

Food Recommendation System for Auto Immune Diseases

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Abstract - There are innumerable factors that can affect a person's health. Few of the most important factors can be the sleep, diet, environment, etc. Auto Immune Diseases have no permanent cure in medicine, most of them can be treated but can't be cured. There are two ways of dealing with auto immune diseases, one is with the help of medication and other is diet. Diet plays an important role in helping any individual cure his auto immune disease. Whereas, medication can only give you temporary relief. In this paper we discuss a model which can help a person get food recommendation based on the type of disease they have. The model will recommend anti-inflammatory ingredients which people can use to make dishes based on various cuisines

Key Words: (Inverse Cooking Algorithm, Recurrent Neural Network, Data Visualization)

1. INTRODUCTION

A lot of factors are responsible for curing an individual's auto immune disease which includes physical exercise, sleeping, nutrition heredity [1]. Nutrition is one of the most important and modifiable factors [2]. There have been lot of food recommendation system in the past. It has helped users get food recipes without searching for it online. It has helped users with making decisions. In this project we add more to the recommendation system as the diet and ingredients differ based on the condition of a person and what disease he is suffering from. Unlike normal food recommendation system this model will provide you with ingredients that are anti-inflammatory which are not good for any auto-immune diseases. Different type of diseases has different types of ingredients which are harmful for them. Food recommendation gets challenging when we add different types of ingredients for different diseases. Nutrition being one of the most modifiable factors we are recommending food based on various cuisines all across the world. Real 1M+ Dataset and Kaggle and natural dataset has been used for scrapping data of all the recipe and ingredients dishes based on various cuisines across the world. They are publicly available dataset. Inverse Cooking Algorithm is used to identify the ingredients present in the recipe

1.1 Inverse Cooking Algorithm

This algorithm can be used to define the food ingredients present in a particular recipe or a dish. Instead of giving the direct recipe of a particular image where the image is the

input given, what it does is, it gives an intermediate result where the ingredients present in the dish are obtained [3]. The major factor of achievement for this algorithm is the accuracy which is higher than average human and basic retrieval system. This type of algorithm will fail when we don't really have a static dataset for the algorithm to refer. It acts like a pipeline. Earlier system used to

Table -1: IoU and F1 score of Humans vs Retrieval System vs Inverse Cooking Algorithm [4]

	IoU	F1	
Humans	21.36	35.20	
Retrieval System	18.03	30.55	
Inverse Cooking Algorithm	32.52	49.08	

1.2 Data Visualization

The tools present in Python language for Data Visualization are Matplotlib [6], Plotly [7], Seaborn [8] and Pandas [9]. Matplotlib allows scatterplots, error charts, histograms and many more. Plotly distinguishes from Matplotlib for allowing a dynamic representation of data points along with their labels. Seaborn is a python library built on top of Matplotlib. It allows the user to explore new visualization options in easier way. These three modules were used in the project.

1.3 Food Recommendation System

Eating is a basic habit but people need to know what to eat that will be beneficial for them. There are so many options out there to choose from, and to know if it will be beneficial for the auto immune disease or health in general is important. Important factor when building these systems would be the data of the user, what allergies or disease the user is suffering from, what does the user like or dislike. Keeping all this data in the form of feedback the system has to recommend food to the user. Moreover, the country where the user lives, the cuisine he prefers needs to be kept as a data. The success of this system is correlated to the ability of suggesting more anti-inflammatory food

ingredients in the dishes and the ability to account the user preference.

2. METHODOLOGY

At first, we take the input height, weight and type of auto immune disease of an individual and provide them with recommendation of carbs, protein, fats intake. We can do this using predefined JavaScript code, which can be toggled according to whether the person is overweight or underweight. Food recommendation will be given by taking image as an input and with the help of Inverse Cooking Algorithm we can get the ingredients present in it and along with-it the details regarding the dish such as how much carbs, proteins and fats are present in the dish can be seen. The input will be taken from the client side with the help of HTML input box. Ajax call will send the post request to backend. As soon as the input is given the backend runs the python script. The output will be the name of the ingredients present in the image the user has inputted. The auto immune disease which the user is suffering from will be searched in the database and the harmful ingredients which are present in the dish will be displayed.

