A PROJECT REPORT

on

"Food Item Recognition with Calorie Estimation"

Submitted to

KIIT Deemed to be University

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN
COMUTER SCIENCE & ENGINEERING

BY

KUMARI TANYA 1605033

UNDER THE GUIDANCE OF
PROF. Manas Ranjan Lenka

SCHOOL OF COMPUTER ENGINEERING
KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY
BHUBANESWAR, ODISHA - 751024
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School of Computer Engineering
Bhubaneswar, ODISHA 751024

CERTIFICATE

This is certify that the project entitled

“Food Item Recognition with Calorie Estimation“

submitted by

KUMARI TANYA 1605033

is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Sci-ence & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during year 2019-2020, under our guidance.

Date: / /

(Prof. Manas Ranjan Lenka)
Project Guide

Acknowledgements

I am profoundly grateful to Prof. Manas Ranjan Lenka for his expert guidance and continuous encouragement throughout to see that this project rights its target since its commencement to its completion.

KUMARI TANYA

ABSTRACT

In this report, I propose a food recognition system that when feeded with the right amount of data can help a user monitor his/her day to day intake of calories. The aplication has a simple HTML frontend with javascrit, rather reactJS making the application more user friendly and scalable. The application starts with asking the user for gis/her details such as gender, height, weight and age. It has been feeded with a formulae to calculate the specific number of calories that a person of that details should be suggested to take. The user then inputs an image from the gallery or mobile phone camera. This image is prin ted on to an HTML element called canvas, from where the image is fed into the model. The model puts the image into one of 101 classes of food items that it was trained upon. It has an accuracy of around 95%.

Keywords: calories, HTML, javascript, neural network, scaleable.

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Chapter 1

Introduction

1.1 GENERAL INTRODUCTION

propose a food recognition system the purposes of which are estimating calorie and identify food items. With the rapid development of our society, more attention has been paid to the quality of life, especially the food eat. Food recognition systems is a system which could identify the type of food in an image that is captured with a camera. This is an idea to help the users to keep track of their calorie intake. The user can automatically record their food and calorie intake with just a snap of its photo.

adopt image recognition methods which are suitable for all suitable platforms. To recognize food items, a user draws bounding boxes around the food item, and then the system starts food item recognition within the indicated bounding boxes. To recognize them more accurately, segment each food item region, extract image features and finally classify it into one of the one hundred food categories with a convolution neural networks.

can awake users if their food habits problems such as bad food trends and unhealthy food. It is useful for disease prevention.

1.2 SCOPE OF THE PROJECT

Our project proposes on recognising/detecting food items in a food image and show its calorie value by using convolutional neural network(popular for image recognition). will train our model to recognise food items, then with the help of support vector machines(SVM), classify those food items into different categories(e.g burger,pizza etc)

1.3 Problem Statement

The purpose of this project is to take food images as input, process the input, training the model, to recognise the food item. The second step is to estimate the amount of calories that a user would gain on consuming the food item. This project is restricted to globally recognisable food. It can be further developed to recognise local food items. It further engulfs around the concept of CNN.

Chapter 2

Literature Survey

[1] Issues in dietary intake assessment of children and adoloscents

There has been a number of proposed methods for measuring daily food diet information. In this, one existing system which asks the user to give the details of food and drinks he/she had consumed in 24 hours to the instructor or dietitian but the problem with this type of method is sometimes people won't be able to remember exactly what they ate with content and amount. It is hard for the user to explain and give details of everything he/she consumed in the last 24-hours.

[2] Determination of food portion size by image processing

Researchers trying to improve on this technique and in the paper [2] author uses a new idea in which the user takes a picture of the food before eating and using a calorie card as a reference, it tells the calorie value of the food. The card should be placed next to the food while capturing the picture . Drawback of this system is that it will not work without the card.There is another system which is based on support vector machine but use the thumb for calibration of each and every food image, it requires long calculation for measuring nutrition of the food photo taken with the camera of a mobile phone, but the use of thumb of patient for calibration, solves the problem of carrying cards or special trays. More specifically, an thumb image is captured and stored with its measurements in the first usage time (first time calibration).

[3] Self-monitoring dietary intake: Current andfuture practices

In this, another method had been proposed by the author where a user have the PDA(personal diet assistant) app. In which the user record the daily food intake information on a mobile phone . but it has been shown that result of the portion has significant error and take long time for the user to enter the record.

[4] Healthaware: Tackling obesity with health aware smart phone systems

Yet another approach appeared in [4] where user can take a picture of the food from a smartphone and its compared with the predefined similar picture with it's known nutrition value stored in the database.The main disadvantage of this system is that it does not consider the size of the food, which is extremely important.

[5]Food recognition using statistics of pairwise local features

Food recognition is a difficult task since appearance of the food are various even they belongs to the same category. In [6] the author proposed a method for recognition multiple images which first detect food put region by several detector next recognize by extracted color, texture, gradient and SIFT using multiple kernel learning.

[6] Recognition of multiple-food images by detecting candidate regions

The TADA dietary assessment system [6] has food identification and quantity estimation, although it has some restriction that food must be put on white dishes and food photos must be taken with a checkerboard to food quantity estimation.

Chapter 3

Software Requirements Specification

3.1 FUNCTIONAL REQUIREMENTS

- The application should be able to easily be deployed onto any system with a basic architecture. The system need only have a phone browser and a wifi connection.
- The application should be able to take user input in the relevant format. The input once taken is stored as long as the application runs.
- The application should be able to keep track of the user's calorie intake.
- The application should be able to calculate a specified number of calories daily as per the details of the individual.
- Once an image is input, the application should be able to classify the image into one of the 101 classes of food items.

3.2 NON-FUNCTIONAL REQUIREMENTS

Security: The data is stored in a secured location.
Concurrency and Capacity:The system should be able to handle multiple tests executing simultaneously.
Performance:One of the most important considerations especially in the architecturing phase.
Reliability:The data should be transferred in a reliable way and using trustful protocols.
Usability: End user satisfaction and acceptance is one of the key pillars that should be taken into account.
Documentation: Last but no the least,all projects require a minimum of documentation at different levels.

Chapter 4

Requirement Analysis

3.1 PRODUCT FUNCTIONS

- To provide an easy interface to input the object image
- User would be able to upload the image
- System would be able to pre-process the given input to align it
- System would be able to detect food items present in the image
- System would be able to estimate calories

3.2 USER CLASSES

- Naive users: Key factor in uploading the images which serves the secondary resource for the data set, in order to improve a model.
- Analyst: Studies the problem and works on the data collected. decides the best suitable algorithm to be applied etc.

3.3 USER INTERFACES

An Android App/bsite for the interaction with the user. Input of food items is given from a picture taken through the smartphone. Once the image is uploaded, it is categorized to different food categories with the help of image processing. And when compared with a trained dataset it will display the calorie count of the food items to the user as output.

3.4 HARDWARE INTERFACES

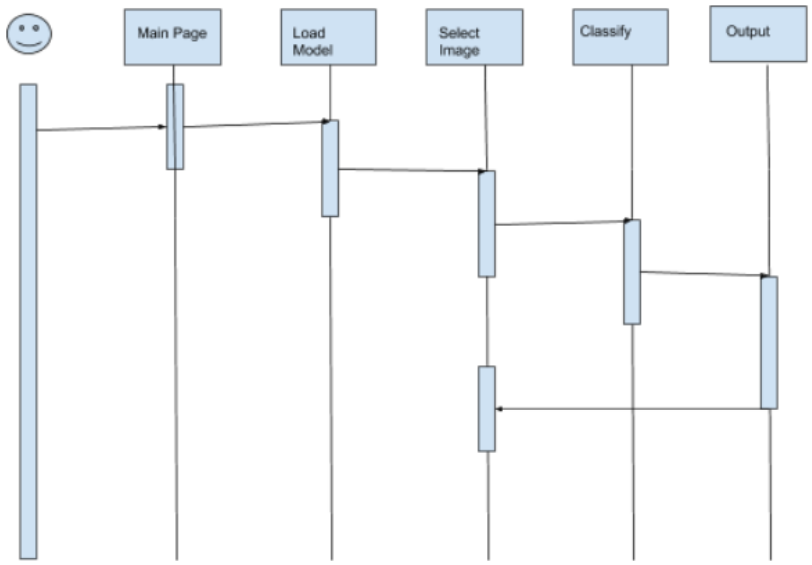
Mobile Phone which is running on Android version 6.0 or higher with a camera is the hardware used by the user to give input.
Backend management of processing is done by systems present on the server side which have graphical processors to preprocess, categorize and detect the food item and calculate the amount of calories.

