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# NU_RGB_Notched-N_wordmark_RB

# A Generative AI Tool for Recipe Creation Based on Available Household Ingredients

**Reducing Food Waste and Enhancing Meal Planning with Ingredient-Aware AI Recipes**

IE7374

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## Project Title & Description

A Generative AI Tool for Recipe Creation Based on Available Household Ingredients

A generative AI-powered tool designed to help users create meal ideas from ingredients they already have at home. By inputting a list of grocery items, users receive one or more recipe suggestions that incorporate those items effectively. The system leverages natural language processing and generative models to craft complete and coherent recipes including ingredients lists, instructions, and preparation times. This tool aims to reduce food waste, save time, and inspire home cooking using artificial intelligence.

## **Problem Statement**

Food waste is a major global issue about one-third of all food produced is lost or wasted, much of it at the household level. A common reason is that people forget about or don’t know what to do with the ingredients they already have at home. Many struggle to come up with meal ideas based on random ingredients in their kitchen, leading to repetitive meals or groceries going unused. This is especially frustrating for people with dietary preferences, like vegetarians, who already have fewer options. There’s a need for a smart, easy-to-use tool that helps people turn what they have into something they actually want to eat reducing food waste, saving money, and making mealtimes more enjoyable. Generative AI can help solve this by creating personalized recipes based on what's in your fridge and how you like to eat.

## Background

There’s been some exciting progress in using AI to help with meal planning, especially with models like transformers that can generate structured content like recipes. For example, RecipeGPT is a project that shows how a language model can take a list of ingredients and turn it into a full recipe that actually makes sense. Tools like SHARE go a step further by adjusting recipes to match specific dietary needs, like making something vegetarian or gluten-free. On the consumer side, apps like DishGen and MealPractice let you plug in what you have at home and get recipe suggestions, which is great for avoiding food waste. Even Allrecipes has a cool feature that works with Snapchat—you can scan what’s in your fridge and get ideas for what to cook. That said, most of these tools are still quite general. There’s still room for something more focused: a smart system trained specifically on cooking data, designed to really understand ingredients and help people make the most of what they already have.

## Methodology

1. NLP & Generative Models

* Fine-tune a pre-trained language model (e.g., GPT-2 or GPT-3) on recipe datasets like Recipe1M+ or one from Food.com/Kaggle

1. Ingredient Embeddings

* Use word embeddings or transformer encodings to capture semantic similarity between food items

1. Prompt Engineering

* Guide the generative model to create recipes in a consistent and structured format

1. Frontend Interface

* A simple web page or CLI for users to input ingredients and view recipes... Streamlit?

Libraries/Frameworks: PyTorch, Transformers, Pandas, and potentially Streamlit for UI

## Data Sources

Possible data sources:

* Recipe1M+ dataset
* Food.com or Kaggle

## Expected Outcomes

We expect to deliver a working prototype that:

* Accepts a list of grocery items as input
* Returns one or more coherent, diverse, and creative recipes using those ingredients
* Potentially recommends a similar recipe if none exist with the given ingredients
  + Alternatively, could provide a recipe based on ingredients and outputs a grocery shopping list for a few items the user needs

Potential Impact:

* Lowers food waste through better ingredient utilization
* Enhanced user experience for meal planning
* A foundational model that can be expanded for dietary preferences or regional cuisines

## Code Repository

<https://github.com/alliselwah/IE7374_Group4>

## Team Roles

To be determined, pending project proposal feedback.

Akshit:

Anna:

Allison: