D.Y.Patil College Of Engineering, Akurdi

Department of Computer Engineering

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COOKEAZY

Group No. :07

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Introduction

- Many times, people want to try something new, but don’t have sufficient ingredients at home. There is also much confusion about what to cook with the available ingredients. Further, there might not have sufficient time to get more ingredients from the markets due to various reasons. The only option is to make the best use of all the available ingredients.

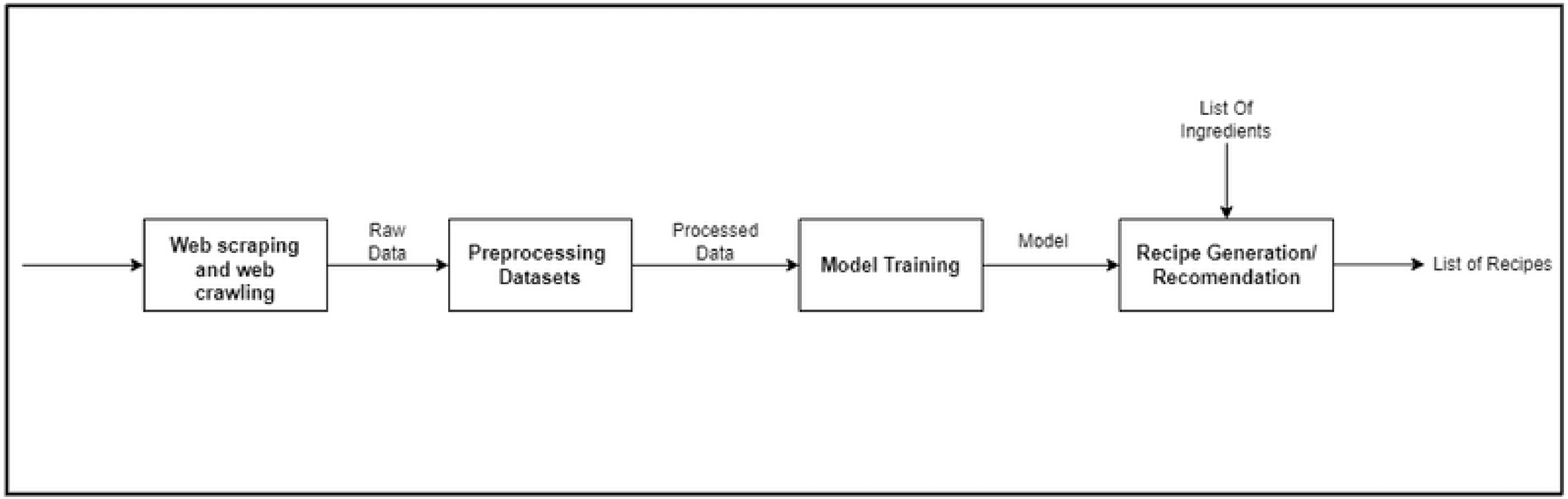
- We will provide a way to cook the best possible dish from leftover ingredients. Our project provides a recipe that can be cooked with the available ingredients.

Problem Statement

- There is a need for a system that will accept ingredients as an input field and generate and recommend recipes accordingly, thus saving a lot of time and effort. To reduce the manual task of repeatedly giving ingredients as input, a home grocery dataset can be linked by the system.

- Thus we need a robust system that can make cooking a lot more convenient and promote a healthy lifestyle.

Proposed Work



Proposed Work Methodology

LITERATURE SURVEY

Sr. No.	Title, Conference and Publication year	Description	Challenges
1.	RecipeBowl: A Cooking Recommender for Ingredients and Recipes Using Set Transformer 14 Oct 2021 , IEEE	In this work, the author proposes RecipeBowl which is a cooking recommendation system that takes a set of ingredients and cooking tags as input and suggests possible ingredient and recipe choices.	The trained model provides recommendations based on similarity-based rankings calculated between its predicted ingredient/recipe with the actual ones

Sr. No.	Title, Conference and Publication year	Description	Challenges
2.	Recommendation of Indian Cuisine Recipes based on Ingredients. 2019 IEEE 35th International Conference on Data Engineering Workshops (ICDEW)	In this paper, the author purposed a method that recommends recipes for Indian cuisine on the basis of available ingredients and liked cuisine. For this work, the author did web scraping to make a collection of recipe varieties and after that apply the content-based approach of machine learning to recommend the recipes.	The collected dataset has a lot of features like ingredients, steps, time to prepare, etc. but we need only a few features to recommend similar recipes.

Sr. No.	Title, Conference and Publication year	Description	Challenges
3.	Collaborating personalized recommender system and content-based recommender system using TextCorpus, 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS)	In this paper, the author has proposed a method to format the data in the dataset using POS taggers using the NLTK framework. In this paper, the author has proposed a user-profile model which uses this tagging mechanism to provide better recommendations compared to the existing state-of-the-art recommender techniques	This paper presents an effective approach for the efficient retrieval of data of users' interests. The author has proposed the tagging system for the dataset and the new user-profile design in this paper

Sr. No.	Title, Conference and Publication year	Description	Challenges
4.	Shobhna Jayaraman'. Tanupriya Choudhury, Praveen Kumar; 2017 International Conference On Smart Technology for Smart Nation; Analysis of Classification Models Based on Cuisine Prediction Using Machine Learning.	In this paper author aimed to bring attention from recipe recommendations to studying and analyzing the underlying correlation between the cuisine and their recipe ingredients. the correlation between various recipes and their ingredient sets.	Even after comparing various classification models and finding their respective accuracy and time consumed, the results may vary based on the dataset taken into consideration.

Sr. No.	Title, Conference and Publication year	Description	Challenges
5.	Suyash Maheshwari, Manas Chourey, 2017, “International Research Journal of Engineering and Technology (IRJET)” Recipe Recommendation System using Machine Learning Models.	Here, the author used two machine learning models- vector space model and the Word2Vec model to find top ingredient pairs from different cuisines and to suggest alternate ingredients. The focus is on Indian cuisine. Indian cuisine is very vast and diverse and hence it is difficult to find patterns and generate pairs.	Completing recipes is a challenging task, as the success of ingredient combinations depends on a multitude of factors such as taste, smell and tex ture.

Sr. No.	Title, Conference and Publication year	Description	Challenges
6.	Recipe Recommendation System with Ingredients Available on User; Siddharth Raj , Dr Ajay Shanker Singh, Ayush Sinha, Anandhan K., Mayank Srivastav. 2021, 3rd International Conference on Advances in Computing,	In this paper, the author aimed to bring attention from recipe recommendations to studying and analyzing the underlying correlation between the cuisines and their recipe ingredients. The correlation between various recipes and their ingredient sets were investigated.	The users need to learn all the machine learning algorithms for the recommendation system

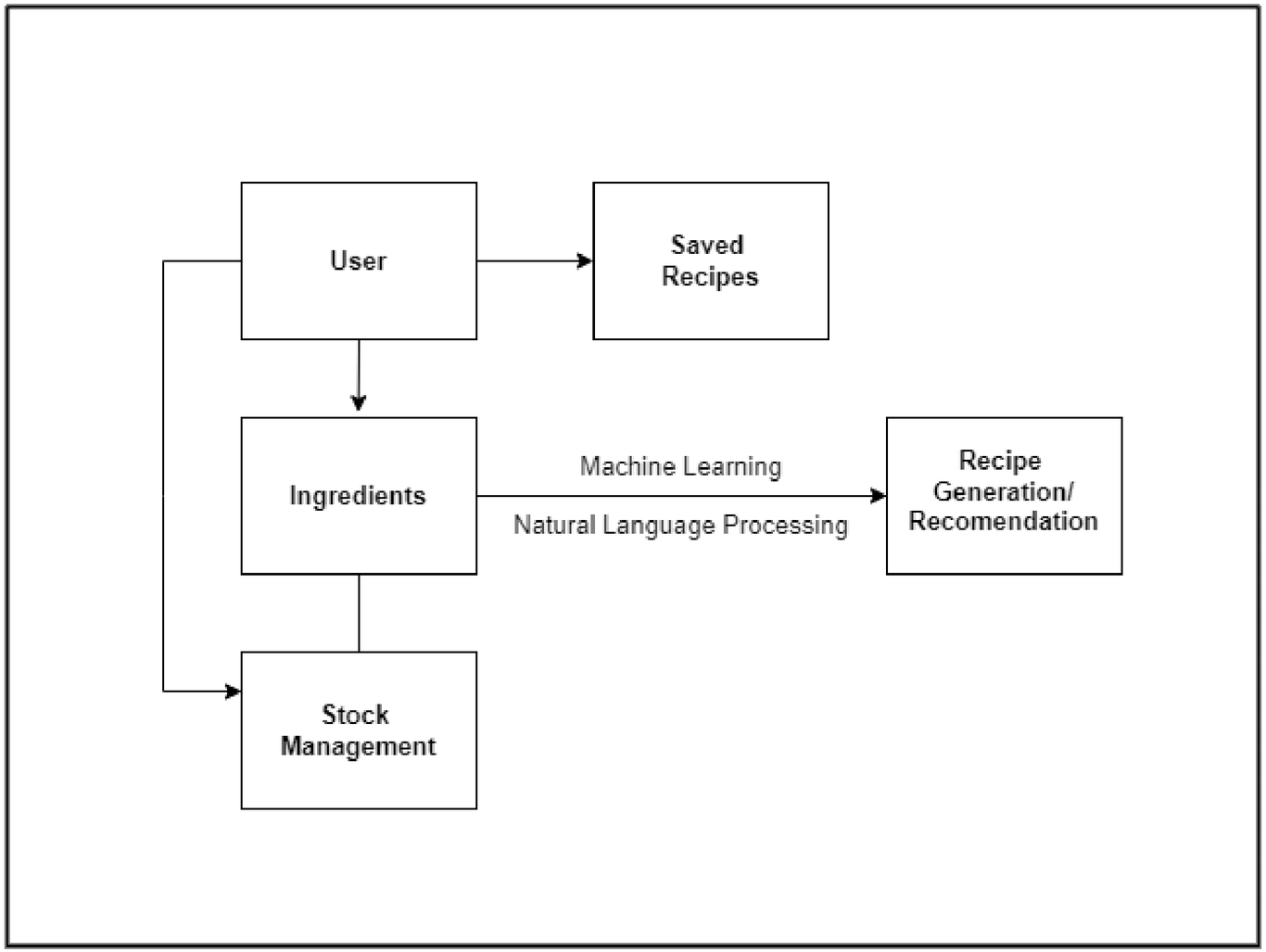
Sr. No.	Title, Conference and Publication year	Description	Challenges
7.	A Novel recipes recommendation system Based on Knowledge-Graph ; Bo Huang*, Xiaonan Shi, Rongqiang Wang, Chenyang Wang, Yuanhao Han. 2022, 7th International Conference on Intelligent Computing and Signal Processing (ICSP)	In this paper, Author crawled recipe knowledge through crawlers and built a dietary knowledge graph integrating multi-domain information by using the rich semantics of knowledge graph.	The expansion of the knowledge graph is indispensable, and more disease diet information should be added to meet the recommendation needs of different people.

Sr. No.	Title, Conference and Publication year	Description	Challenges
8.	Discovery of Recipes Based on Ingredients using Machine Learning. Feb 2019 International Research Journal of Engineering and Technology (IRJET)	In this paper, a recommendation method is used in which the ingredients available by the user are taken as input an analyzing process is done with the help of the data set collected, and the appropriate dishes or recipes are recommended to the user by Machine Learning using K-Nearest Neighbors algorithm.	In this paper author used KNN classifiers, we can use a better classification algorithm for a better recommendation system.