3.5 SORFWARE INTERFACES

- Tensorflow API
- GoogLeNet Inception V3

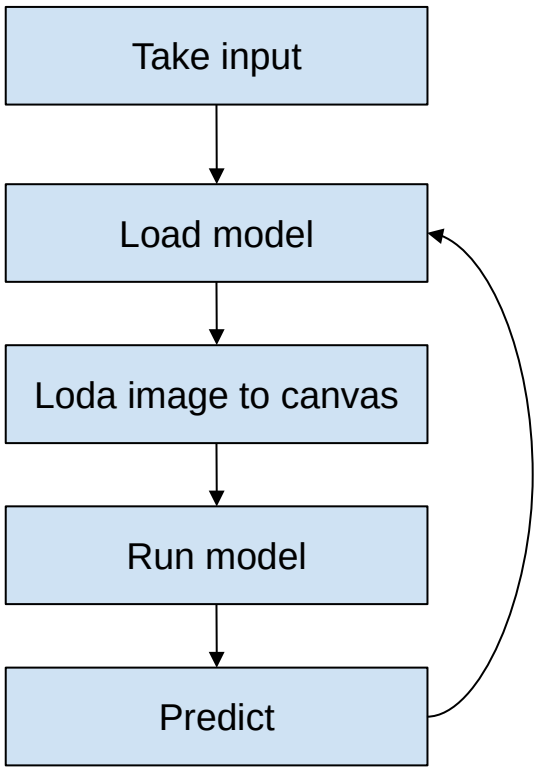
Chapter 5

System Design



The Figure shows all interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged beten the objects needed to carry out the functionality of the scenario.

Figure 1: Sequence Diagram



The figure alongside depicts the flow of a data of a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself. There are a total of 4 classes in the aplication. The application starts with the main state, that takes input, then is the load model state,

Figure 2: Data Flow Diagram

Chapter 6

System Testing

6.1 Test Cases and Test Results

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	User details blank	User details are not entered and the button is clicked	Application passes control via a loop to alert message	An alert is dispplated to enter the details
T02	User details filled	The user details are filled in the appropriare fields, and button is clicked	Application passes control via a loop to next page; Changes state	The appplication saves the data and control flows to next page
T03	Download Model	The user clicks on the download model button	Application sends request to AWS server; Changes state	The model is downloaded and saved into cache
T05	No File selected : main page	The user does not select and image and proceeds with clicking “classify” button	Application passes control via a loop to alert message	The application logs a message on console of the browser.
T06	Non-Image selected : main page	The user selects a file, hover the file is no and image, and proceeds to click classify.	Application passes control via a loop to alert message	The application logs a message on console of the browser.
T07	Image selected : main page	User selcts an image and then proceeds to click “classify” button.	Application passes control to classift image; Changes state	The aplicatio transfers control to the classify image function.
T08	No File selected : result page	The user does not select and image and proceeds with clicking “classify” button	Application passes control via a loop to alert message	The application logs a message on console of the browser.
T09	Non-Image selected : result page	The user selects a file, hover the file is no and image, and proceeds to click classify.	Application passes control via a loop to alert message	The application logs a message on console of the browser.
T10	Image selected : result page	User selcts an image and then proceeds to click “classify” button.	Application passes control to classift image; Changes state	The aplicatio transfers control to the classify image function.

