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Voice Enabled Food Recipe Recommendation using Machine Learning & NLP.

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ABSTRACT- In our application we introduced a new system for making a wide range of foods with voice-over instructions and nutrition standards. The system uses natural language processing(NLP) and other techniques such as word embedding and tokenization to accurately interpret ingredients and quantities supplied by the users. The system offers a selection of recipes with voice-over instructions for each step of cooking by using advanced Machine Learning(ML) algorithms to analyze large datasets of food categories, ingredients, enabling the exploration of complex patterns and interactions such as image recognition through deep learning so is also used in this project for the users to be able to search type food image and also find the related recipe according to the image.

KEYWORDS

Convolutional Neural Networks(CNN), Text-Processing, Lemmatization.

1. INTRODUCTION

A Recipe Recommendation for Indian Cuisines is a system that learns from the user's past preferred dishes to suggest new and untried cuisines. The tradition of India has always been quite refreshing due to its extensive use of spices and herbs. Indian meals encompass a wide range of dishes, which is well-known. Cooking style however, varies regionally and it can generally be separated into South Indian and North Indian cuisine. India is well recognized as a diverse array of cuisines available at numerous hotels and resorts, and a symbolic of unity in diversity.

Machine Learning(ML) and Natural Language Processing(NLP) are game changers in the field of food recipe suggestions. They dramatically improve the personalization, effectiveness and overall user's experience. When recommending food, it is crucial to

consider both the originality and the element of surprise. Combining these aspects creates a pleasant dining experience. By balancing novelty with serendipity, food recommendations can be personalized to individual tastes and preferences, ensuring satisfaction. Voice-enabled food recipe generation is a revolutionary advancement that combines technology and cooking, providing a convenient and sophisticated way to create and access the recipes. This new way of cooking makes it easier for the people to cook by making it less difficult to find more recipes, making it enjoyable and user-friendly.[]

We also discuss the various challenges involved in designing recommendation system for food, lessons learnt from previous research and determine what we value the important future directions from the field. In order to provide these contributions we hope to provide a useful resource for the researchers and practitioners.

A. Related Works

Food recipe recommendation system employs various techniques from machine learning, natural language processing, and data mining to provide personalized and related recipe suggestions to the users. Some of these methods include Web Scraping, Case-based reasoning etc. Web Scraping is a system used to fetch a lot of information from the sites where the information is stored in a database in tabular format. It involves accessing the HTML or other structured content of the webpage, parsing it, and then extracting the desired information. Case-Based Reasoning is the adaptation of existing knowledge in order to find a new answer to a problem. CBR involves leveraging a database of previously encountered recipes and their associated attributes(ingredients, ratings, cooking time) to recommend new recipes to the user according to their preferences. When no matches are found while using this method the system creates a new suggestion by combining Domain knowledge(include flavors, ingredients, or dishes types) with Adaptation knowledge.(matching algorithm).

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2. MOTIVATION

The motivation behind the food recipe recommendation project stems from the aspiration to improve the overall cooking experience. This improvement is sought in various ways, such as hands-free convenience, accessibility for all the users and increased efficiency in the kitchen. By integrating the voice systems, the project aims to provide assistance and information to the users as they navigate through the individual steps of the recipe. This feature not only improves the cooking process, but also promotes inclusivity by catering to the individuals with visual impairments or physical disabilities, making cooking more accessible to a wider range of people. In addition, the project seeks to promote cleanliness in the kitchen by reducing the need to interact with the screen, thus minimizing potential clutter and facilitating a more hygienic environment. The emphasis of a user friendly interface ensures that accessing the recipes is simple and intuitive, making it particularly appealing to those less comfortable with traditional interfaces. The research. seeks to revolutionize the cooking experience by using the technology to improve accessibility, efficiency and cleanliness, making cooking more enjoyable and inclusive for everyone.

3. PROPOSED SYSTEM

With the help of natural Language Processing(NLP) and Machine Learning(ML) techniques, our suggested method offers experimenters with an engaging and user friendly environment for trying out various recipes which are classified based on the similarity[2].The core concept of our project aims around elevating user experience in accessing the food recipes through a range of innovative features. Our first objective is to introduce a voice-enabled food recipe generation feature. By integrating a text-to-speech engine, our system will seamlessly transform recipe text to natural speech instructions. This enhancement ingredient and instruction generation feature, which for Image Recognition, enhancing the system's ability to identify food images and suggest corresponding recipes. This technique is of convenience use to the users that helps in eliminating the tedious manual input, would provide users with real time voice guidance while they cook. Another key aspect of our system is the ingredient and instruction generation feature, which will produce detailed recipe complete with ingredient list and step-by-step instructions. The recipes will also be tailored to match individual user preferences, guaranteeing a personalized cooking journey.