Sr. No.	Title, Conference and Publication year	Description	Challenges
9.	Recommendation System for Alternative ingredients Based on Co-occurrence Relation on Recipe Database and the Ingredient Category 2016 International Congress on Advanced Applied Informatics	This paper proposes a recommendation system for alternative ingredients. The recommended ingredients are based on the co-occurrence frequency of ingredients on the recipe database and ingredient category stored in a cooking ontology.	The quantity of ingredients should be recommended along with ingredient name.

Sr. No.	Title, Conference and Publication year	Description	Challenges
10.	Collaborative Filtering Recommendation Algorithm Based on Random Forest Filling, 2019 IEEE 2nd International Conference on Information Systems and Computer Aided Education (ICISCAE)	This paper is aiming at the sparsity problem of data sets in the field of information recommendation, a collaborative filtering recommendation algorithm based on random forest filling is proposed. First, the ID3 algorithm is adopted to construct the decision trees, and the random forest is composed of the decision trees.	This paper is analysis of collaborative filtering using random forest algorithm

System Architecture



System Architecture

Algorithms

Web scraping and web crawling

Web scraping:
It refers to the process of extracting information from websites by using software tools that simulate human browsing behavior. This typically involves automated scripts or programs that visit websites, analyze their content, and extract data that is relevant for a particular purpose.

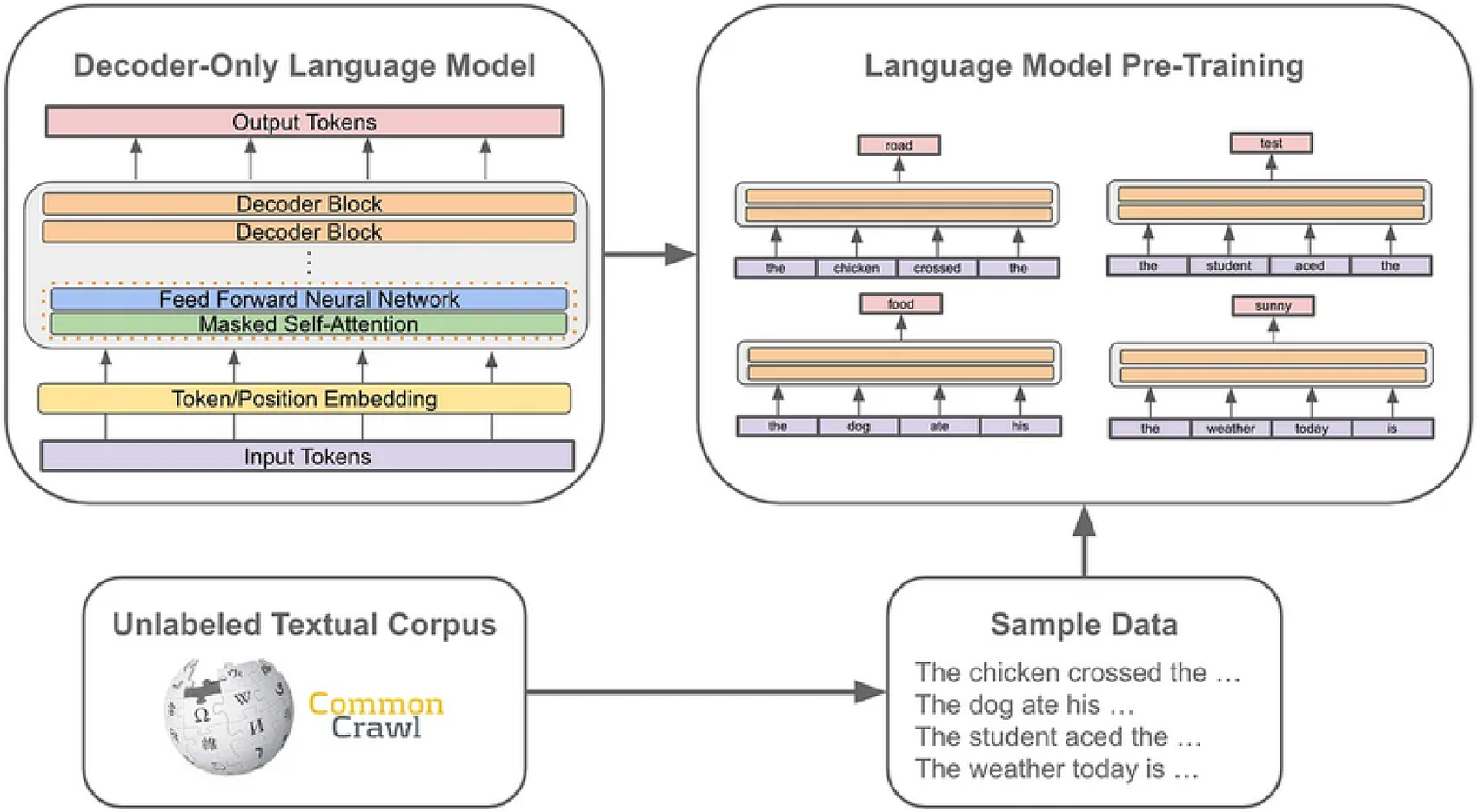
Web crawling :
It is the process of systematically exploring the internet and following links from one page to another. Web crawlers are designed to visit as many pages as possible and to collect as much data as they can, including text, images, links, and other types of content.

