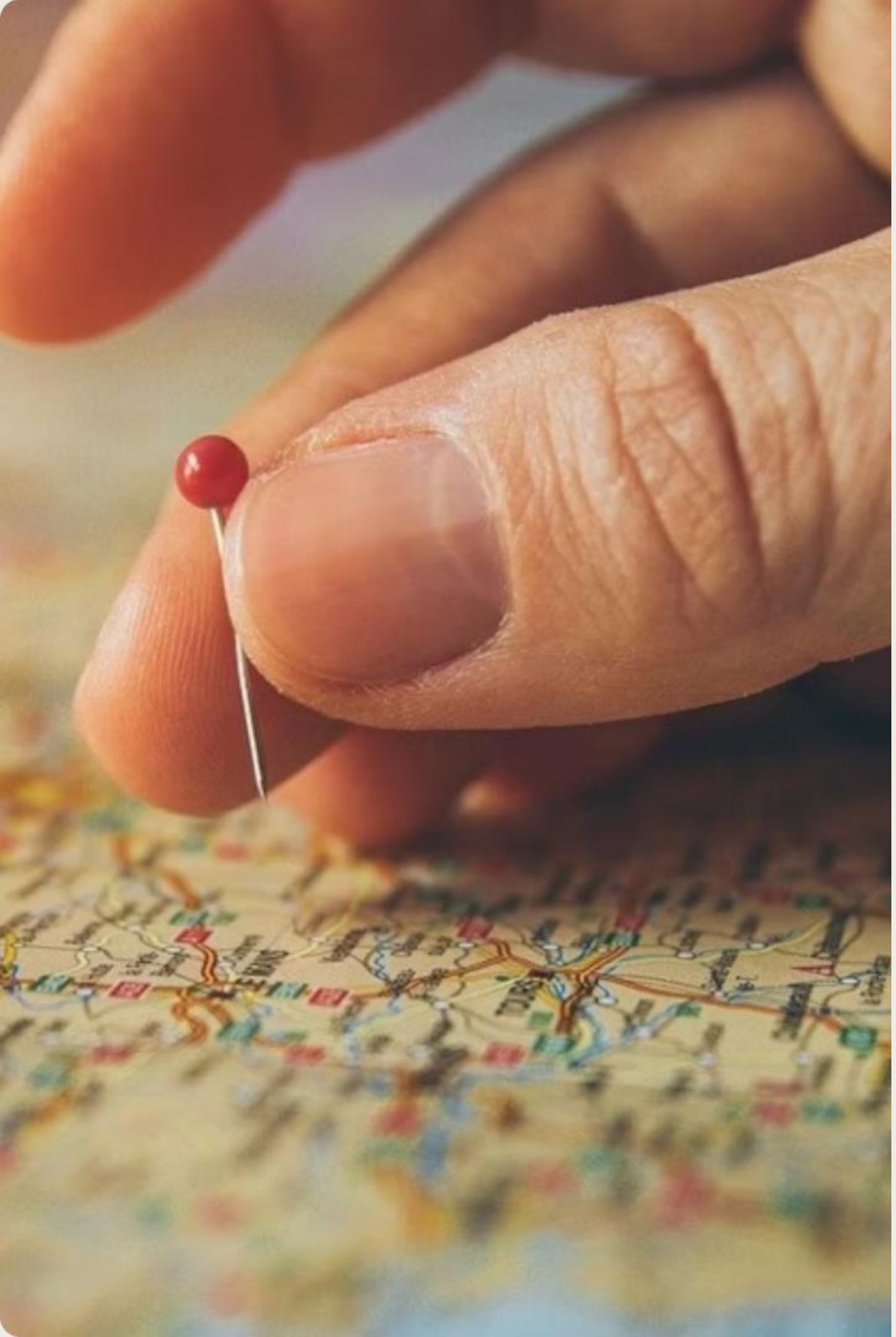
Match the available ingredients to the recipe and adjust the instructions accordingly, ensuring the dish can be prepared with on-hand items.

4

Ingredient Notification

Compare the required ingredients to the user's inventory and provide real-time alerts on missing items, enabling efficient meal planning.





Key Technologies

1. **Flask Framework:** The web application and user interactions are built using the Flask framework, a popular Python web development tool.
2. **TensorFlow:** The image classification model, responsible for identifying ingredients from user-uploaded kitchen images, is powered by the TensorFlow machine learning library.
3. **Pandas:** The recipe dataset is managed and manipulated using the Pandas data analysis library, enabling efficient data processing.
4. **Image Processing:** Advanced computer vision techniques are employed to process and classify the images uploaded by users, determining the available ingredients in their kitchens.

Team Members and Contribution

Harshwardhan Jain (**harshwardhan22csu392@ncuindia.edu**)

- Lead Developer
- Frontend developer
- Integration Specialist
- Technical Writer
- AI Specialist
- Backend developer

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- Data Scientist
- Quality Assurance (QA) Tester
- AI model management
- Backend Developer

Conclusion

The AI Kitchen model has successfully integrated advanced AI capabilities to streamline the process of preparing customized dishes. Through intelligent ingredient recognition, dynamic recipe adaptation, and real-time availability notifications, the solution delivers an enhanced user experience.