Advanced deep learning techniques are also incorporated for Image Recognition, enhancing the system's ability to identify food images and suggest corresponding recipes. This technique is of convenience use to the users that helps in eliminating the tedious manual input.

A. Methods used in Proposed system

1.Convolutional Neural Networks(CNN) Convolutional Neural Networks and Residual Networks(ResNet) involves training models to identify and classify food items depicted in the image. CNN are a type of deep learning architecture particularly suited for image recognition tasks due to their ability to automatically learn features from the raw pixel data.

In food image recognition, ResNet works by using skip connections, also known as shortcut connections or identity mappings. These connections allow the network to skip one or more layers, passing the input directly to the deeper layer in the network. By doing so ResNet enables the network to learn residual mappings, which are the differences between the input and output of a particular layer.

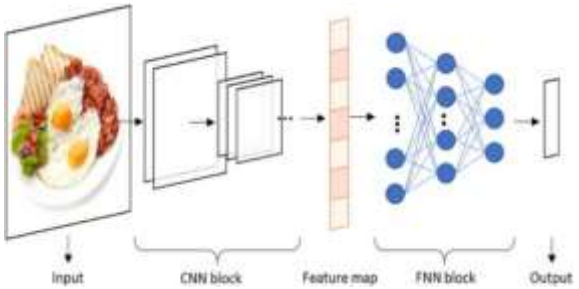

Fig. Image Processing using Deep Learning

2.Natural Language Processing

Lemmatization and tokenization are the two important preprocessing steps in natural language processing(NLP).

Tokenization: Tokenization in NLP is the process of breaking down the text into smaller units, typically words or tokens.

These tokens can be individual words, sub-words or even characters. In the word tokenization approach, the text is segmented into individual words based on whitespace or punctuation. Eg:"Tokenization is important for NLP" would be tokenized to ["Tokenization", "is", ,"important", "for", "NLP"].

Lemmatization: Lemmatization in NLP is the process of reducing the words to their base or root form for more accurate matching. By lemmatizing the variations in the ingredient names and cooking techniques can be reduces. Eg: The ingredient named "tomatoes" can be lemmatized to the common root word "tomato".

Bag-of-words(BOW):Bag-of-words in this model can be applied to both the user queries and the recipes to extract relevant information and facilitate matching. In tokenization the text of each recipe or user query is broken down into individual words or tokens. For each recipe or user query a feature vector is created. This vector represents the presence or absence of each word in the dataset. One approach is to use to use binary values(1 for the presence of food item in the dataset and 0 for the absence).

4. EXPERIMENTAL RESULTS

In the experimental results section, Food recipe generation with voice instructions have shown promising outcomes. During user testing, participants found the voice-enabled instructions intuitive and straightforward, leading to smoother cooking experiences. Feedback from users emphasized the convenience of hands-free guidance, allowing them to concentrate more on cooking tasks and less on navigating written instructions.

Evaluation Metrics

In assessing a food recipe generation project, various metrics are essential for understanding its effectiveness and user satisfaction. Firstly, the accuracy of the generated recipes compared to established culinary standards or expert-reviewed recipes is crucial. This includes examining ingredient proportions, cooking techniques, and overall recipe coherence. Additionally, ensuring recipe completeness ensures that the generated recipes encompass all necessary ingredients, cooking steps, and relevant instructions for successful meal preparation. User satisfaction stands as another vital metric, measured through feedback from users via surveys or testing, focusing on elements like clarity of instructions, ease of use, and overall enjoyment of the cooking experience. Furthermore, analyzing the uniqueness and diversity of generated recipes, alongside their adaptability to user preferences and feedback over time, offers valuable insights. Error rates in recipe generation, user engagement statistics, system accessibility, and performance efficiency should also be taken into account. By comprehensively evaluating these metrics, developers can refine and optimize the project to better cater to user needs and preferences while ensuring the quality and reliability of the generated recipes.