Algorithms

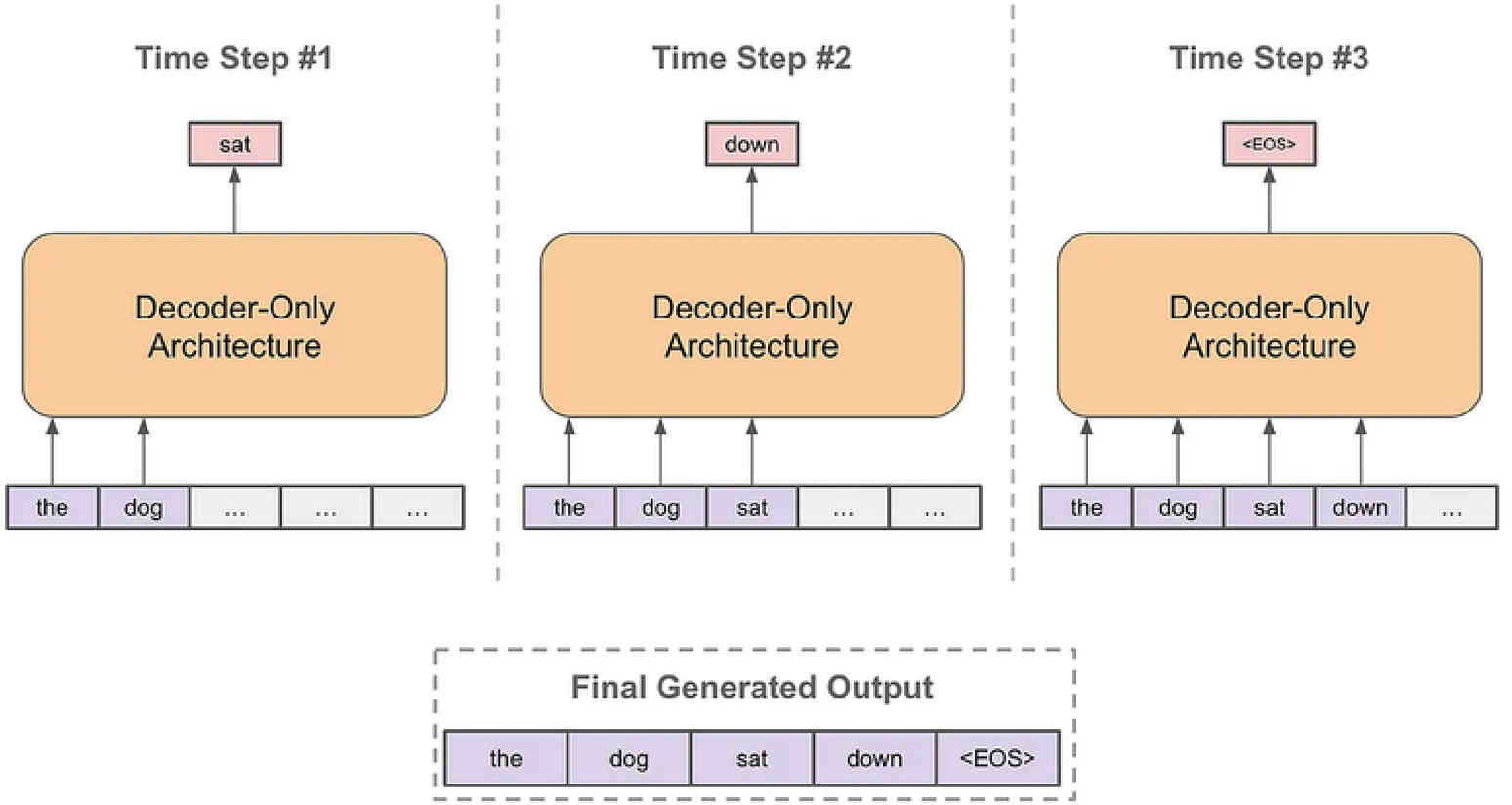
GPT-2 (Generative Pre-trained Transformer 2)

GPT-2 is a transformer-based language model that can be used for recipe generation and recommendation by training it on a large corpus of recipe data. It can capture complex relationships between ingredients and generate natural language text, making it suitable for tasks like recipe generation and recommendation. Additionally, GPT-2 has achieved state-of-the-art results on a range of natural language processing tasks, including language modeling, text completion, and question answering, making it a promising choice for recipe suggestion websites

GPT-2 Basic working :



- ***Model's output at time t is used as input at time (t+1) that can continually predict the next token in a sequence***



Mathematical Model

- *Set of tokens (of size N) that comprise our pre-training dataset :*

$$\mathcal{U} = \{u_1, u_2, \ldots, u_N\}$$

- *Given a deep learning model with parameters θ, a language modeling objective tries to maximize the likelihood shown below:*

$$\mathcal{L}(\mathcal{U}) = \sum_{i=1}^{N} \log\left(\mathbb{P}(u_i | u_{i-k}, \ldots, u_{i-1}, \Theta)\right)$$

