

ABSTRACT

This project report introduces "Taste of Nepal," a comprehensive Wholesome platform integrating React, Node.js, Express, MongoDB, and a Machine Learning-driven chatbot with image recognition of Nepali food pictures. "Taste of Nepal" aims to simplify the exploration of Nepali cuisine and culture, offering a user-friendly interface to access a diverse database of recipes while exploring the rich history of Nepali Wholesome traditions. By leveraging modern technology and intuitive design, the project seeks to empower a broad audience, from beginner cooks to Wholesome enthusiasts, nurturing cross-cultural appreciation and making the complicated world of Nepali cuisine both accessible and engaging. Through this project, we aspire to promote Wholesome exploration and cultural understanding, one delicious dish and historical insight at a time.

Keywords: *Image Classification, MultiLayer Perceptron, Machine learning.*

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LIST OF ABBREVIATIONS

API: Application Programming Interface

CNN: Convolutional Neural Network

ML: Machine Learning

ReLU: Rectified Linear Unit

RAD : Rapid Application Development

TON: Taste Of Nepal

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

"Taste of Nepal" – your ultimate destination for a delightful wholesome journey through the rich and diverse flavors of Nepali cuisine. The website not only serves as a treasure trove of mouthwatering recipes but also offers an image classifier facility that connects you with the past history and cultural significance with the help of images of these delectable cuisines.

The image classifier, your friendly wholesome companion, will not only guide you through the step-by-step preparation of authentic Nepali cuisine but will also take you on a historical journey, unraveling the stories and traditions behind each cuisine. Discover how the flavors of Nepal have evolved over centuries and how they have been lovingly passed down through generations.

Whether you're an experienced chef looking to master the art of Nepali cooking or a beginner eager to explore new tastes, "Taste of Nepal" has something for everyone. Join us on this gastronomic adventure to celebrate the past, savor the present, and prepare for a future filled with the delightful flavors of Nepali cuisine. Get ready to embark on a wholesome Journey like no other, right here on the "Taste of Nepal" website.

1.2 PROBLEM STATEMENT

Despite the growing interest in global cuisines and wholesome exploration, there is a notable lack of easily accessible and comprehensive resources dedicated to Nepali cuisine. The absence of a centralized platform that not only provides authentic Nepali cuisine but also educates users about the historical and cultural significance of these cuisines poses a significant challenge for individuals seeking to immerse themselves in the flavors of Nepal.

1.3 OBJECTIVES

- To develop a web platform enabling users to explore and submit Nepalese recipes, featuring image recognition using CNN algorithm for cuisine identification and historical insights.

1.4 SCOPE AND LIMITATION

The detailed exploration of the Taste of Nepal project encapsulates a comprehensive analysis of its scope and limitations. The enumeration of these aspects provides an understanding of the project's strengths and areas for improvement. It sheds light on both the expansive reach and potential growth opportunities, as well as the identified constraints and areas requiring strategic enhancements. This holistic examination not only pinpoints the project's current standing but also serves as a foundation for future endeavors, fostering a dynamic and adaptive approach to continuous improvement.

1.4.1 Scope

1. It integrates an advanced image classifier for skillful image recognition.
2. Recognition unlocks insights into the rich history of Nepali cuisine.
3. Users can actively participate by contributing and sharing authentic Nepali recipes.
4. Through user engagement, culinary knowledge is shared with a broad audience.
5. The platform actively promotes and shares Nepali recipes.

1.4.2 Limitations

1. Limited dataset availability challenges historical information provision for featured food items, with ongoing efforts to expand and enhance inclusivity.
2. The website predominantly features Newari culture recipes due to data constraints, recognizing the need to represent a broader spectrum of Nepali culinary tradition.

1.5 DEVELOPMENT METHODOLOGY

The project follows the Rapid Application Model (RAD) model.

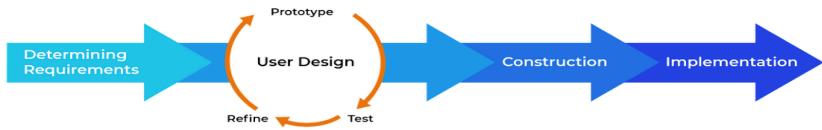


Fig 1-1 RAD Methodology

This project emphasizes rapid development and prototype building over detailed planning, allowing for quick iterations and updates without the need to start anew. The approach prioritizes flexibility, enabling efficient adjustments as the project evolves.

1.6 REPORT ORGANIZATION

The project report adheres to the following structure:

Chapter 1: The Introduction section covers the project's overview, background, objectives, scopes, and limitations.

Chapter 2: The Background Study and Literature Review section explores fundamental theories and general concepts related to the project.

Chapter 3: The System Analysis section outlines the general system architecture, entities, and their interactions. It includes the overall working mechanism, requirements, and feasibility analysis.

Chapter 4: The System Design section provides a diagrammatic representation, including Sequence, Activity, Use-Case, and State diagrams illustrating the entities, their activities, and relationships.

Chapter 5: The Implementation and Testing section details the tools used and project implementation, along with testing conducted in each iteration.

Chapter 6: The Conclusion and Future Recommendations section summarizes the current progress, plans, and critical analysis post-project completion.

CHAPTER 2: BACKGROUND STUDY AND LITERATURE REVIEW

2.1 BACKGROUND STUDY

Nepali food culture is characterized by a diverse range of flavors and dishes that reflect the country's geography, ethnic diversity, and cultural traditions. Staple foods include rice and lentils, often accompanied by a variety of vegetables, pickles, and chutneys. Dal Bhat, a traditional meal consisting of lentil soup, rice, and seasonal vegetables, is a daily staple. Momos (dumplings), Dhindo (traditional millet dish), and various meat curries are also popular. The use of aromatic spices, such as cumin, coriander, and turmeric, adds distinctive flavors. Food in Nepal is not just a culinary experience; it's a cultural expression that brings people together.

The adaptation of foreign food culture has brought both positive and transformative influences to Nepali food culture. Exposure to global cuisines, influenced by international travel and media, has introduced new ingredients, cooking techniques, and flavors to Nepali kitchens. Fusion dishes and creative culinary blends are becoming more prevalent. However, while this infusion adds diversity, it also poses challenges to traditional practices. The increased availability of processed and fast foods may contribute to shifts in dietary habits, potentially impacting the health aspects of the traditional Nepali diet. Balancing the incorporation of foreign elements while preserving the essence of traditional Nepali food remains a dynamic aspect of this cultural evolution.

"Taste of Nepal" is a recipe website with a unique image classifier designed to recognize Nepali food images. This innovative feature goes beyond just offering recipes; it provides users with historical information about each recognized dish. The goal is to encourage people to embrace and maintain their cultural food habits by offering a deeper understanding of the rich history behind each meal. By combining technology and cultural heritage, "Taste of Nepal" aims to create a more engaging and meaningful culinary experience, fostering a connection between users and their traditional Nepali food habits.

2.2 LITERATURE REVIEW

Online recipe websites have undergone a transformative journey since their inception in the early days of the internet. In the early 2000s, these platforms were primarily personal blogs and smaller websites catering to niche audiences [1]. However, with the surge in food culture popularity and a growing demand for culinary knowledge, larger recipe websites like Food.com, Epicurious, and Allrecipes.com emerged. Recent years have witnessed the rise of specialized recipe websites targeting specific dietary preferences such as vegetarian, keto, or gluten-free, and offering meal planning services tailored to health and fitness goals [2]. This diversification is not merely limited to content but extends to interactive features such as video tutorials and user-generated content, enhancing user engagement. These platforms have significantly impacted the food industry, making cooking more accessible and influencing industry trends through the data collected on user behavior and preferences [3]. Information on ingredient popularity, cooking methods, and recipe demand aids companies in staying abreast of industry trends and developing products that resonate with consumers .Research on online recipe websites suggests a need for focus on specific cultural and regional cuisines. Many platforms tend to prioritize Western or Indian recipes, overshadowing core native cuisines that represent diverse cultural identities. Recognizing this gap, efforts have been made to develop platforms that uniquely showcase specific culinary cultures, such as a website dedicated to Nepali food. This approach seeks to highlight the rich diversity of Nepali cuisine and its representation of cultural heritage.Recent research has delved into the realm of food image recognizing chatbots, contributing to advancements in automatic speech recognition and mobile messaging interfaces. A notable example is the Foodbot, which combines these technologies to record food intake, set goals, and offer personalized recommendations [4]. Additionally, efforts have been made to create benchmark datasets for evaluating the performance of food image recognition models. The MyFoodRepo-273 dataset, with 24,119 images categorized into 273 classes, serves as a valuable resource for developing and assessing these chatbots [5]. In line with this research, an approach has been taken to build a food image recognizing chatbot that focuses specifically on Nepali cuisine. Leveraging machine learning tools, such as TensorFlow, this chatbot aims to recognize and provide insights into the history and

cultural significance of Nepali dishes. The fusion of cultural representation and technological innovation seeks to bridge gaps in the recognition of diverse culinary heritages. The evolution of online recipe websites and the emergence of food image recognizing chatbots reflect a dynamic intersection of technology, culture, and culinary exploration. These platforms not only democratize cooking but also contribute to the preservation and celebration of diverse food cultures. The literature reviewed underscores the importance of cultural representation in online platforms, prompting the development of specialized websites that showcase the richness of lesser-represented cuisines like Nepali. The ongoing research in food image recognizing chatbots signifies a promising trajectory in merging technology with cultural identity, creating a more inclusive and engaging culinary experience.

Detailed description of the website which were taken as an references for the literature review with its features

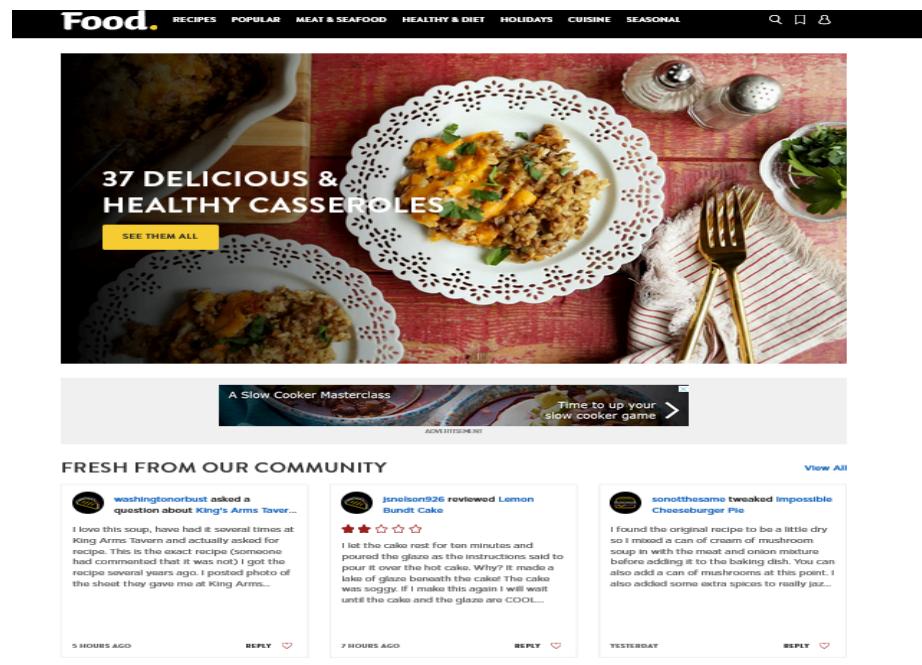
- **Food.com**

The platform predominantly focuses on European delicacies, showcasing their cultural significance and popular dishes within their habitat. Additionally, it features selected Asian continent delicacies, particularly highlighting Indian culinary items. The website not only presents recipes but also offers insights into the cultural importance of these dishes. Users can explore the diverse cooking methods employed to prepare these delicacies, providing a comprehensive understanding of both European and Asian cuisines.