Chapter 7

Project Planning

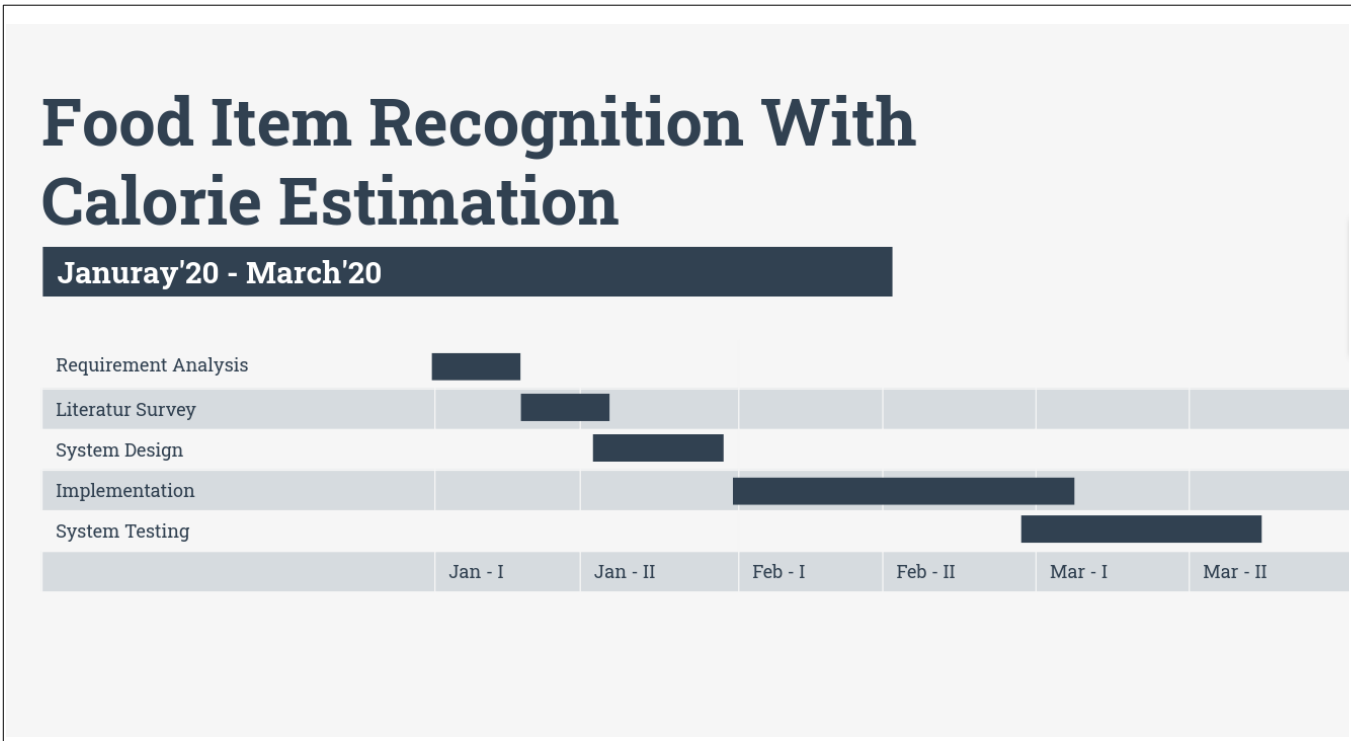


Figure 3: Gantt Chart

Chapter 8

Implementation

```
    return (
      <div className="App"><br></br><br></br>
        <center><div className='heading'>Food Recognition with Calorie Estimation</div></center><br></br><br></br>
        <center><div className='sub-heading'>This app was coded for final year project by <a target="_blank" href="https://github.com/Tanya3375/Food-
Recognition">Kumari Tanya</a> (USN:1605033)</div></center><br></br>
        { inputTaken && modelLoaded && !modelRunning ?
                <center>
                        <button onClick={this.showData}>Show Data</button><br></br><br></br><br></br>
                </center>

                : ''}
        { !modelLoaded && !inputTaken ?
```

```
                : ''}
        { !modelLoaded && !modelLoading && inputTaken ?
                <center>
                        <button onClick={this.loadModel}>Start</button><br></br><br></br><br></br>
                </center>

                : ''}

        { !modelLoaded && modelLoading ?
          <p className='loading'>
<center><div className='sub-heading-1'>Your data has been saved, and the model is currently loading. Once loaded, you can start using the app</div></
center><br></br>
<center><div className='sub-heading-1'>LOADING MODEL: {loadingPercent}%</div></center><br></br>
</p>
          : ''}
        { modelLoaded && imageLoading ?
          <p className='loading'><div className='sub-heading-1'>LOADING IMAGE</div><br></br></p>
          : ''}
        { modelLoaded && imageLoadingError ?
          <p className='error'><center><div className='sub-heading-1'>ERROR LOADING IMAGE.<br/>TRY DIFFERENT URL</div></center><br></br></p>
          : ''}
        { modelLoaded && modelRunning ?
          <p className='loading'><center><div className='sub-heading-1'>CLASSIFYING: {classifyPercent}%</div></center><br></br></p>
          : ''}
        </div>
        <div className='interactive'>
          { modelLoaded && !modelRunning && !imageLoading ?
          <p>
            <center>Food Image: <input type='file' id='file' ref={(input) => { this.urlInput = input; }}/>
            <br/><br/>
            <button onClick={this.classifyNewImage}>Classify Image</button></center>
          </p>
          : '' }
          <center><canvas id='input-canvas' width='299' height='299'/></center>
          { topK ? <Predictions topK={topK}/> : ''}
        </div>
      </div>
    );
  }
}

export default App;
```