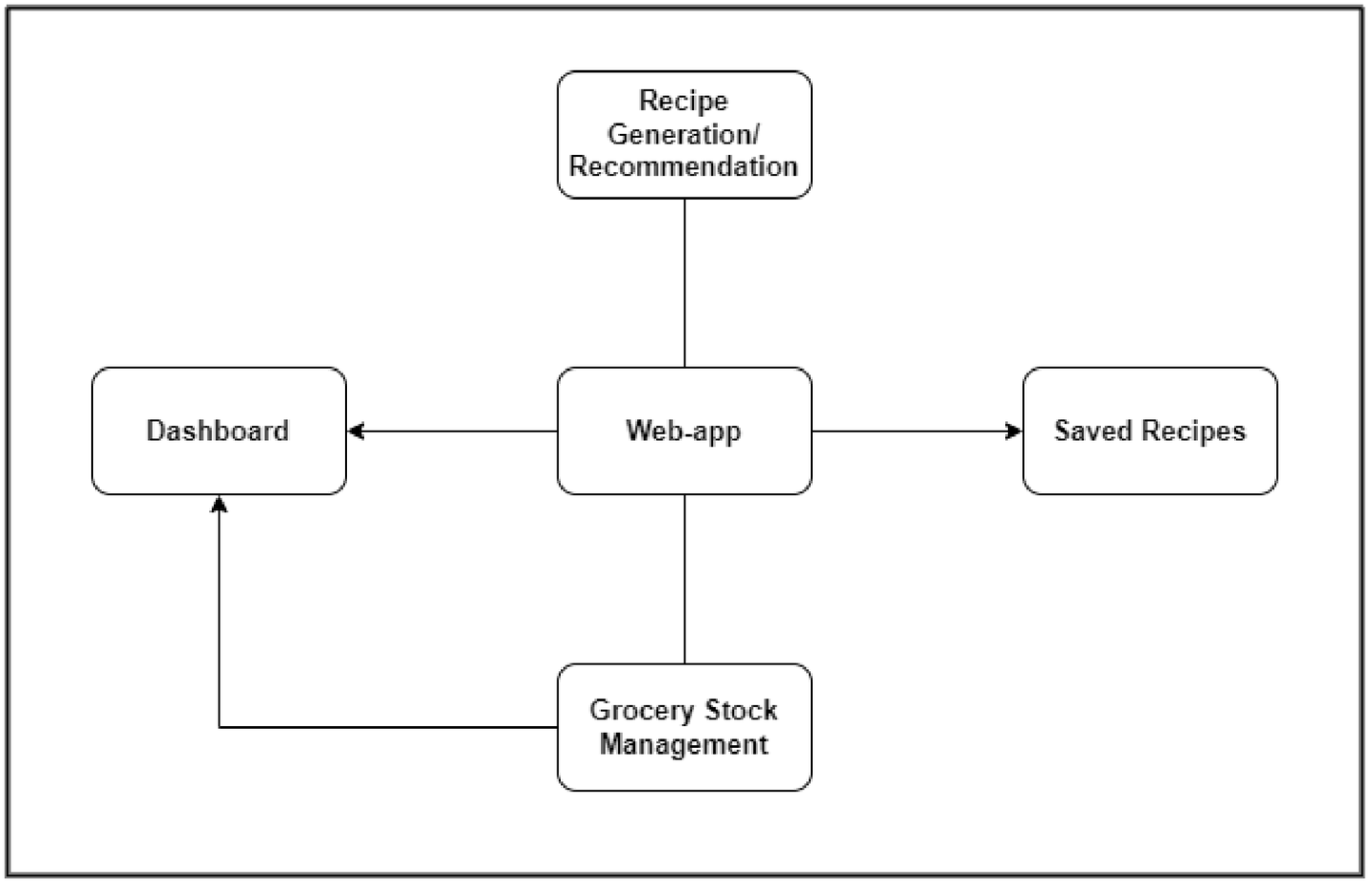
Language model loss over the full text corpus

Conditional probability of i-th token given k preceding tokens and model parameters θ

- *This expression characterizes the model's probability of predicting the correct next token given k preceding tokens as context.*