Features

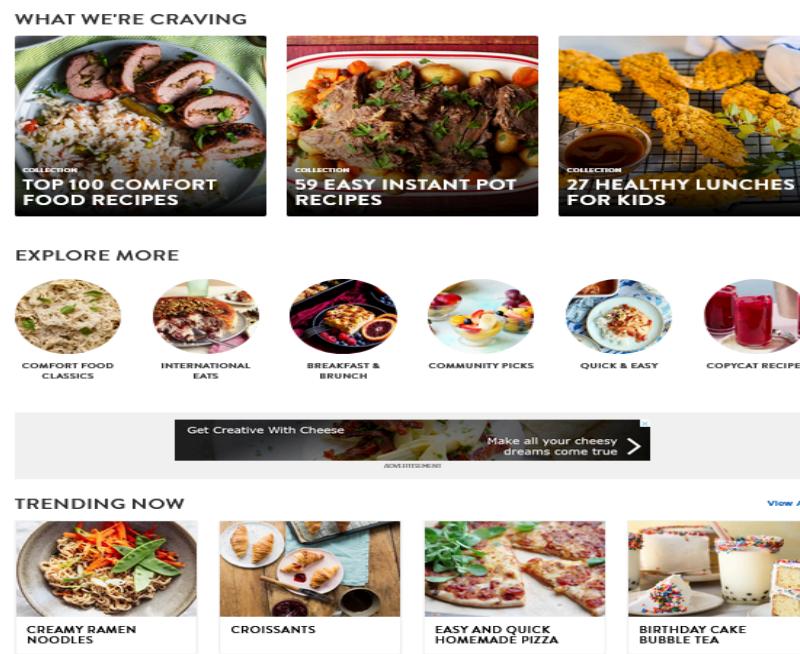
- Recipe of various cuisines
- Healthy and seasonal recipes are also provided
- Community pick section is also where highly demanded recipes from certain regions are shown.

Screenshots



[1] Food., "Source," 2024.

Fig:2-1 Food.com Homepage



[2] Food., "Source," 2024.

Fig:2-2 Food.com categories Section

- **Ranveerbrar.com**

This is an Indian celebrity chef's website which mainly contains different Indian delicacies along with its recipes. Since, the chef also has his own youtube channel the link is also provided where people can enjoy the videos. Blog section is also present where chefs have traveled to different Indian states and lost food items were explored.

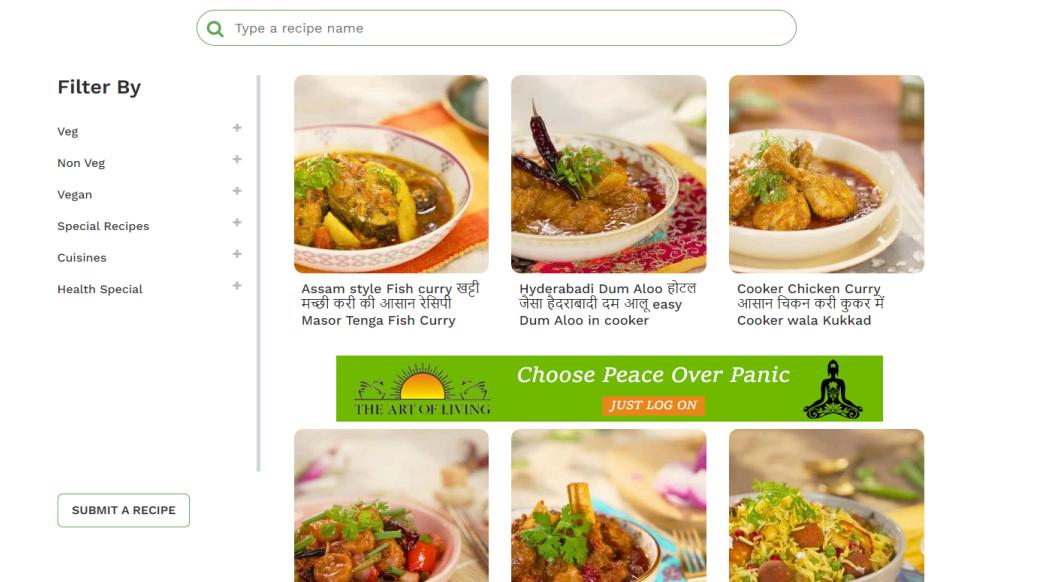
Features

- Boosting Indian cuisine
- Lost traditional recipes are covered
- Video facility are also provided for recipes

Screenshots

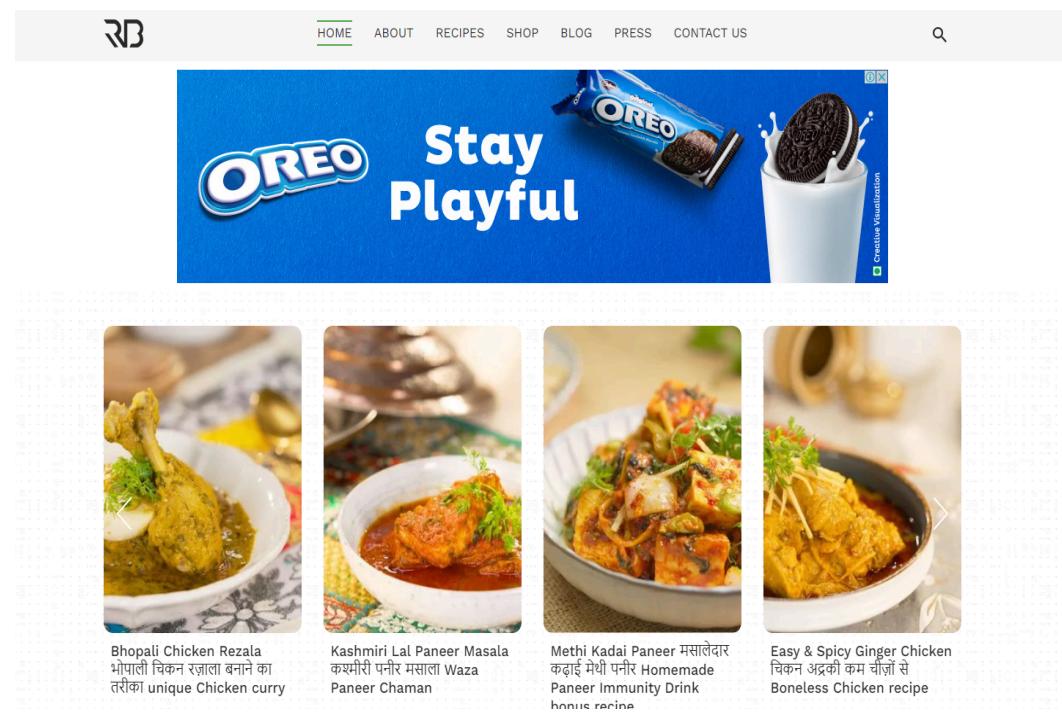
Ranveer's Recipes

Home / Recipes



[3] Brar, "Source," n.d.

Fig 2-3 Ranveer Brar's Website HomePage



[4] Brar, "Source," n.d.

Fig 2-4 Ranveer Brar's Website Categories

CHAPTER 3: SYSTEM ANALYSIS

3.1 SYSTEM ANALYSIS

3.1.1 Requirement Analysis

- **User Registration and Profiles:** Users can create accounts with unique usernames and passwords. Users can edit and manage their profiles.
- **Recipe Database:** The website offers a comprehensive database of Nepali recipes. Users can search for recipes based on keywords, ingredients. Each recipe includes detailed ingredients, step-by-step instructions, preparation time, and serving size.
- **Image classifier:** The Image classifier gets the image as an input from the user, recognizes the image as per the trained dataset and displays the history accordingly.
- **User Feedback and Ratings:** Users can provide feedback on recipes and rate them for quality. The website aggregates ratings to help users discover popular recipes.
- **Mobile Responsiveness:** The website is fully responsive, ensuring a seamless user experience on various devices, including smartphones and tablets.
- **Performance and security:** The website must load quickly to enhance user satisfaction. It should handle concurrent user interactions efficiently, even during peak usage times. User data, including personal information and login credentials, is securely stored and protected.
- **Data Backup and Recovery:** Regular automated backups of the website's data and content are performed. A data recovery plan is in place to minimize downtime in case of data loss.
- **Documentation and Training:** Comprehensive documentation for website administrators and moderators is available. User-friendly guides or tutorials may be provided to help users make the most of the website and chatbot.

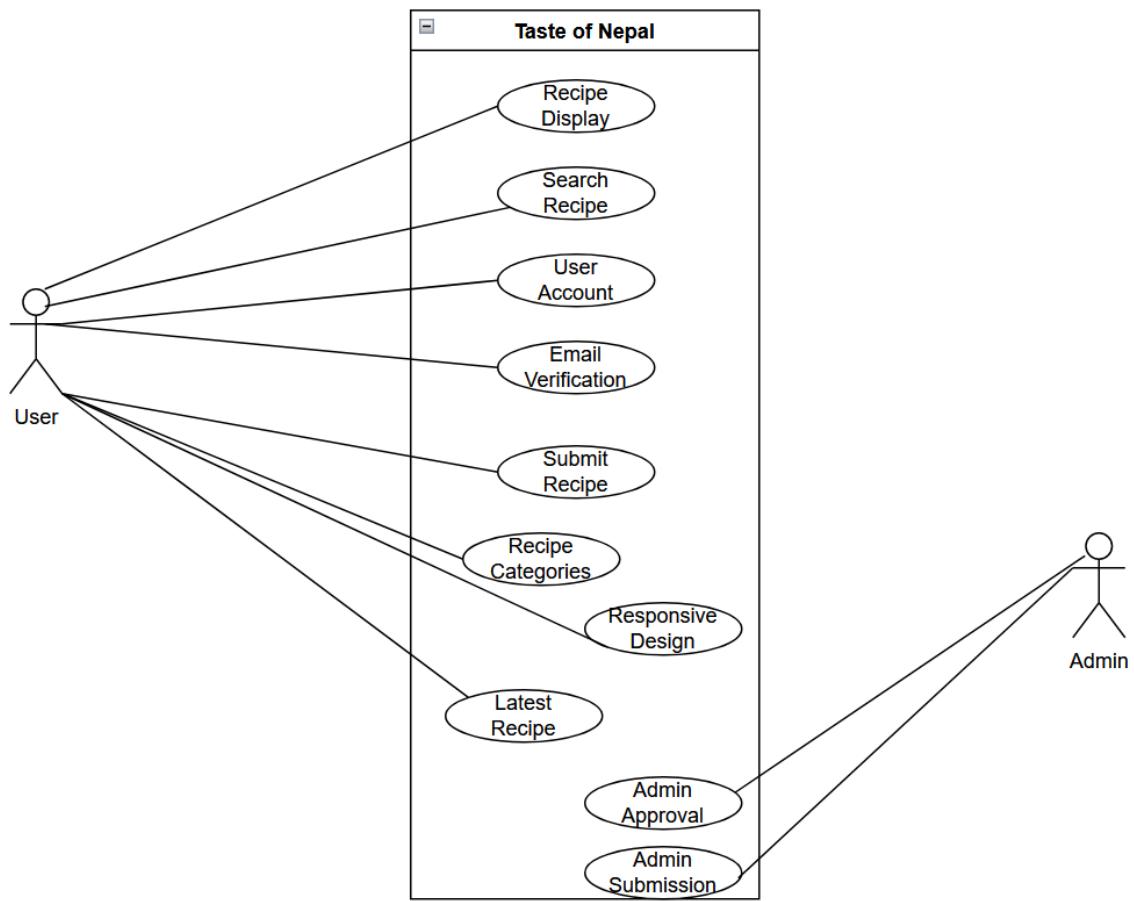


Fig 3-1 Use Case Diagram for food recipe website

In the above use case it is shown that how user interact with the “Taste of Nepal” website where in user can browse recipe posted by admin or other user similarly search for the different recipes which they are fond of .While to submit the recipe user must be registered user and email provided while user registration must be verified one. Users also have the option to search recipes according to the latest posted or random recipes which are published on the website. Similarly, In scenario of the admin it is responsible for submitting the recipe and approving the user submitted recipes.