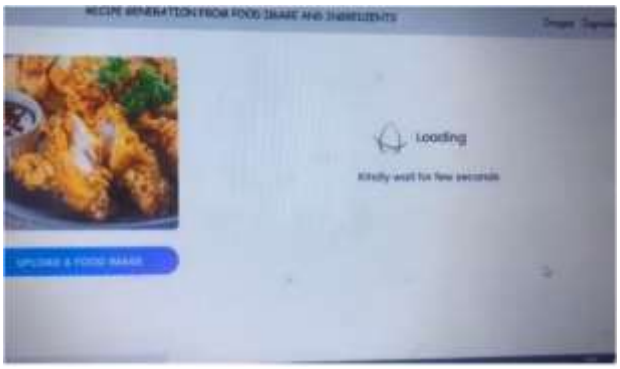

Fig Food image upload

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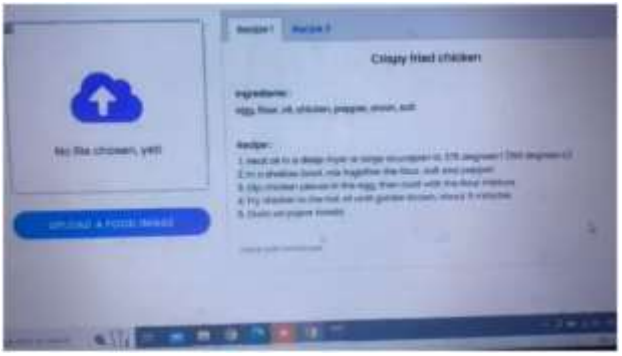

Fig Recipe generation from image

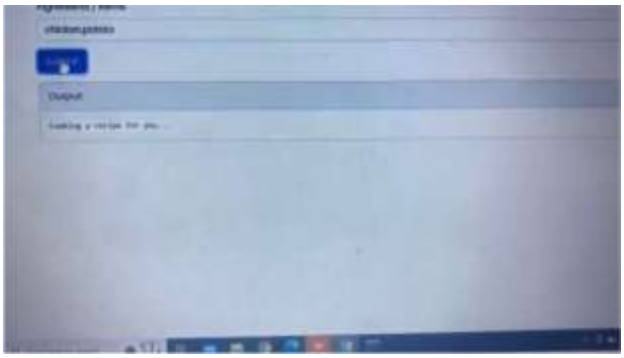

Fig Ingredients

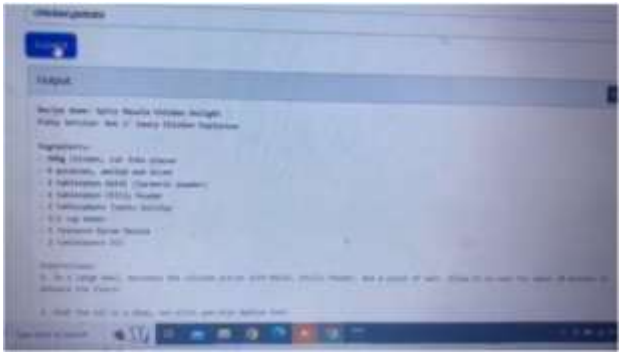

Fig Recipe generation from ingredients

5.CONCLUSION

The creation of a voice-enabled food recipe generator signifies a significant stride forward in culinary technology, offering users an effortless and convenient means of accessing a diverse array of recipes. This innovative tool empowers users to seamlessly discover, create, relish delicious meals tailored to their preferences and dietary requirements. The incorporation fo artificial intelligence algorithms enables the recipe generator to glean insights from the user interactions, offering personalized recommendations and continually refining the user experience. This adaptive functionality ensures that users receive pertinent and engaging content, augmenting their overall satisfaction with the platform. The integration of food recipe recommendations marks a significant advancement in culinary technology. By providing users with spoken guidance, this innovation offers a more intuitive and hands-free cooking experience, enhancing accessibility and convenience in the kitchen.

6.FUTURE SCOPE

The projects future scope is promising and multifaceted. Firstly, enhancing personalization through machine learning algorithms could be pivotal. These algorithms might analyze user preferences and cooking habits to offer tailored recipe recommendations and personalized voice instructions. Secondly, diversifying the recipe database will be essential for engaging users and meeting a broader range of culinary preferences, including regional cuisines and

dietary needs, integrating the project with smart kitchen appliances holds potential for revolutionizing cooking by enabling seamless communication between the recipe generator and devices, allowing for automated adjustments based on voice instructions. Our systems predicts ingredients as set by means of novel architecture, modeling their dependencies without imposing any order, and then generates cooking instructions by attending to both image and its inferred ingredients simultaneously. Additionally, incorporating nutritional information into recipe recommendations can empower users to make healthier choices. Multilingual support would broaden accessibility, appealing to a more diverse user base. Building a community platform for sharing recipes and tips fosters collaboration among cooking enthusiasts. Commercial partnership with food-related business could expand the project's reach. Lastly, including educational resources and tutorials would benefit novice cooks and culinary professionals alike. Pursuing these avenues could shape the future of cooking technology and transform culinary experiences.

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