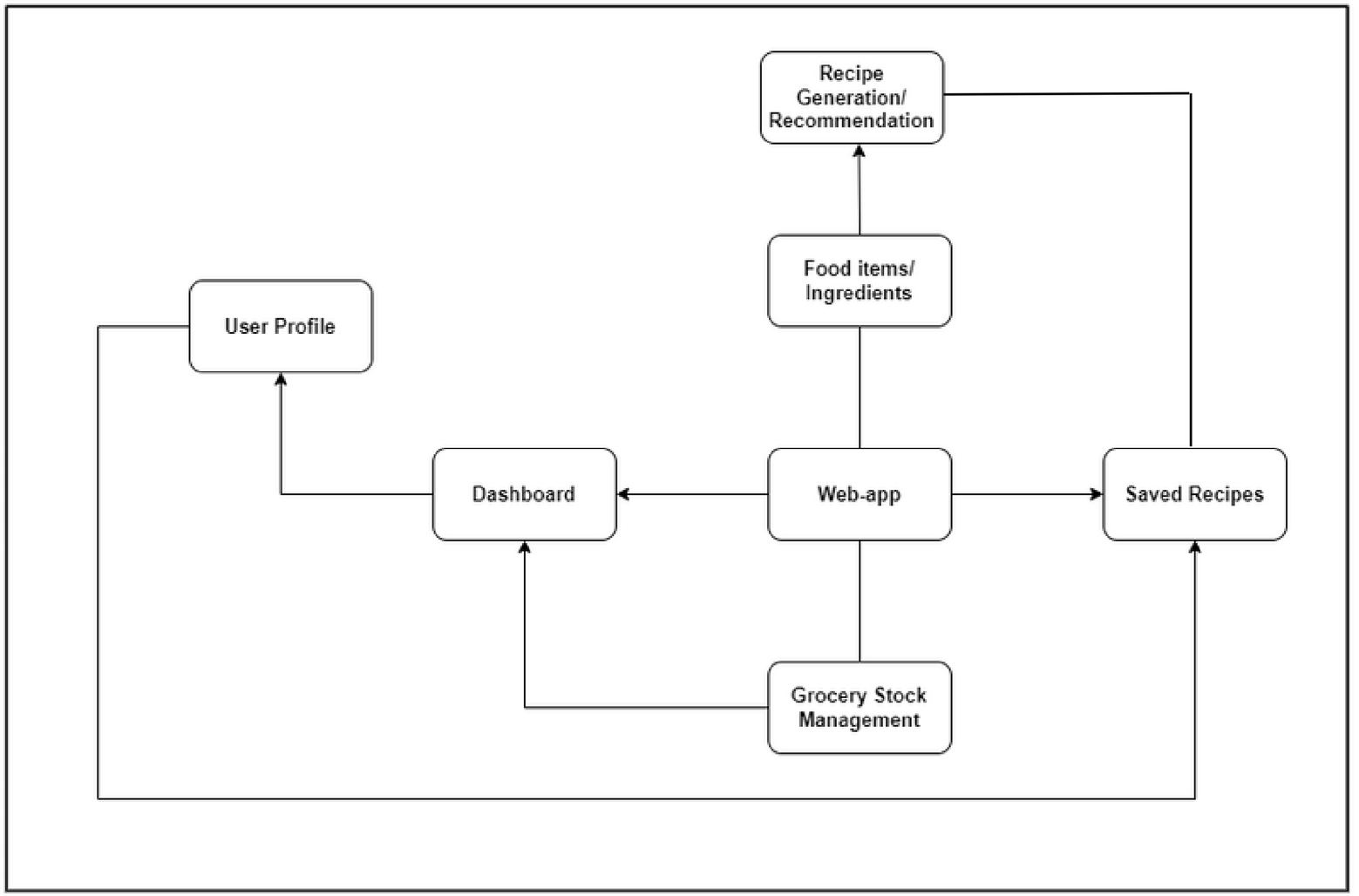
System Modeling

DFD Level 0



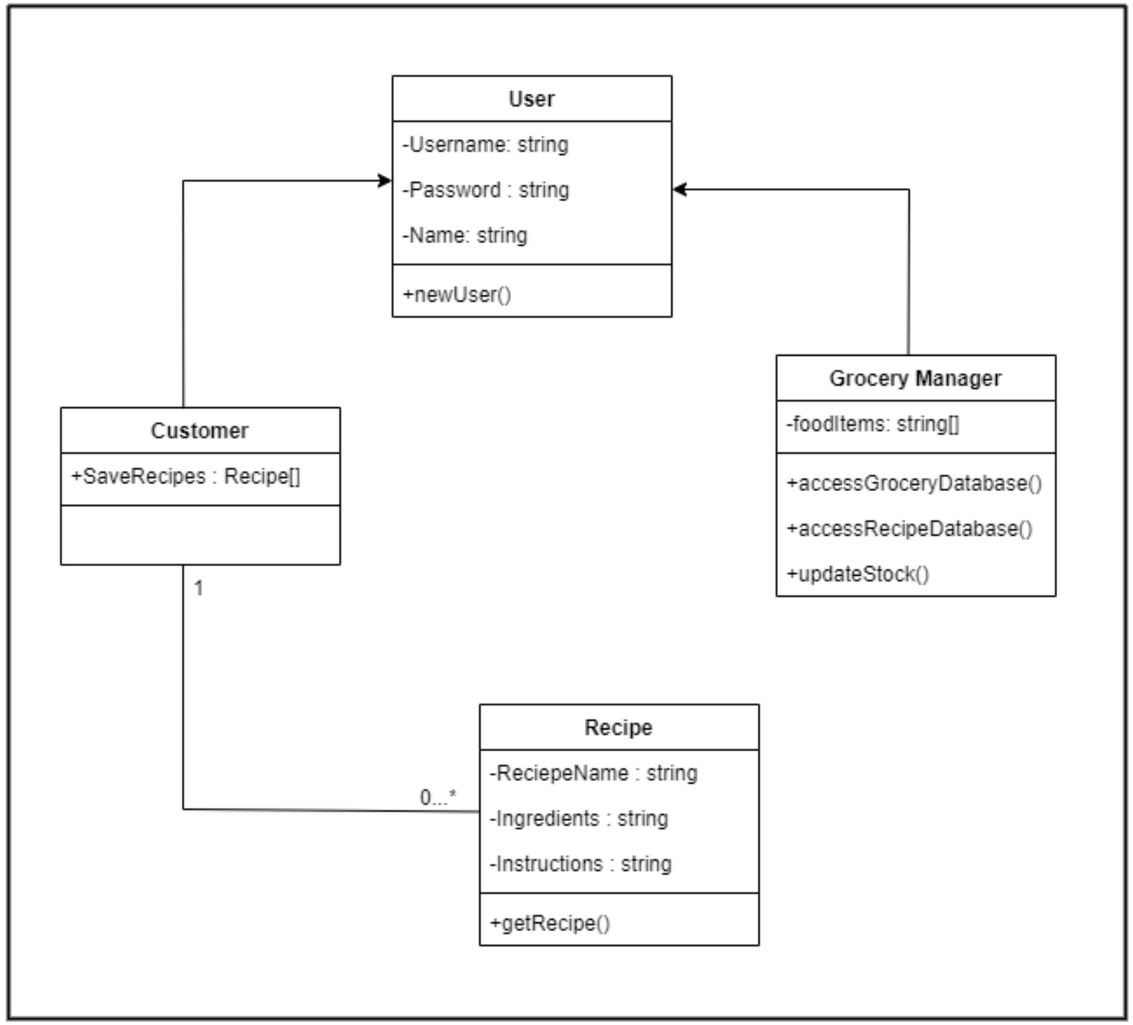
DFD Level 0

DFD Level 1



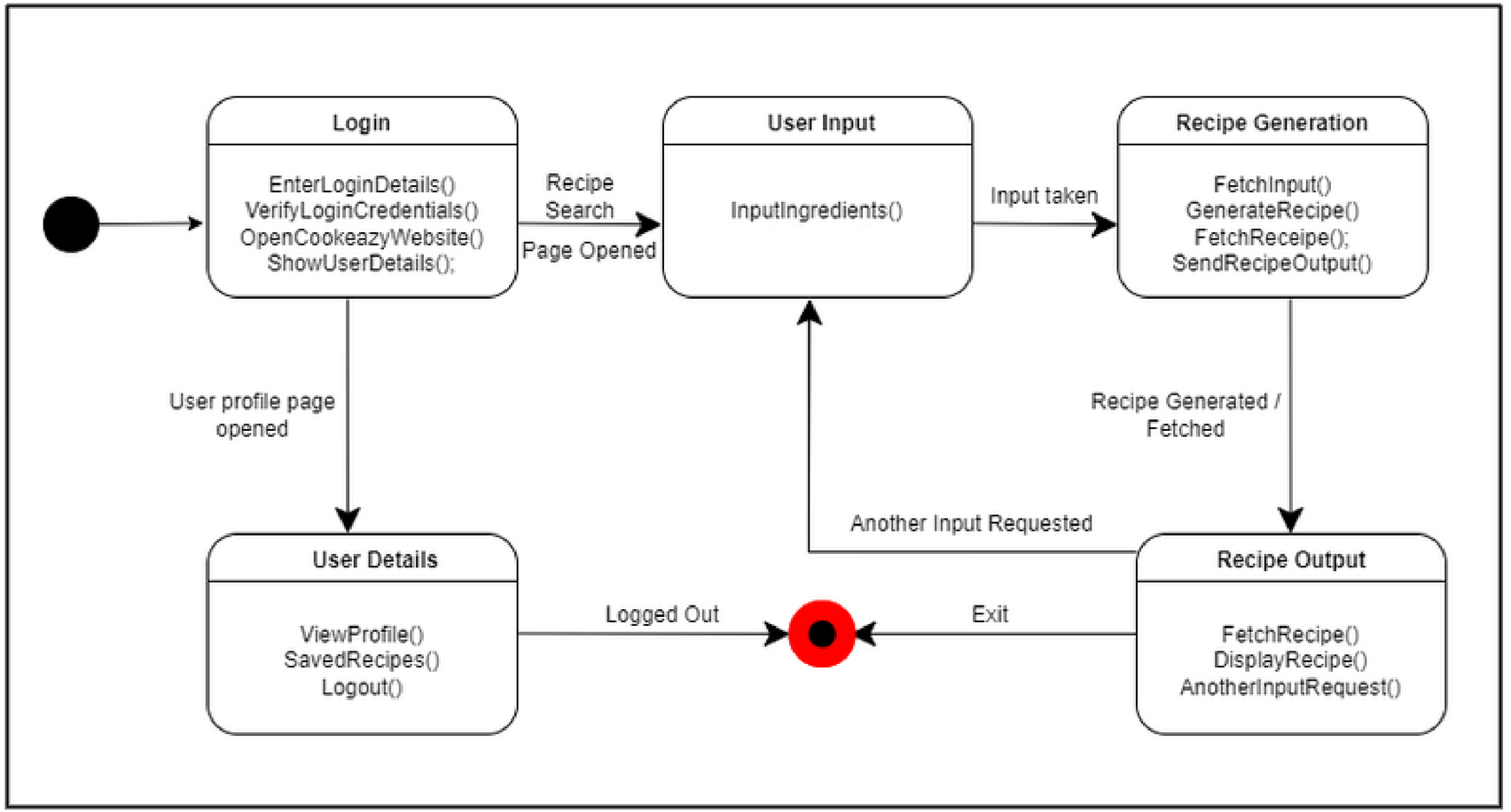
DFD Level 1

Class Diagram



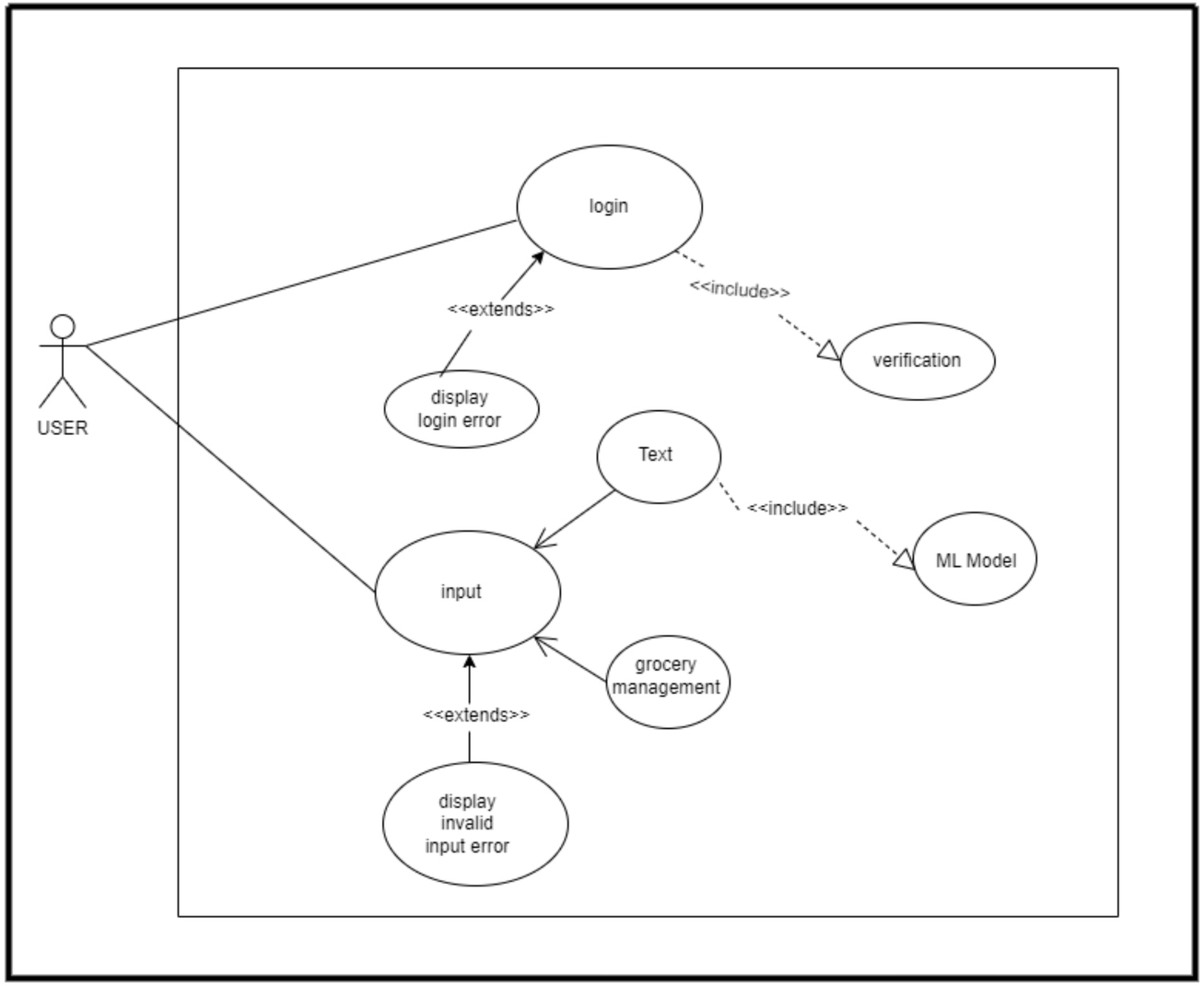
Class Diagram

State Diagram



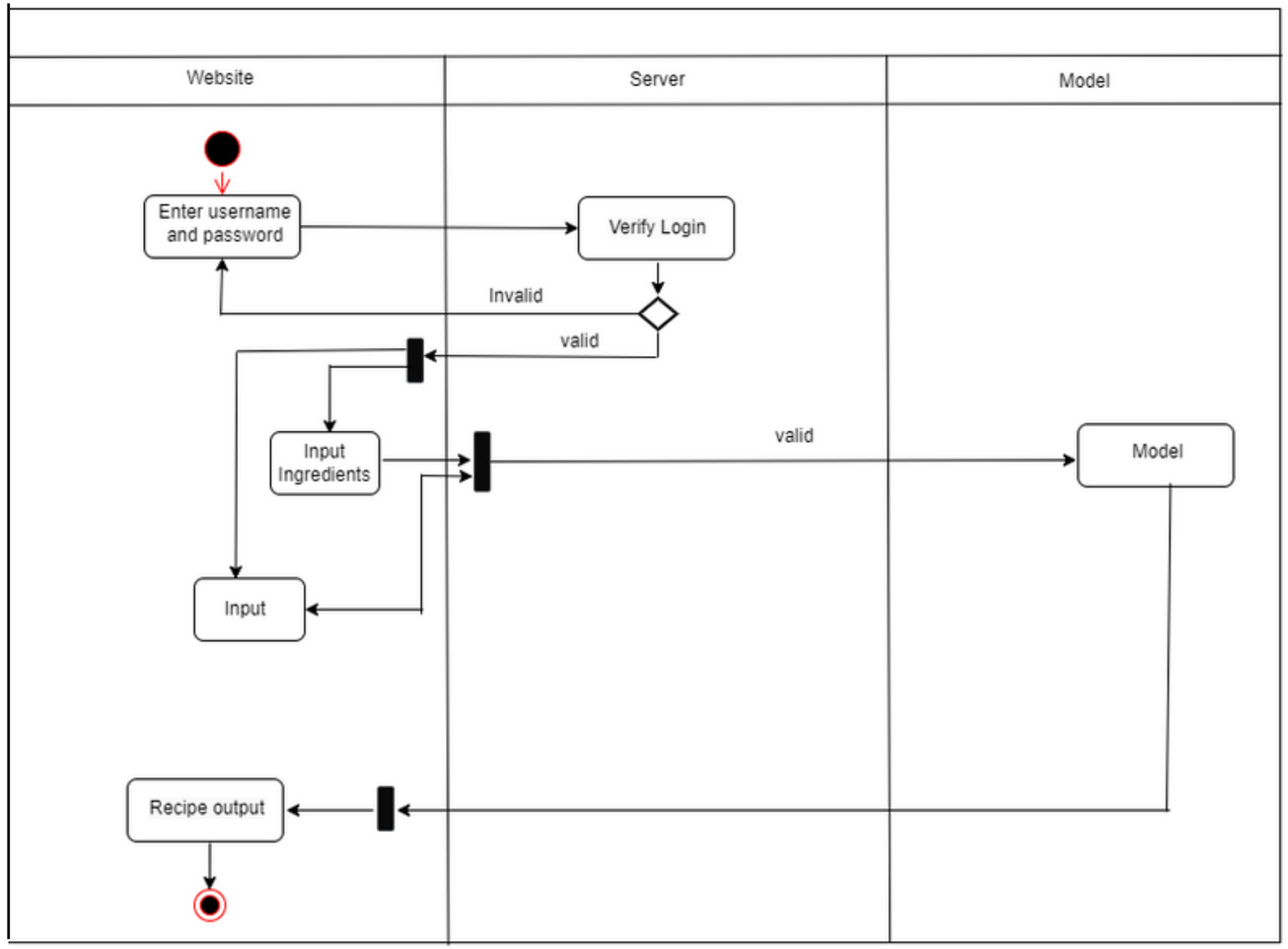
State Diagram

Use Case Diagram



Use Case Diagram

Activity Diagram



Activity Diagram

TEST CASES

Sr. No.	Test Case	Results
1.	To check the registration functionality of Users.	Only the registered users are able to login using their email and password.
2.	To check the login functionality of Developers.	Registered users are able to login successfully.
3.	To check whether the visualisation is visible and should change for different parameters	Visualization is visible and changes with different parameters.

Sr. No.	Test Case	Results
4.	To check if the user can save recipes.	Users are able to save recipes.