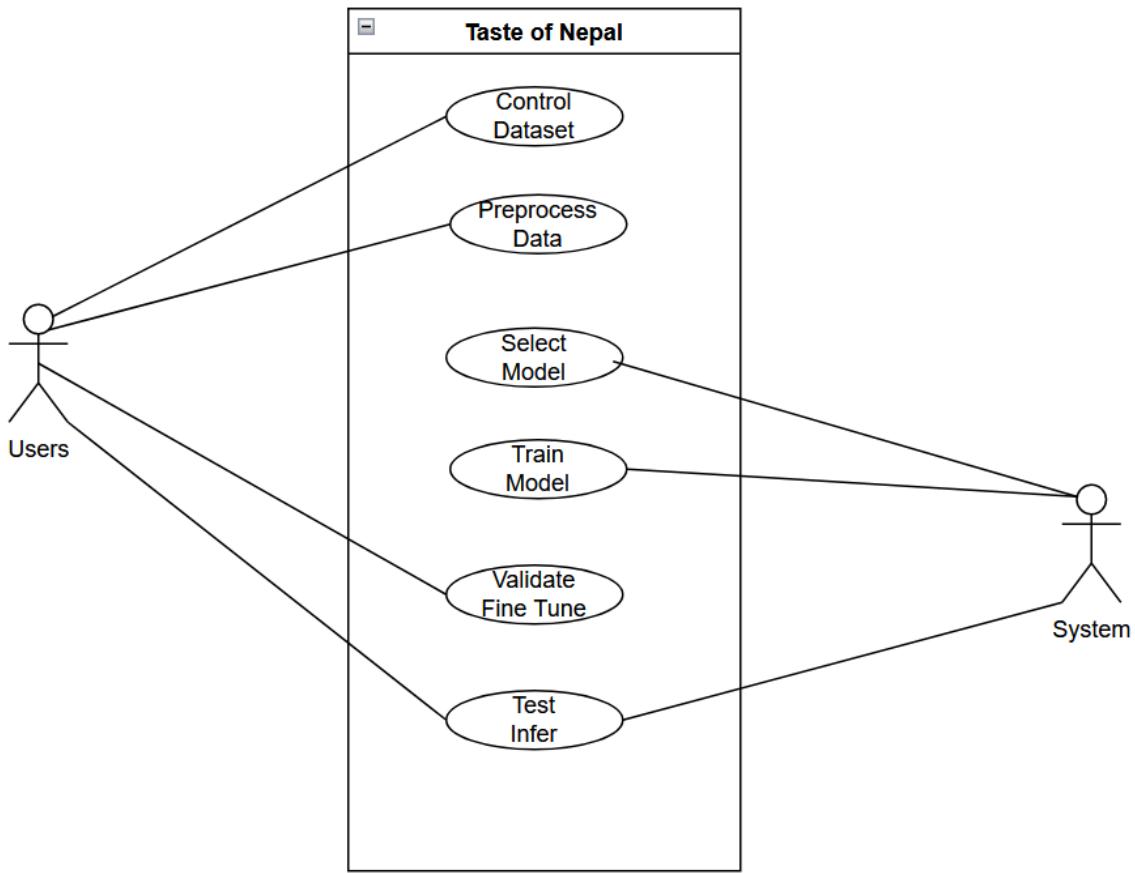


Fig 3-2 Use Case Diagram for image classification

3.1.2 Feasibility Analysis

i. Technical Feasibility

The application is technically feasible. The services are provided through the application. The services that are intended to be provided are possible to be implemented using available technology. Only mobile phones and the internet are going to be needed. There is no specific large hardware and software specification that is required to run the program. It can run on minimal hardware.

ii. Operational Feasibility

Operational feasibility assesses whether a project can be effectively and efficiently operated once implemented. In the context of the project with an image classifier showcasing Nepali cuisine history, operational feasibility ensures that the project can be

sustained, maintained, and updated to provide a valuable and user-friendly experience to visitors while adhering to legal and regulatory requirements.

iii. Economic Feasibility

One of the initial considerations is the cost estimation. This includes evaluating both the one-time development costs and the ongoing operational expenses. Development costs encompass web development, image classifier integration, content creation, multimedia assets, and initial marketing efforts. It's crucial to have a clear understanding of these expenses to determine the project's financial viability.

iv. Schedule Feasibility

The project involves careful planning, allocation of sufficient time for each project phase, and proactive management to mitigate potential delays. A well-structured project timeline is essential to ensure the successful and timely completion of the project, aligning with the project's objectives and user expectations which is described using the Gantt chart below:-

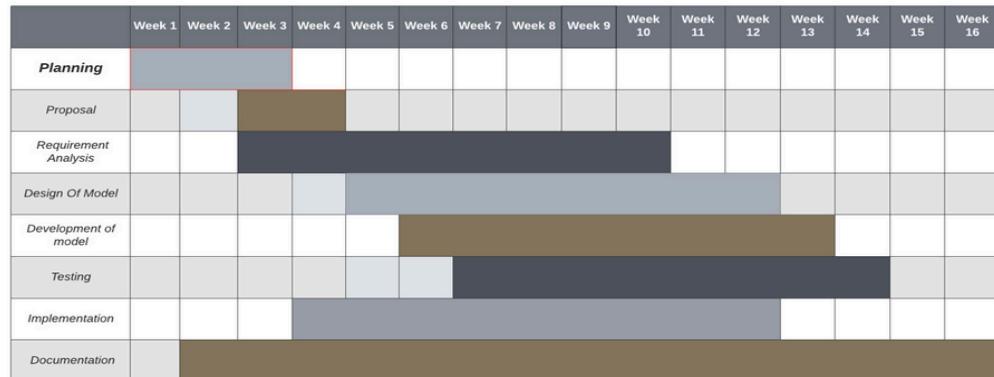


Fig 3-3 Gantt chart

Each stage in this project, assign appropriate time for each phase, and actively observe the project to avoid any potential delays. A carefully designed timeline, as shown in the following Gantt chart, is essential for making sure the project fulfills its goals and satisfies user expectations.

3.1.3 Analysis

i. Object Modeling using class and object diagram

In the system's object modeling, it uses Class and Object Diagrams to show how different parts work together..

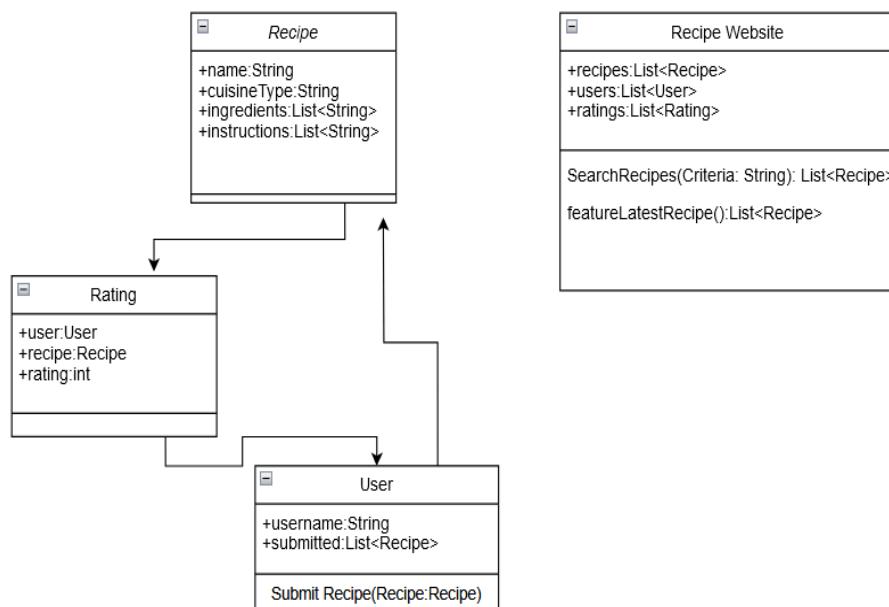


Fig 3-4 Class Diagram for food recipe website

It has a “Recipe” class which describes how users can submit different recipes according to their name, categories and ingredient list . “User” class who are able to firstly register then login to view the recipes from the website as well have the facility to use the submit recipe method for posting the recipe. “Rating” class is also incorporated which gives the feasibility to rate the recipes.