Figure 4: Code

Chapter 9

Screen shots of Project

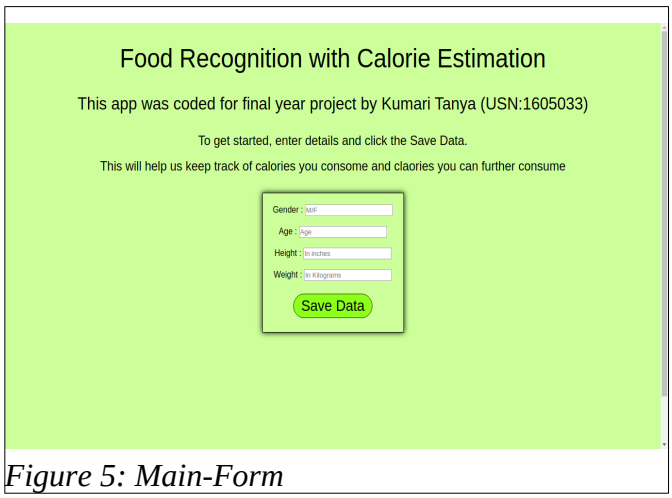


Figure 5: Main-Form

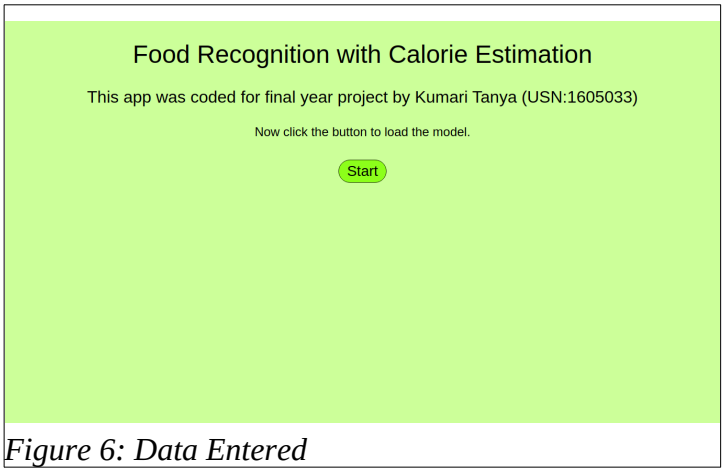


Figure 6: Data Entered

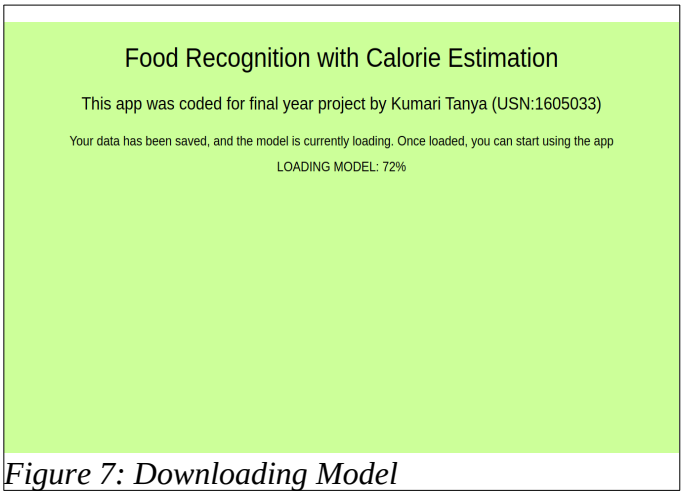