2.1 Recipe1M+ Dataset

Recipe1M+ is the largest dataset available for recipes [10]. The recipes are stored in two separate json files which can be called in the main project using the extension. Along with this file containing ingredients list of all diseases and the ingredients which users can't consume according to the particular disease is added. One of the most important things to build this recommendation system was to extract recipes from 1M+ dataset. To achieve this, it was optimized in a way such that all the punctuation marks were removed and remaining words were arranged accordingly. The typos were taken care of.

Diabetes:sugar,smoothies,bread,grilled-meats,steak,fries,soda,sports-drinks,diet-soda,cinnamon roll

Rheumatoid arthritis:salt,MSG,Alcohol,Aspartame,Gluten,% milk,2% milk,Acidophilus Milk,Acid Whey,Am st,Low Fat Milk,Malted Milk,Milk,Milk Derivative,Milk Fat,Milk Powder,Milk Protein,Milk Protein Hyd

Psoriasis:flavoured noodles,chicken-salted chips,flavoured crackers and crisps,sauces,stock cubes,sack kashk,booza, borhani, buffalo curd, bulgarian yoghurt, butter, butterfat, buttermilk, buttermil

Multiple Sclerosis:sausages,bacon,canned meats,meat,white bread,pasta,biscuits,flour tortillas,fren

System Lupus Erythematosus:Seeds, cheese,yogurt,salmon,beans,lentils,almonds,whye protein,collard g

Inflammatory bowel disease:salt,MSG,Alcohol,Aspartame,Gluten,% milk,2% milk,Acidophilus Milk,Acid Wh Yeast,Low Fat Milk,Malted Milk,Milk,Milk Derivative,Milk Fat,Milk Powder,Milk Protein,Milk Protein I

Addison's disease:Coffee, Green tea, black tea,alcohol,bananas,oranges,salt

Graves disease:wheat, rye,barley,malt,triticcate,yeast,grains,salt,bread,milk,cheese,yogurt,white fi

Sjögren's syndrome:% milk,2% milk,Acidophilus Milk,Acid Whey,Ammonium Caseinate,Anhydrous Milk Fat, k Derivative,Milk Fat,Milk Powder,Milk Protein,Milk Protein Hydrolysates,Milk Solid Pastes,Milk Sol

Hashimoto's thyroiditis:flavoured noodles,chicken-salted chips,flavoured crackers and crisps,sauces,

Fig -1: List of ingredients harmful for a particular disease

2.2 Kaggle and Nature Dataset

This dataset consists of recipes along with the cuisines they belong to. In order for a person to choose which cuisine they prefer this dataset has been very helpful to recommend the dishes from 11 different types of cuisines: North America, Western Europe, Northern Europe, Eastern Europe, Southern Europe, Middle Eastern, South Asian, South-East Asian, East Asian, Latin American, African.

	NA	WE	NE	EE	SE	ME	SA	SEA	EA	LA	A	Total
K&N	45843	6774	739	381	14178	645	3618	3572	7435	11892	1173	96250

Fig -2: Kaggle and Nature Dataset recipes in particular cuisines

2.3 Cuisine Classification

In order to analyze the auto immune disease beating molecules in the dishes, variety of dishes in different types of cuisines, we found the average of auto immune disease beating molecules per cuisine was calculated. North Europe, Middle East and Africa were the region whose cuisines had highest anti auto immune disease molecules whereas, North American cuisine had the least [5]. This makes the North American cuisine not good for people with auto immune- diseases.

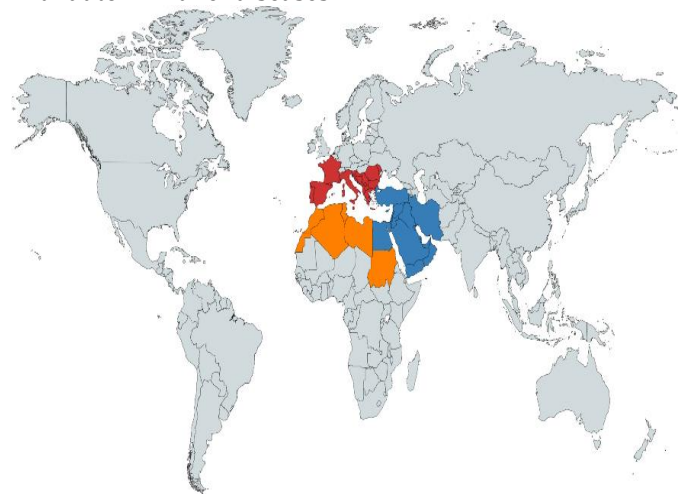


Fig -3: Map of the areas with least anti-inflammatory molecules in cuisines

3. WEBSITE

The webpage has various articles along with the food recommendation system which the user can read to understand more about their situation.

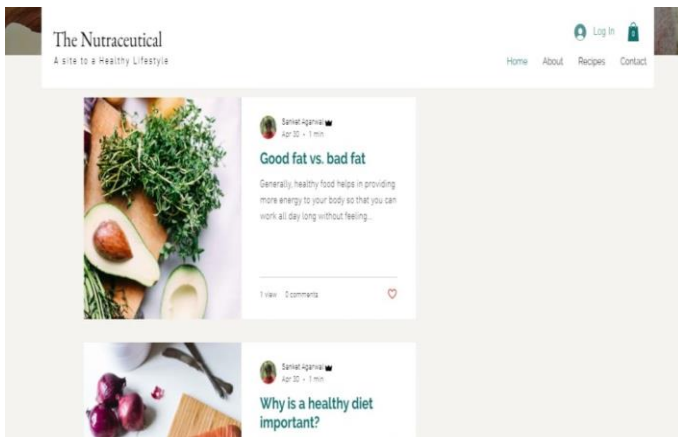


Fig -4: Website version of the project

There are various blogs and videos on internet and people often do get confused with what might be a suitable or valid diet for them. This website compiles all of that according to the user input. It also recommends food or dishes which the user prefers.

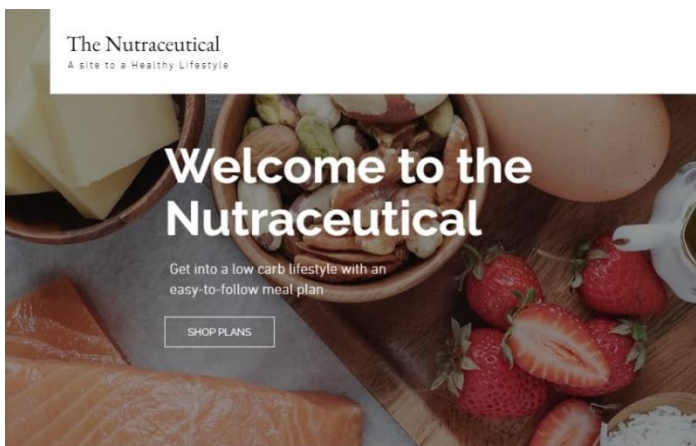


Fig -5: Website home page

4. CONCLUSIONS

The goal of this project was to large available dataset of recipe and build a food recommendation system which can help people focus on the nutrition more as it can be a major part of curing their auto immune disease. The motive of building a user-friendly system for people across the globe was established. Another motive was to try natural methods to control the inflammation by suggesting anti-inflammatory ingredients and by adopting natural methods to help cure the auto immune diseases. Future enhancement can be that the number of auto immune diseases according to which the model will give food recommendation are only 100. New diseases can be discovered in future so more data can be added accordingly.

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