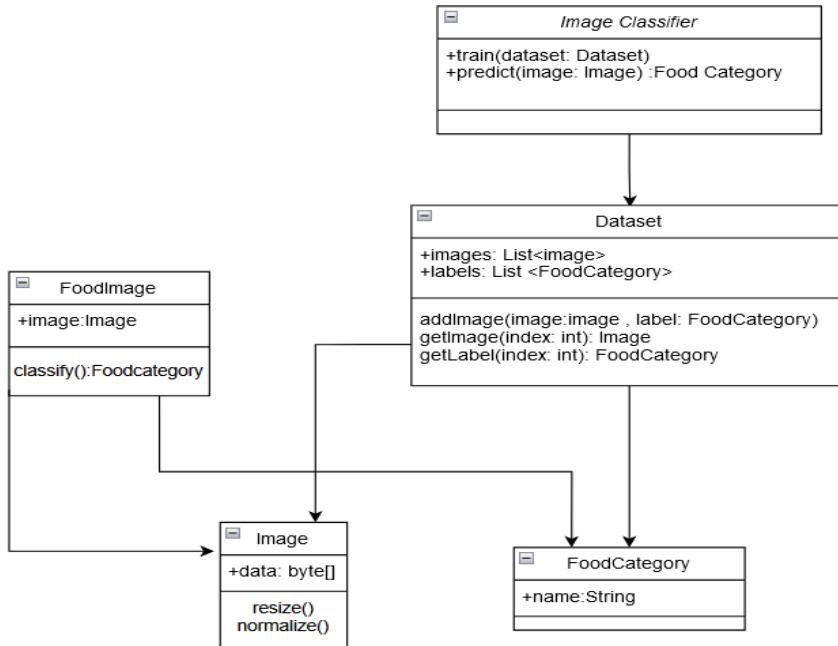


Fig 3-5 Class Diagram for image classification

In this above class diagram. It has shown different classes and their attributes and methods which are used for the image classification. It contains the image classifier class which is used for predicting the images provided by the user as an input to classify and predict the category of the image it belongs to and provide the user with the appropriate name of the image.

ii. Dynamic Modeling using state and sequence diagram

a. State Diagram

The following state diagram depicts a simplified system for user interaction. They can browse the application. The user within the logged-in state can interact with the Image Classifier , submit recipes and hence checkout various recipes on the website

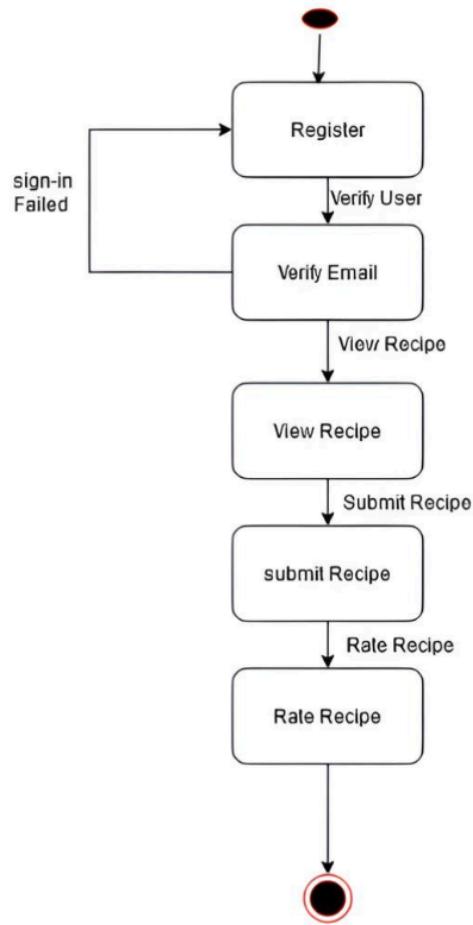


Fig 3-6 State diagram for Recipe Website

b. Sequence Diagram

The sequence diagram involves the interactions between the user ,recipe website and the database in the system.

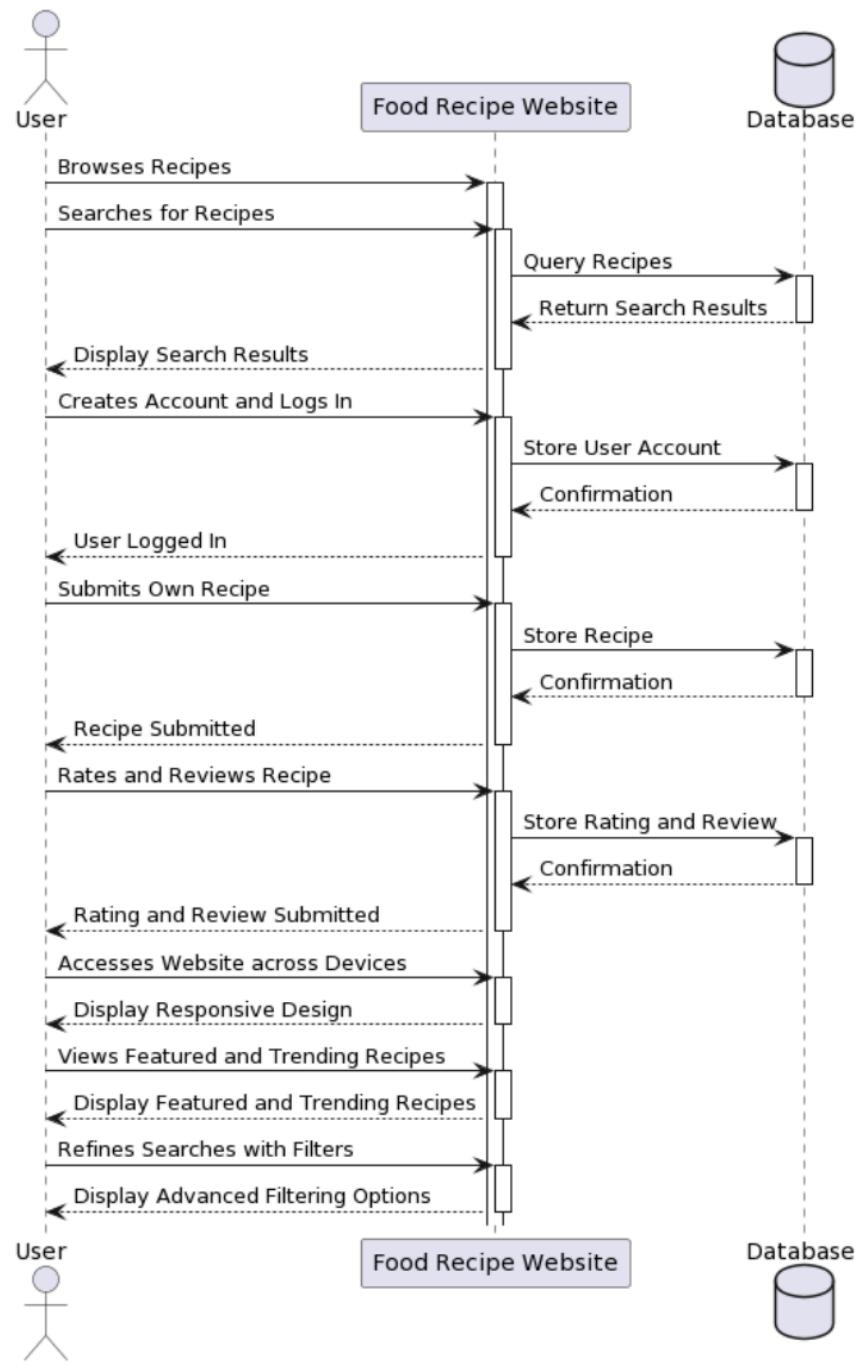


Fig 3-7 Sequence diagram for food recipe website

In this diagram it is seen that a logged In user can perform different functionality such as browse the recipe from the website which is retrieved from the database. Search different recipes as per their wishes and also the search with keywords is possible .The logged In

user can enjoy the perks of submitting their own recipes from their culture. Users can also rate the recipes.

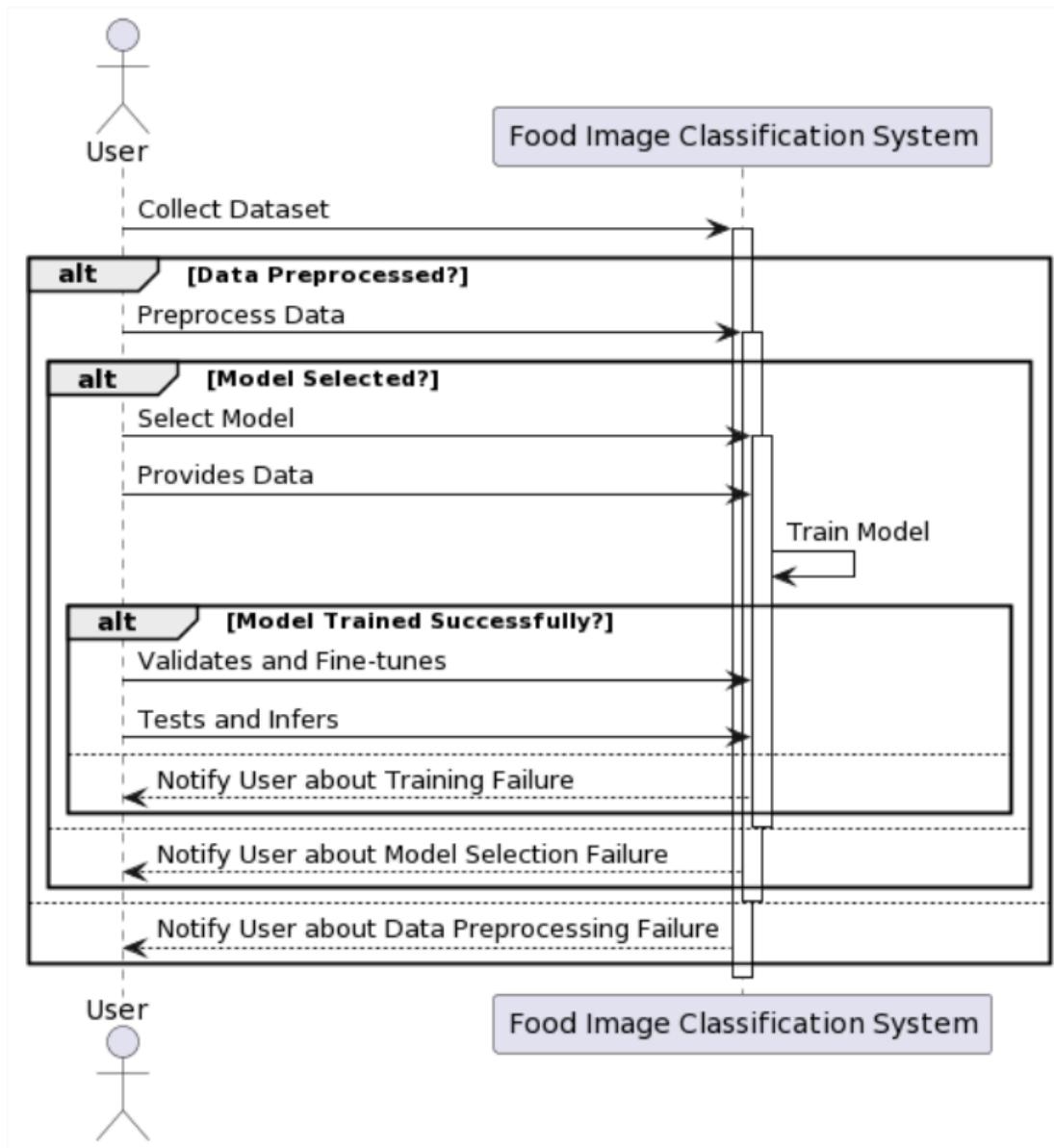


Fig 3-8 Sequence diagram for Image Classification

The sequence diagram provided above is for the image classifier where the user collects the data from some sources and provides it the image classifier as per the trained dataset if the classifier recognizes the image it responses with the history and name of the food if not then notify the user with the data processing failure.

