Pimpri Chinchwad Education Trust's
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# AUTONOMOUS SMART KITCHEN PLANNER

Presented by

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# INTRODUCTION

- The Autonomous Smart Kitchen Planner is an AI-based system that suggests meals by considering available ingredients, time, and dietary preferences.
- AI and CSP in use: CSP (Constraint Satisfaction Problem) algorithms are applied to handle multiple constraints efficiently, like limited ingredients or time.
- Purpose: To simplify meal planning, reduce food wastage, and promote healthier eating.

# MOTIVATION

Why automate meal planning?
It saves time and reduces the stress of deciding what to cook.

Environmental impact: Meal planning can help reduce food wastage, a significant global issue.

Key challenges: Managing multiple constraints like dietary preferences, available ingredients, and time limits.

# OBJECTIVES

## Automate meal planning

Provide users with recipe suggestions based on available ingredients and preferences.

## Minimize food wastage

By suggesting recipes that use perishable ingredients.

## Promote healthier choices

By meeting dietary goals like calorie limits or nutritional balance.

## User-friendly interface

Easy input of constraints and seamless recipe suggestions.

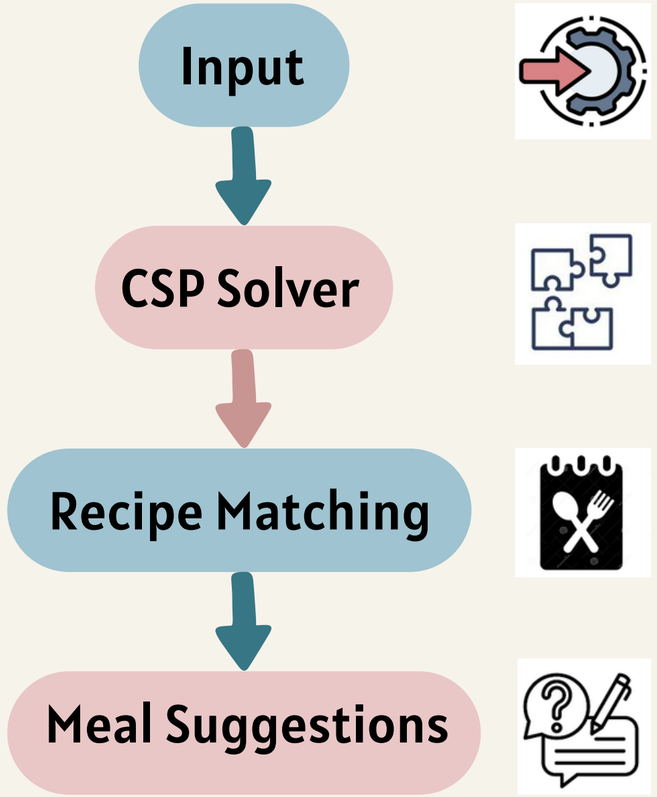
# SYSTEM ARCHITECTURE

**User Input Module:**
Inputs ingredients, preferences, and time constraints.

**CSP Solver:**
Processes inputs and generates meal suggestions.

**Recipe Database:**
Stores recipes, including nutrition info.

**Output Module:**
Displays suggested meal plans.



# LITERATURE SURVEY

| Sr. No | Title | Author | Work Presented | Methodology | Result Analysis/ Performances Measures | Key Features |
|---|---|---|---|---|---|---|
| I. | Internet of Things based system for Smart Kitchen | Chatterjee, Jyotir Moy, et al. | Proposes an IoT-based system to automate kitchen tasks and enhance efficiency and safety in kitchen environments. | - Develops an IoT-enabled system for monitoring and controlling kitchen appliances.<br>- Uses sensors for tracking appliance usage and ingredient status.<br>- Incorporates wireless communication for remote access and control. | - Improved energy efficiency and reduced manual oversight in kitchen operations.<br>- Enhanced safety through real-time monitoring of appliances and cooking processes. | - IoT integration for real-time appliance monitoring and control.<br>- Remote access to kitchen systems via mobile devices.<br>- Sensor-based tracking for ingredient availability and energy usage. |