5.	To check if the recipes suggested has the ingredients selected by the user.	It generates and recommends correct recipes according to the ingredients.
6.	To check if the users can see their dashboard.	Users are able to view the dashboard.
7.	To check if the users can see their grocery stock	Users are able to check their rece grocery stock available.

Conclusion

To conclude, transformers such as GPT-2 offer significant advantages over traditional machine learning algorithms like KNN, SVM, decision trees, and random forest for recipe generation models. With their ability to handle large amounts of unstructured text data and generate human-like responses, transformers can provide more personalized and engaging recipe recommendations to users based on their preferences and previous interactions with the website. Additionally, transformers can learn complex relationships between words and phrases and produce more creative and diverse outputs than rule-based or statistical models.

Future Scope

A basic recipe generation model developed using transformers and GPT-2 has vast potential for future development and improvement.

- Multimodal recipe generation, which could incorporate additional modalities such as images or user preferences to produce more contextually relevant and personalized recipe recommendations.
- Integration with e-commerce platforms would provide a seamless end-to-end solution for users by allowing them to purchase necessary ingredients directly from the website.
- Customized recipe generation can be achieved by training the model on user-specific data such as dietary restrictions, cuisine preferences, or cooking skill level, which can result in even more personalized and relevant recipe recommendations.
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