iii. Process modeling using Activity Diagrams

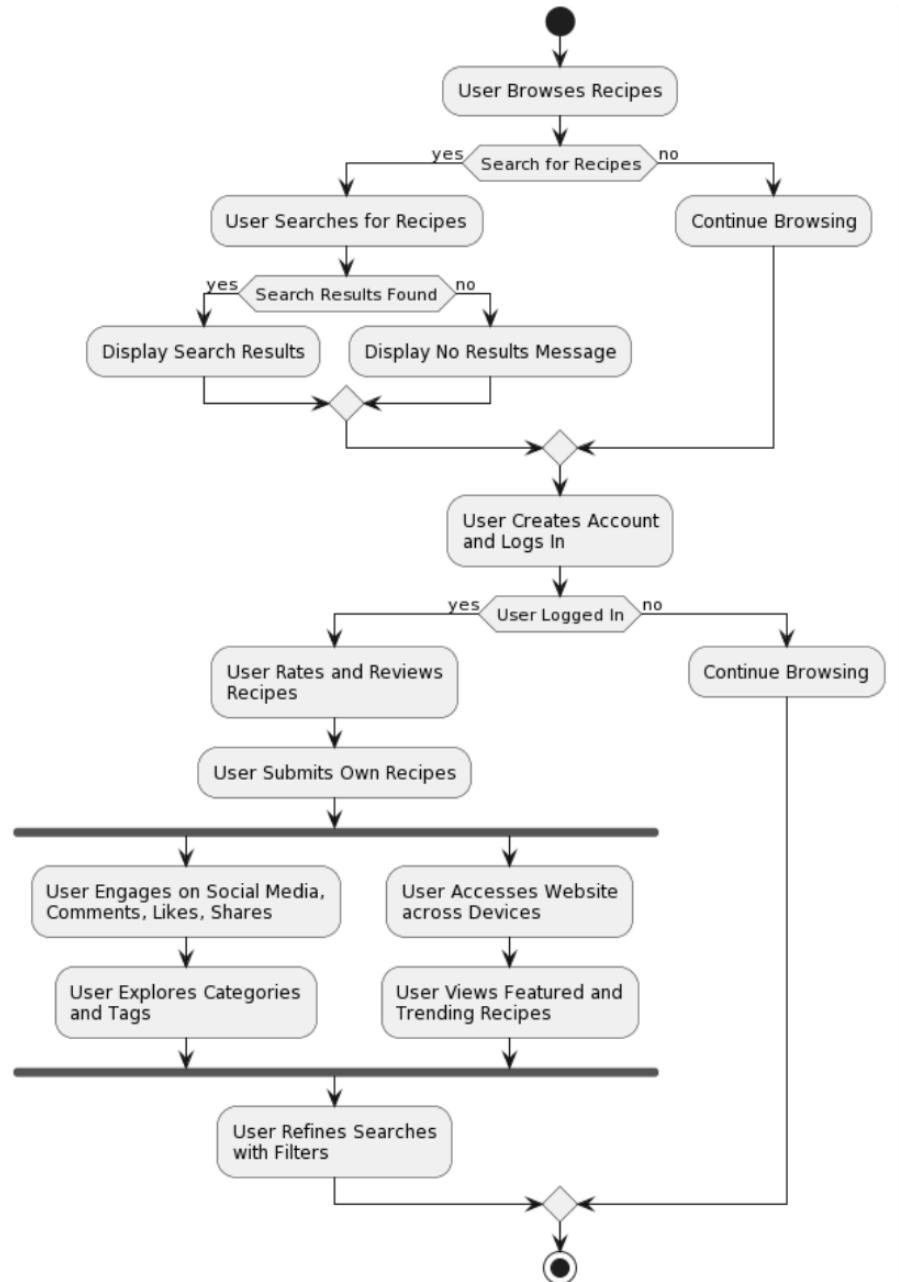


Fig 3-9 Activity Diagram of Food recipe website

The food recipes activity diagram outlines a streamlined workflow within the system. The process begins with the user logging in or registering, followed by accessing the submit recipe. The logged In user can either browse the recipe or submit the new recipe to submit the recipe user must be logged in as well as user can view the latest trending recipes.

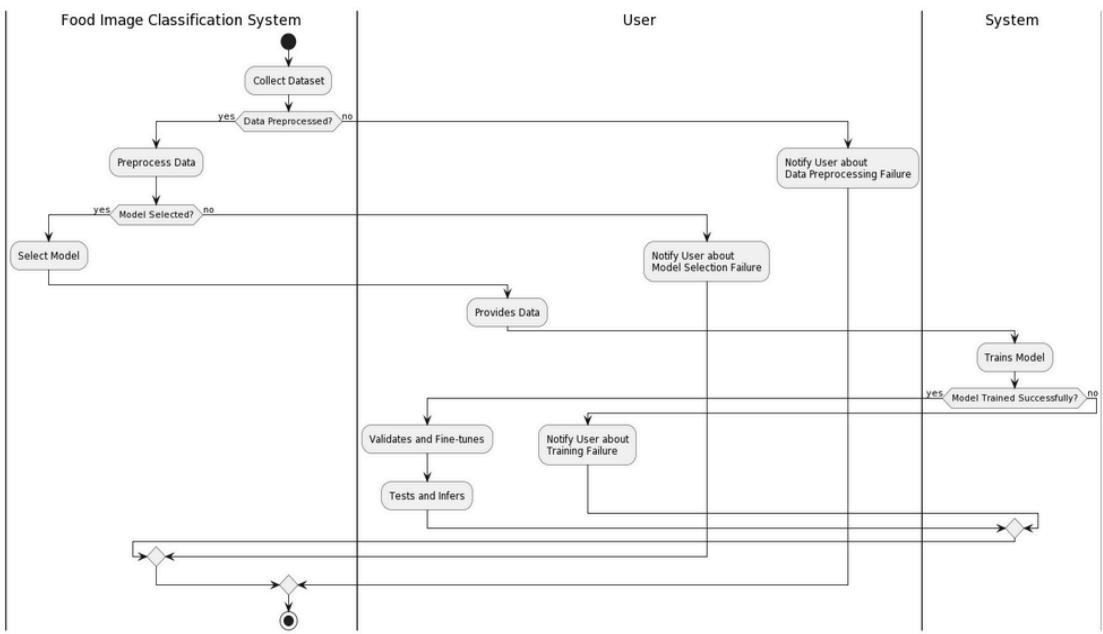


Fig 3-10 Activity Diagram of Image Classification

The above is the activity diagram of the image classification where the system collects the dataset and passes for preprocessing if the data is preprocessed then the model is selected for training if model training is successful then validate and fine-tunes then test and infers.

CHAPTER 4: SYSTEM DESIGN

The Taste of Nepal web application adopts an object-oriented approach, with designs tailored accordingly. This chapter delves into the intricacies of these designs and algorithmic details. This chapter explores the designs and algorithm details.

4.1 DESIGN

In this section, it is shown the enhancement of analyzed diagrams, the component diagram, and the deployment diagram.

4.1.2 Component Diagram

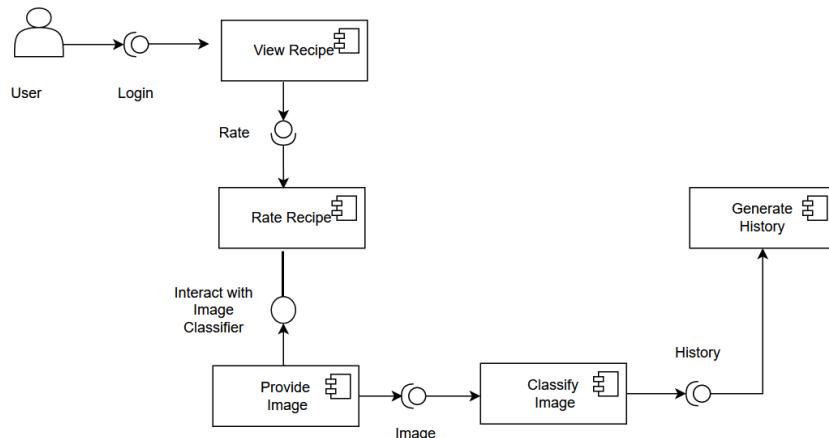


Fig 4-1 Component Diagram for user in Taste of Nepal

The component diagram visually illustrates the relationships and interactions between different components of the Taste of Nepal system, providing a clear overview of its architecture and functionality. Arrows pointing from the user component point toward the view recipe as how the user interacts with the website and how the image provided by the user is classified and shows the history of the food Image.

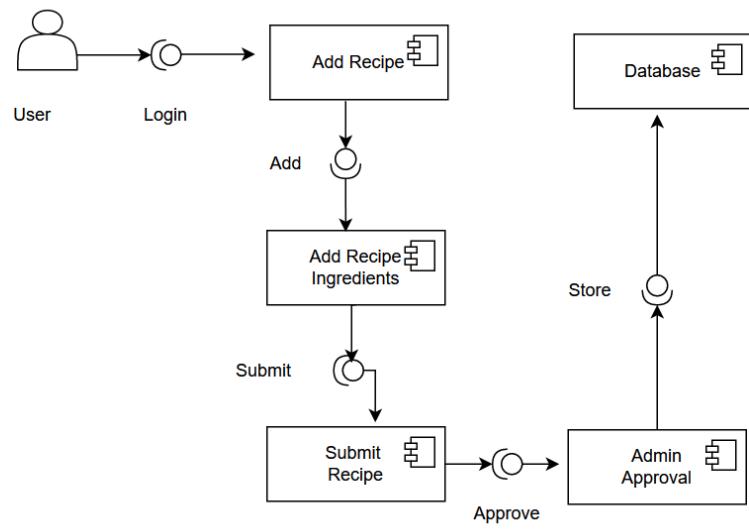


Fig 4-2 Component Diagram for recipe submission

In this component diagram of Taste of Nepal it has shown how logged In users can add different recipes and ingredients. The submitted recipe must be approved by an admin to be stored in a database then only the recipe is shown in the latest recipe section.

4.1.3 Deployment Diagram

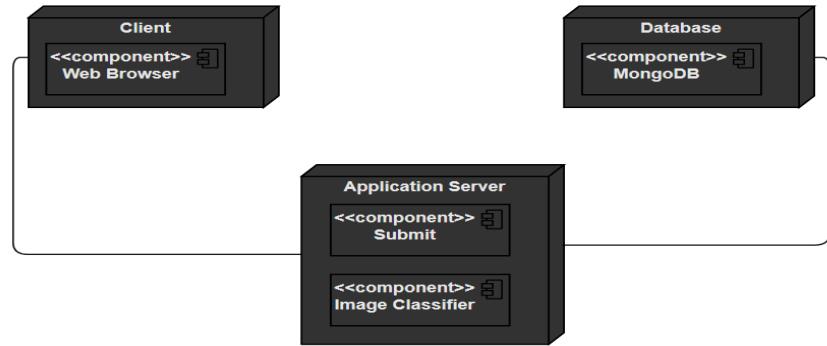


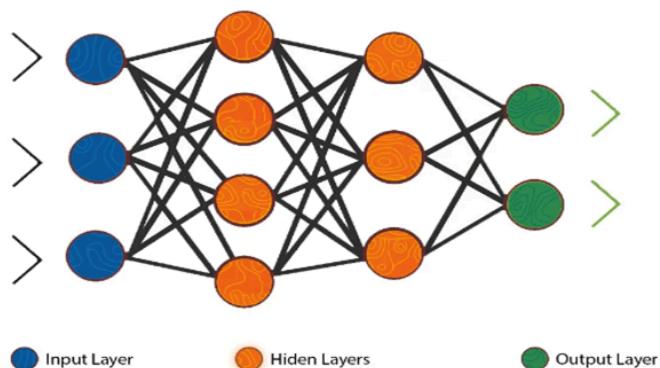
Fig 4-3 Deployment Diagram

The deployment diagram for Taste of Nepal illustrates the distribution of components across runtime processing nodes. At the core is the MongoDB component, managing data storage. The Application Server hosts critical components such as image classifier, recipe submission, and handling various system functionalities. Finally, the Client encompasses the Client's Web Browser component, serving as the interface through which users interact with the system. This structured deployment configuration ensures efficient communication and functionality across all system elements.