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| 2. | Application of Artificial Intelligence in Smart Kitchen | Vu, Trieu Minh, and Riva Khanna | Investigates the application of AI technologies to improve kitchen automation and enhance the user experience. | AI techniques applied in smart kitchen systems (e.g., machine learning for recipe recommendation, computer vision for ingredient identification).<br>- Develops a smart kitchen prototype integrating AI-based sensors and recommendation systems. | - Demonstrates improved efficiency in kitchen task automation, reducing user intervention.<br>- Enhanced recipe recommendation accuracy through AI learning models. | - AI-powered ingredient identification using computer vision.<br>- Recipe recommendation based on user preferences and available ingredients.<br>- Prototype for AI-integrated smart kitchen appliances. |
| 3. | YORI: Autonomous Cooking System Utilizing a Modular Robotic Kitchen and a Dual-Arm Proprioceptive Manipulator | Noh, Donghun, et al. | Introduces YORI, an autonomous cooking system that leverages a modular robotic kitchen and a dual-arm manipulator. | - Utilizes a dual-arm proprioceptive manipulator for performing cooking tasks.<br>- Modular robotic kitchen system to integrate with appliances.<br>- Employs AI-based control algorithms for cooking automation. | - Achieves successful completion of diverse cooking tasks with high precision.<br>- Significant improvements in the efficiency of multi-step cooking processes. | - Modular robotic kitchen system designed to integrate with typical kitchen appliances.<br>- Dual-arm manipulator with proprioception for precise cooking actions.<br>- Capable of handling complex, multi-step cooking tasks autonomously. |

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| 4. | Design and Implementation of Smart Kitchen Safety Protection System for Empty Nesters | Geng, Haopeng, Baoju Liu, and Honglin Fang | Presents a smart kitchen safety system specifically designed to protect elderly people (empty nesters) from common kitchen hazards. | - Uses IoT sensors to monitor kitchen conditions (e.g., gas leaks, stove use, fire hazards).<br>- Incorporates real-time alerts and notifications to family members or caregivers.<br>- Develops an automated shut-off mechanism for appliances in case of danger. | - Successfully demonstrates enhanced safety by preventing accidents in real-time.<br>- Significant reduction in kitchen-related risks for elderly individuals living alone. | - IoT-based monitoring of critical kitchen safety parameters (e.g., gas, fire).<br>- Real-time alerts and emergency shutdown of appliances.<br>- Designed specifically for the elderly (empty nesters), focusing on simplicity and reliability. |

# METHODOLOGY

## CSP Algorithm:

- Variables: Ingredients, meal time, dietary preferences.
- Constraints:  Nutritional goals, available ingredients, cooking time.
- Solution Process: Backtracking and constraint propagation used to find optimal meal plans.

## Flowchart

User inputs → CSP processes constraints → Generates meal plan suggestions.

# PROPOSED SOLUTION

**Optimization:**
**Improve constraint handling to reduce computation time.**

**IoT Integration:**
**Connect with smart kitchen appliances to track ingredient usage.**

**Customizable constraints:**
**Users can adjust time, ingredients, and portion size.**

# CONCLUSION

**Summary: The project automates meal planning, reduces food wastage, and promotes healthier eating using CSP.**

**Impact: Simplifies meal preparation and helps users stick to dietary goals.**

**Future scope: Integrate with grocery services and health data for more personalized suggestions.**

# REFERENCES

[1] Chatterjee, Jyotir Moy, et al. "Internet of Things based system for Smart Kitchen." *International Journal of Engineering and Manufacturing* 8.4 (2018): 29.

[2] Vu, Trieu Minh, and Riva Khanna. "Application of artificial intelligence in smart kitchen." *International Journal of Innovative Technology and Interdisciplinary Sciences* 1.1 (2018): 1-8.

[3] Noh, Donghun, et al. "YORI: Autonomous Cooking System Utilizing a Modular Robotic Kitchen and a Dual-Arm Proprioceptive Manipulator." *arXiv preprint arXiv:2405.11094 (2024).*

[4] Geng, Haopeng, Baoju Liu, and Honglin Fang. "Design and Implementation of Smart Kitchen Safety Protection System for Empty Nesters." *2023 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB)*. IEEE, 2023.

# THANK YOU