4.2 ALGORITHM DETAILS

An **MLP** is a type of artificial neural network with multiple layers, including an input layer, one or more hidden layers, and an output layer. Each layer consists of nodes (neurons), and connections between nodes have associated weights. The network uses an activation function to introduce non-linearity.

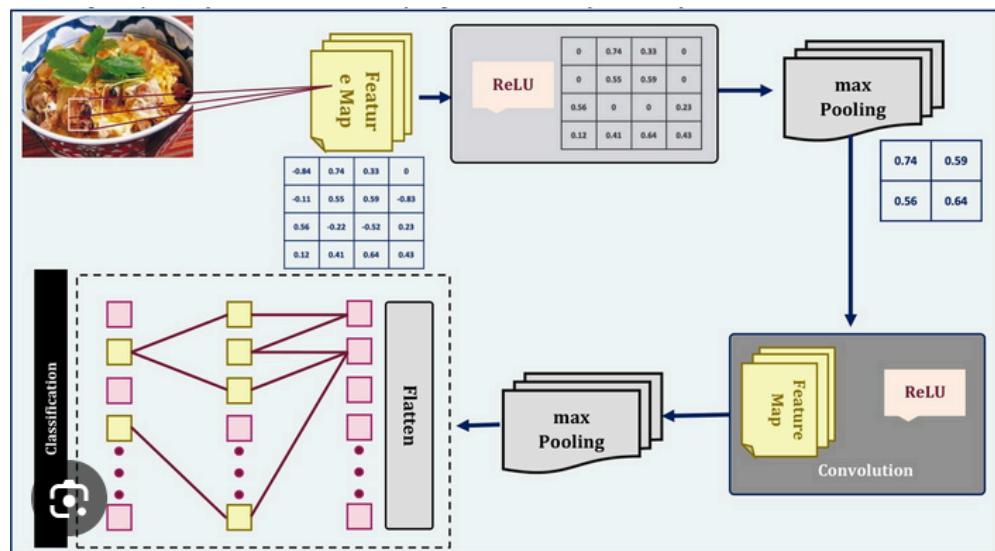
The training of an MLP involves the use of backpropagation, where the network adjusts its weights based on the error in its predictions. This process is usually done through optimization algorithms like gradient descent.



[5] Multilayer Perceptron Archives, "Source," n.d.

Fig 4-4 Multi Layer Perceptron

Convolutional Neural Networks (CNNs) are a class of deep learning algorithms designed for image processing tasks, particularly image classification. Unlike traditional neural networks, CNNs leverage specialized layers, such as convolutional layers, pooling layers, and fully connected layers, to automatically and adaptively learn hierarchical representations of images. The convolutional layers employ filters or kernels that slide over the input image to detect patterns, edges, and features. Pooling layers then reduce the spatial dimensions of the representation, focusing on the most salient information. The learned features are then fed into fully connected layers for classification.



[6] A. Chopra, "Source," 2022.

Fig 4-5 Convolutional Neural Network

In this project the algorithm shown above is used in the following manner which is described below:

Dataset Preparation: Collected a diverse dataset of food images from Kaggle with corresponding labels. Ensure that the dataset covers various cuisines, dishes, and presentation styles.

Data Preprocessing: Resize images to a consistent size. Normalized pixel values to a standard range (e.g., [0, 1]). Flatten the image data to be suitable for input into an MLP.

Model Architecture: Designed an MLP architecture with an input layer (flattened image), one or more hidden layers, and an output layer with neurons corresponding to the number of food classes.

Training the Model: Split the dataset into training and validation sets. Used backpropagation and an optimization algorithm to minimize the difference between predicted and actual labels. Adjusted hyperparameters such as learning rate and batch size for optimal performance.

Validation and Fine-Tuning: Evaluated the model on the validation set to ensure it generalizes well. Fine-tuned hyperparameters and model architecture based on validation performance.

Testing and Inference: Deployed the trained model to classify food images. Evaluated its performance.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 IMPLEMENTATION

The project is implemented using the following tools and technologies

5.1.1 Tools Used

1)ExpressJs: Expressjs is the minimalist and flexible Node.js web application framework that allows us to structure the frontend logic efficiently. It simplifies the process of handling http requests, making it easier to manage different routes and respond to client requests.

2)NodeJs: On the backend of the food recipe website, we employ Node.js as a robust runtime environment to execute server-side code effectively. Node.js allows us to build scalable and high-performance server applications, making it an ideal choice for handling backend operations. With Node.js, it can easily set up a server to handle HTTP requests and responses, facilitating the communication between the frontend and backend of the website. The non-blocking, event-driven architecture of Node.js ensures that the server can efficiently handle multiple concurrent connections, providing a responsive and performant user experience.

3)Python: Here, Python is used as the programming language to implement the project. Python is a simple yet powerful language with highly expressive syntax and has a large number of library support for machine learning. With a lot less code, It is able to implement a convolution neural network with suitable parameters as required for the system.

Frameworks and Libraries:

a) TensorFlow: TensorFlow is a powerful open source machine learning framework that allows us to implement the codes in a managed way. TensorFlow is used to implement the entire neural network for the project. TensorFlow has built-in support for implementing

convolutional neural networks. TensorFlow handles almost the entire part of the system from feeding images to the network to outputting the predicted label. One of the main reasons for choosing TensorFlow is it is primarily written in C++, hence it is faster as compared to other machine learning libraries.

b) NumPy: NumPy (or Numerical Python) is a powerful library used for numerical computation in Python. NumPy is equipped with built-in statistical and mathematical functions. NumPy is specifically used in this project for computing standard deviation, randomized selection of images during training and testing, matrix operations such as flattening a matrix and matrix multiplication. NumPy is implemented in C and C++, hence the operation involving tedious numerical computation runs faster using NumPy as compared to native python codes.

5.1.2 Implementation Details of Modules

The application is the compilation of different modules with various working logic merged together. Under this there are various working modules whose description is provided below:-

a) **Registration Module:** In this module users register to the system by providing email address, name , phone number, uploading the file and password. Email address provided by the user is verified through a verification link sent via email. This ensures that no other users are registering in the system without the registered email.The flow diagram that shows the working mechanism of the registration module is given below.

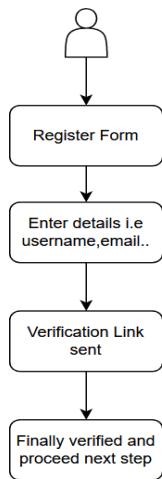


Fig 5-1 Flow Diagram for Registration Module

- b) **Login Module:** After the successful registration of the user, the user provides user detail to the system. The email address and the password provided by the user during login is checked with the data in the database. The login becomes successful only after the user details match and are verified. It is described using the flow diagram shown below.

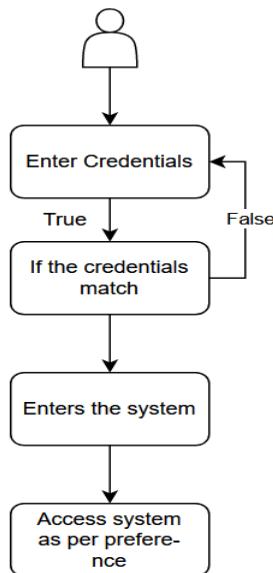


Fig 5-2 Flow diagram of the Login Module

- c) **Forgot Password Module:** If user forgets the password during the login in the application , then the application provides the user with the module that works with resetting password. For this the user has to provide the email address they have registered themselves. The reset can be performed when the reset link is sent to the registered email. In this module pseudocode is used for describing how the forget password works in system of “Taste of Nepal”

```
# Helper functions

function isValidEmail(email):
    # Implement email validation logic
    return true if valid else false

function isRegistered(email):
    # Implement logic to check if the email is registered
    return true if registered else false

function generateResetToken():
    # Implement logic to generate a unique reset token
    return resetToken

function saveResetToken(email, resetToken):
    # Implement logic to save the reset token along with user's email and expiration
    time
    saveToDatabase(email, resetToken, expirationTime)

function sendPasswordResetEmail(email, resetToken):
    # Implement logic to send a password reset email
    # Use a service or library to send emails

function isValidResetToken(email, resetToken):
    # Implement logic to check if the reset token is valid and not expired
    return true if valid and not expired else false
```

```
function updatePassword(email, newPassword):  
    # Implement logic to update the user's password in the database  
    updateInDatabase(email, newPassword)
```

```
function displayMessage(message):  
    # Implement logic to display messages to the user  
    showOnUI(message)
```

```
function getUserInput(prompt):  
    # Implement logic to get user input  
    return userInput
```

- d) **Submit Recipe Module:** In this module users should be logged In and then only the users are able to submit the new recipes. For submitting the recipe the user must provide the ingredients list, description of the recipe and the photo as well.
- e) **Approval Module:** In this module the user submitted recipes should be approved by the admin then only the submitted recipe will be stored in the database and which can be simply retrieved to the latest recipe section.
- f) **Search module:** In this module the search of the recipes added by admin as well as multiple users can be either done by adding the categories name or the name of the recipes. This search module is implemented in “Taste of Nepal” in three forms which is listed below
 - **Explore Latest :** In this users can search the latest recipes entered in the system which makes it easier for the regular users to not go recipe one by one for searching the latest one added by the admin or other users.
 - **Categories:** Users are able to search the recipe based on categories too if they don't have any idea which particular recipes to search i.e Newari, Nepalese e.t.c.

- **Random:** Here, the system suggests random recipes to the users which can be explored if users are not aware about nepali cuisine.
- g) **Edit Profile Module:** In this module the logged In user can edit their information to edit profile one must be a logged in user.
- h) **Image Classification Module:** It is the most crucial part of the system where users can interact with the image classifier by providing the food image and the classifier should respond by recognizing the image with its name and providing the history as well. It is described using a flow diagram shown below.

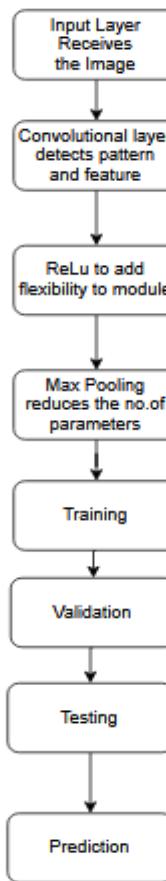


Fig 5-3 Flow Diagram of Image classification Module

5.2 TESTING

Software testing involves executing a program to identify and fix bugs, aiming to ensure the completeness and quality of computer software. The purpose is error discovery by examining all possible faults in a work product. Testing checks the functionality of components, assemblies, and the final product, ensuring it meets requirements and user expectations without unacceptable failures.

5.2.1 Unit Testing

This section describes various unit testing for the Taste of Nepal modules.

Table 1: Test cases for unit testing

S.N	Test Case	Input	Expected Outcome	Actual Outcome	Result
1.	User Registration	“user12@gmail.com” Password: “user12” Phone number: “980000001” Address: “user Add” Username: “user12” Photo:“uploadfile” .	Registration Successful	Registration Successful	Pass
2.	User	Email: “user12@gmail.co	Verification successful	Verification successful	Pass

	Verification	m” Verification link sent.	and redirect to login page.	and redirect to login page.	
3.	Insert Recipe	Category: “Newari” Photo: uploaded_file Name: “Sukuti” Ingredients: “test Ingredients” Description: “test Description”	Admin receives approve/reject Option in dashboard	Admin receives approve/reject Option in dashboard	Pass
5.	User Profile Update	Username: “user123” Phone number: “9823620118” Photo: “New file upload”	Profile Edited Successfully	Profile Edited Successfully	Pass
6.	User Forgot Password	Email: “user12@gmail.com”	Forget password link sent	Forget password link sent	Pass
7.	Rate Recipe	4 stars	Recipe rate updated	Recipe rate updated	Pass

8.	Model Training	Model Training	Training dataset	Trained Model with poor Accuracy	Fail
9.	Model Training	Training dataset	Training dataset	Trained Model with High Accuracy	Pass
10.	Model Evaluation	Test dataset provided	Reasonable Accuracy	Model produces reasonable Accuracy	Pass
11.	History	Test Image Provided	Recognized the Image and provide the history of the food	Recognized the Image and provide the history of the food	Pass

5.2.2 System Testing

System testing involves testing the entire system as a whole to ensure that it meets the specified requirements and performs the intended functions. In the case of Taste of Nepal, here, two core functionalities: submitting Recipe and classifying the image with the help of image classifier.

Table 2: Test cases for system testing

S.No	Test Case	Input	Expected Outcome	Actual Outcome	Result
1.	User Submits the Recipe	Category: “Newari” Photo: “Uploaded file” Name: “Sukuti” Ingredients: “test Ingredients” Description: “test Description”	Recipe is shown in the latest recipe section	Recipe is shown in the latest recipe section	Pass
2.	Provides food image to the classifier	Photo: “File uploaded”	Classifier recognizes the image with its name and provides the history to that.	Classifier recognizes the image with its name and provides the history to that.	Pass

5.3 RESULT ANALYSIS

The Taste of Nepal website has undergone comprehensive testing, and the results indicate successful functionality across its various modules. Key features such as User

Registration, Login, Submit Recipe, and Edit Profile operate smoothly, providing users with seamless experiences and appropriate redirects. The implemented email notification system is effective in keeping users informed.

Administrative actions, including recipe approval and rejection, are functioning as intended, demonstrating proper workflow and system reliability. Ratings-related functionalities, crucial for user engagement, are working well and contribute to a positive user experience.

The Image Classifier, a significant component of the system, accurately recognizes food images and provides relevant information, including the food's name and historical details. This functionality enhances the overall user experience and showcases effective implementation in food image classification.

For classification purposes two algorithms are used and they are MLP and CNN whereas while using MLP algorithm the accuracy of recognizing the images were really less so , switched the algorithm towards CNN where the accuracy achived was 70% . CNN used the concept of hyperband tuning algorithm, so that perfect configuration can be found to classify the image and to distinguish that the image belongs to the specific category.

Here, the graphical representation of how the classifier worked in training and the testing phase is shown and described in detail.

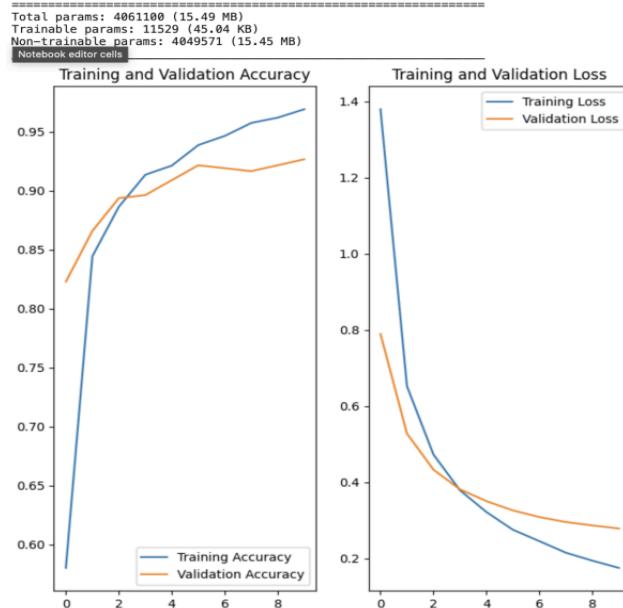


Fig 5-4 Graphical representation of training and validation

This graph depicts the training accuracy (blue line) and testing accuracy (orange line) over the training epochs. Initially, both the training and testing accuracies are low, indicating that the model is not performing well in the early stages of training. As the training progresses, the training accuracy steadily increases, reaching high values by the end of training. This implies that the model is effectively learning the patterns in the training data. The testing accuracy, which is a more reliable measure of the model's generalization performance, also exhibits a consistent upward trend. It follows the training accuracy closely, with some fluctuations, suggesting that the model is not overfitting to the training data and can generalize well to unseen data. Importantly, the testing accuracy reaches high values similar to the training accuracy, indicating that the model's performance is consistent on both the training and testing data. Overall, the high and closely matched training and testing accuracies, coupled with the convergence of the training and testing losses, indicate that the model has been successfully trained and can accurately perform the task at hand on both the training data and unseen data.

CHAPTER 6: CONCLUSION AND FUTURE RECOMMENDATIONS

6.1 CONCLUSION

The integration of a food recipe website with image classification technology presents a powerful synergy, offering a comprehensive platform for culinary enthusiasts. By incorporating an advanced image classifier, users can not only explore diverse recipes but also benefit from the visual recognition of food items. This enhances the user experience by providing insights into the preparation and presentation of dishes.

The integration of a food recipe website with image classification technology presents a powerful synergy, offering a comprehensive platform for culinary enthusiasts. By incorporating an advanced image classifier, users can not only explore diverse recipes but also benefit from the visual recognition of food items. This enhances the user experience by providing insights into the preparation and presentation of dishes.

In summary, the combination of a food recipe website and image classification technology creates a dynamic platform that not only satisfies users' culinary curiosity but also leverages visual recognition to enrich their exploration and understanding of diverse food items. Ongoing enhancements and a commitment to inclusivity demonstrate a proactive approach to evolving and meeting the diverse culinary interests of users.

6.2 FUTURE RECOMMENDATION

While there exists an opportunity for continuous enhancement. The following recommendations outline potential areas for improvement :

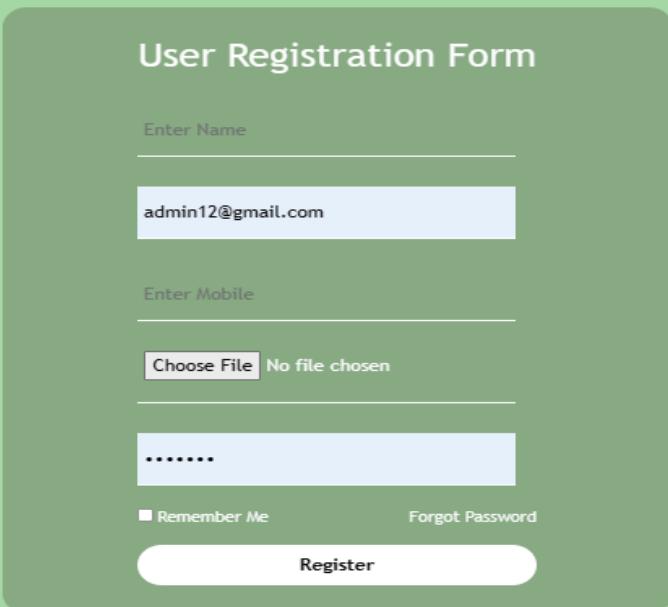
1. **Diversification of Culinary Traditions:** Expand the recipe collection beyond Newari cuisine to represent a more comprehensive array of Nepali culinary traditions.
2. **Dataset Enrichment:** Continuously work on expanding the dataset to overcome limitations in historical information for featured food items.
3. **Personalized User Experience:** Implement user profiles and preferences to offer personalized recipe recommendations based on individual tastes and preferences.

4. **Multilingual Support:** Provide multilingual support to cater to a global audience, making the website accessible to users from different linguistic backgrounds.
5. **Continuous Model Training:** Implement a continuous model training pipeline to adapt to evolving food trends and diverse user-submitted images.
6. **Fine-Tuning for Cultural Variations:** Fine-tune the image classifier to recognize subtle variations in food presentation and styles across different Nepali culinary traditions.
7. **Multimodal Capabilities:** Explore multimodal capabilities by combining image recognition with additional information such as recipe ingredients, cooking methods, or cultural context.

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APPENDIX



The image shows a user registration form titled "User Registration Form". The form is contained within a rounded rectangular container with a dark grey background and a white border. It includes fields for "Enter Name" (with placeholder text "admin12@gmail.com"), "Enter Mobile" (with placeholder text "....."), and a file upload field ("Choose File" showing "No file chosen"). There are also "Remember Me" and "Forgot Password" links, and a prominent "Register" button at the bottom.

User Registration Form

Enter Name

admin12@gmail.com

Enter Mobile

Choose File No file chosen

.....

Remember Me [Forgot Password](#)

Register

Appendix 1: User Registration Page



Appendix 2: User Login Page

Savor the symphony of Nepali spices in every bite. Our culinary sanctuary invites you to explore authentic recipes, where tradition meets innovation, creating a feast for your senses.

Indulge in a diverse collection of delectable recipe ideas.

Embark on a culinary exploration celebrating the diverse flavors of Nepali culture. Our extensive selection offers a rich tapestry of recipes, inviting you to savor the essence of traditional Nepali cuisine. Discover the warmth and authenticity of these delightful culinary creations.

[Explore Latest](#)[Show Random](#)

Newari

Nepalese-Tibetan

Newari

Newari

Nepalese

View All

Appendix 3: Homepage

Latest Recipes

[View More](#)

Keema noodles



Chatpatey



Shya Phaleys



Dapao



Lapping

Newari Recipes

[View More](#)

Samay Baji



Kachila



Keema Chatamari



Juju Dhau



Gwaramari

Nepalese Recipes

[View More](#)

Appendix 4: Latest Recipes and Newari Recipes



Photo Courtesy

publish your recipe for free Today

Publish your recipe in front of various people.

[Submit Recipe](#)

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Find Us On
Build by AA

Appendix 5: Submit Recipe



[Home](#) [About](#) [Submit](#) [Image AI](#) [logout](#)

Explore Categories

[Home](#) / [Categories](#) / Explore Categories



Samay Baji



Kachila



Keema Chatamari



Juju Dhau



Gwaramari

Appendix 6: Newari Category

Explore Categories

[Home](#) / [Categories](#) / Explore Categories



Keema noodles



Shya Phaley



Dapao



Lapping

Appendix 7: Nepalese Tibetan

Keema noodles

↳ Nepalese-Tibetan



Cooking Instructions

Heat oil in a pan over medium heat. Add chopped onions and sauté until golden brown. Add ginger-garlic paste and chopped green chili. Sauté for a minute until the raw smell disappears. Add chopped tomatoes and cook until they are soft and the oil starts separating from the masala. Add cumin powder, coriander powder, turmeric powder, red chili powder, and salt. Mix well. Cook the masala for a few minutes until the oil separates. Add the minced meat (keema) to the masala mixture. Cook the minced meat until it is browned and cooked through, breaking up any clumps with a spatula. Add the cooked noodles to the keema mixture. Toss everything together until the noodles are well-coated with the keema and masala. Adjust salt and spice levels according to your taste. Garnish with fresh coriander leaves. Serve hot with lemon wedges on the side. Enjoy your Keema Noodles! This dish is a delicious blend of spiced minced meat and noodles, creating a satisfying and flavorful meal.

Ingredients

Minced meat (keema) - often beef or lamb

Egg noodles or rice noodles

Cooking oil

Ginger

Onions

Garlic

Green chilies

Tomatoes

Spices (such as cumin, coriander, garam masala)



Appendix 8 : Cooking Instructions

Explore Latest



Thekuwa



Dhido Set



Kheer



Anarsa



Selroti



Gwaramari



Juju Dhau



Keema Chatamari



Kachila



Samay Baji



Dapao

Appendix 9: Explore Latest

Explore Random



Dapao

Appendix 10 : Explore Random



Home About Submit Image AI logout

selroti

x

epali spices in every bite. Our culinary sanctuary invites you to explore authentic recipes, where tradition meets innovation, creating a feast for your senses. Welcome to Nepali culinary bliss.

Indulge in a diverse collection of delectable recipe ideas.

Embark on a culinary exploration celebrating the diverse flavors of Nepali culture. Our extensive selection offers a rich tapestry of recipes, inviting you to savor the essence of traditional Nepali cuisine. Discover the warmth and authenticity of these delightful culinary creations.

[Explore Latest](#)

[Show Random](#)



Newari



Nepalese-Tibetan



Newari



Newari



Nepalese



[View All](#)

Latest Recipes

[View More](#)

Appendix 11 : Search Recipe or Category using Keywords



Home About Submit Image AI logout

Search...

Search Results



Selroti

Appendix 12 : Search Results



Submit Your Recipe

Share your amazing recipes with thousands of viewers across the world. Fill our form to get started.

Email

Recipe Name

Description

Ingredients
Example: Timur, ginger, garlic, sugar.....

+ Ingredient

Select Category

Product Image
Choose File No file chosen

Submit Recipe

Appendix 13 : Submit User Recipe



Submit Your Recipe

Share your amazing recipes with thousands of viewers across the world. Fill our form to get started.

Email

Recipe Name

Description



Ingredients
Example: Timur, ginger, garlic, sugar.....

+ Ingredient

Select Category

Product Image
Choose File

Submit Recipe

Appendix 14: Submit User Recipe



Submit Your Recipe

Share your amazing recipes with thousands of viewers across the world. Fill our form to get started.

Recipe has been added.

Email

Recipe Name

Description

Ingredients

Example: Timur , ginger , garlic , sugar.....

+ Ingredient

Select Category

Product Image

 Choose File No file chosen

[Submit Recipe](#)

Appendix 15 : Recipe Submitted

Admin Dashboard

Users Details

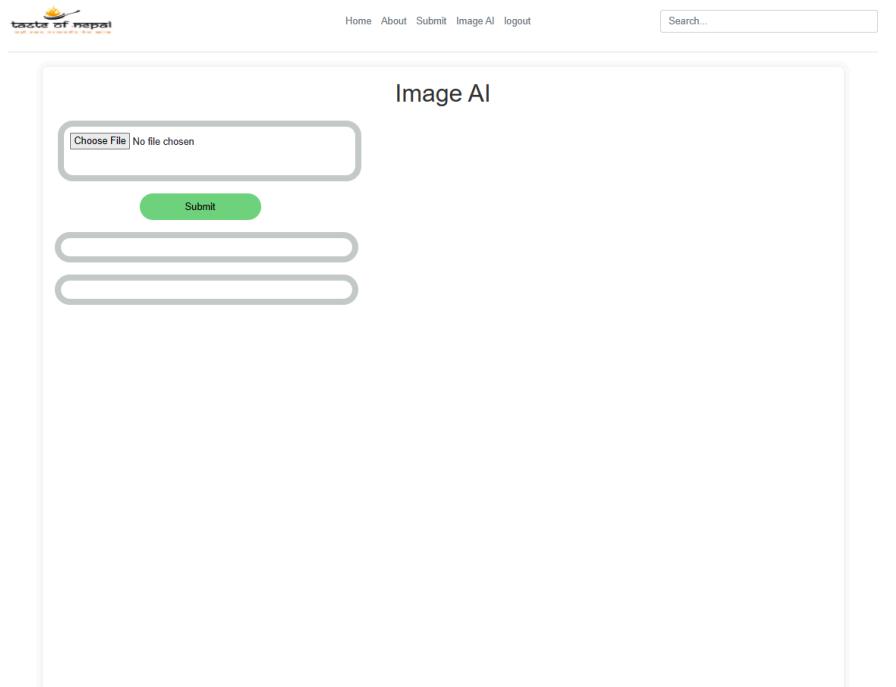
Name	Email	Mobile	Image	Verified
kharell	aaratikharel.076@kathford.edu.np	9864238943		Verified
user12	user12@gmail.com	9749492867		Verified
Aarushi Khanal	khanalaarushi@gmail.com	9856324566		Verified
Aaratili	aaratikharel2@gmail.com	98644238943		Verified
Aarushi12	Aarushi12@gmail.com	9844556677		Verified
prasmi	prasmi12@gmail.com	97494928		Verified

Pending Recipes

Name	Description	Ingredients	Image	Actions
aalu chana	Aloo Chana is a delightful Indian dish renowned for its hearty flavors and wholesome ingredients. This dish combines tender potatoes, diced and cooked to perfection, with nutritious chickpeas, creating a harmonious blend of textures. The preparation begins by sautéing onions, ginger-garlic paste, and green chilies until aromatic, followed by the addition of ripe tomatoes, which lend a rich and tangy base to the dish. A medley of spices, including turmeric, coriander, and red chili powder, infuses the dish with warmth and depth of flavor. As the potatoes and chickpeas simmer in this fragrant mixture, they soak up the spices, resulting in a luscious gravy that coats each morsel. Garnished with fresh cilantro leaves for a burst of freshness, Aloo Chana is best served hot, accompanied by fluffy rice or crispy rotis, providing a satisfying and nourishing meal that delights the senses and comforts the soul.	potato, chana, salt, onion, oil, tomato	1709982635927Screenshot 2024-03-09 165302.png	Approve Reject

[Go to home](#)

Appendix 16 : Admin Dashboard



Appendix 17 : Choose food Image

Prediction: dalbhat

History:

Dal Bhat, the quintessential Nepali dish, consisting of lentil soup (dal) served with rice (bhat), along with a variety of side dishes such as vegetable curries, pickles (achar), and sometimes meat or fish, holds immense cultural significance in Nepal. Its roots trace back to the cultural and agricultural heritage of the region, where lentils and rice have been staples for centuries. Lentils, rich in protein and nutrients, have been cultivated alongside rice, the primary carbohydrate source, reflecting Nepal's long history of agriculture. Over time, the simple combination of dal and bhat evolved into a cohesive meal, with different regions developing their own variations incorporating local ingredients and cooking techniques. This culinary evolution led to Dal Bhat becoming a symbol of Nepali identity, cherished for its nutritional value, cultural importance, and role in social and religious practices. Whether served as a gesture of hospitality to guests or enjoyed as a daily meal, Dal Bhat remains a beloved and integral part of Nepali cuisine, embodying the country's diverse culinary traditions.

Appendix 18 : Image Classification Result

Image AI

 No file chosen**Prediction: kheer****History:**

Kheer, a beloved Nepali dessert, holds a significant place in the country's culinary history and cultural traditions. Originating from ancient times, Kheer has its roots in Indian and Persian cuisines, reflecting the cultural exchanges and influences that have shaped Nepali gastronomy over the centuries. This creamy rice pudding is prepared by simmering rice in milk and sweetening it with sugar, flavored with aromatic spices such as cardamom, cinnamon, and cloves. Variations of kheer may include ingredients like nuts, dried fruits, saffron, or rose water, adding layers of texture and fragrance to the dish. Kheer is not only a delicious treat but also holds symbolic importance in Nepali culture, often served during festivals, celebrations, and religious ceremonies. It is a dish of abundance and prosperity, symbolizing good fortune and auspicious beginnings. Families gather to prepare kheer together, infusing the dessert with love and shared memories. The history of kheer in Nepal reflects the country's diverse culinary landscape and the blending of cultural influences from neighboring regions. Despite its ancient origins, kheer remains a timeless favorite, cherished by Nepalis of all ages. It continues to be a comforting indulgence, connecting people across generations and reaffirming the enduring legacy of Nepali cuisine.



Appendix 19 : Choose food Image

Image AI

 No file chosen**Prediction: gundruk****History:**

Gundruk is a traditional Nepali food with a rich history deeply intertwined with the country's agricultural practices and cultural heritage. Originating in ancient times, gundruk emerged as a method of preserving leafy green vegetables such as mustard greens, radish leaves, and cauliflower leaves. To create gundruk, these vegetables are harvested, chopped, and left to ferment for several days in a mixture of salt and spices. The fermentation process not only preserves the vegetables but also enhances their flavor and nutritional value. Gundruk holds significant cultural importance in Nepal and is a staple ingredient in many Nepali dishes. It is commonly used to add a tangy flavor and unique texture to soups, curries, and stir-fries. Additionally, gundruk is celebrated for its digestive properties and is often consumed as a side dish to aid digestion, particularly with heavy or rich meals.

The history of gundruk reflects the resourcefulness of Nepali communities in utilizing local ingredients and traditional preservation techniques to create nutritious and flavorful foods.

Despite modernization and changing dietary habits, gundruk remains a cherished part of Nepali cuisine, serving as a symbol of cultural identity and culinary heritage passed down through generations.



Appendix 20 : Choose food Image

Image AI

 No file chosen

Prediction: **dhindo**

History:

Dhindo, a traditional Nepali food crafted from buckwheat, millet, or corn flour, epitomizes the fusion of agricultural practices and culinary traditions deeply embedded in Nepal's heritage. Originating from ancient times, when indigenous communities cultivated resilient grains in the country's diverse landscapes, dhindo emerged as a staple dish sustaining generations. Its preparation involves blending flour with water and cooking it until it achieves a dense, porridge-like texture. Dhindo's cultural significance transcends mere sustenance, intertwining with festivals, religious ceremonies, and communal gatherings, where it is savored alongside lentil soup, vegetable curries, and pickles. This humble dish, consumed by hand, embodies both simplicity and nutritional richness, offering carbohydrates, fiber, and essential nutrients. Dhindo's resilience mirrors that of the Nepali people, who ingeniously utilize local resources to create dishes that nourish both body and spirit. Despite the encroachment of modernization, dhindo remains an enduring emblem of Nepali cuisine, preserving the country's culinary legacy amidst changing times.



Appendix 21 : Choose food Image