Figure 7: Downloading Model

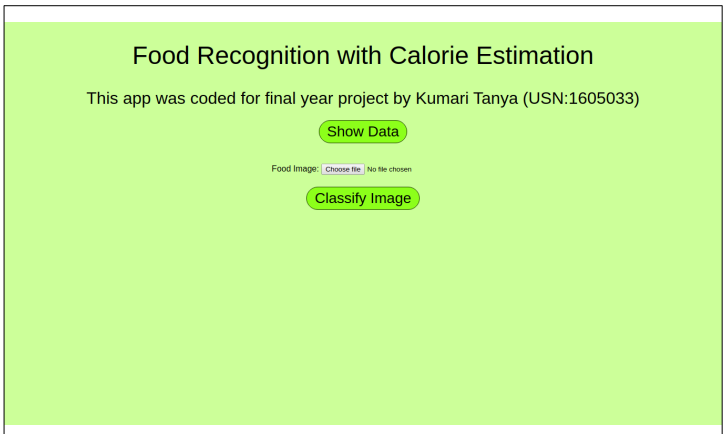


Figure 8: Model Downloaded

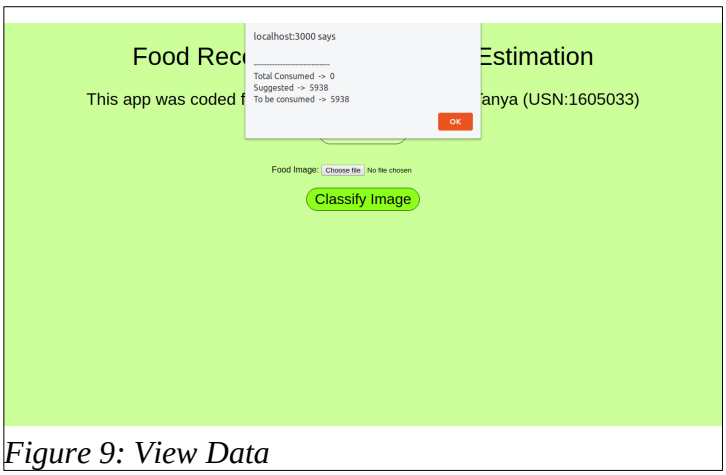


Figure 9: View Data

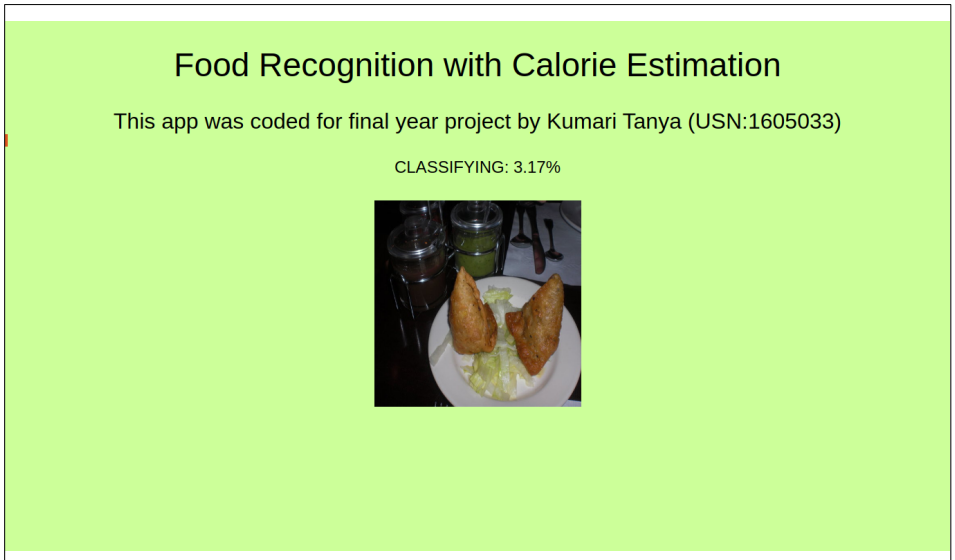


Figure 10: Classifying Image

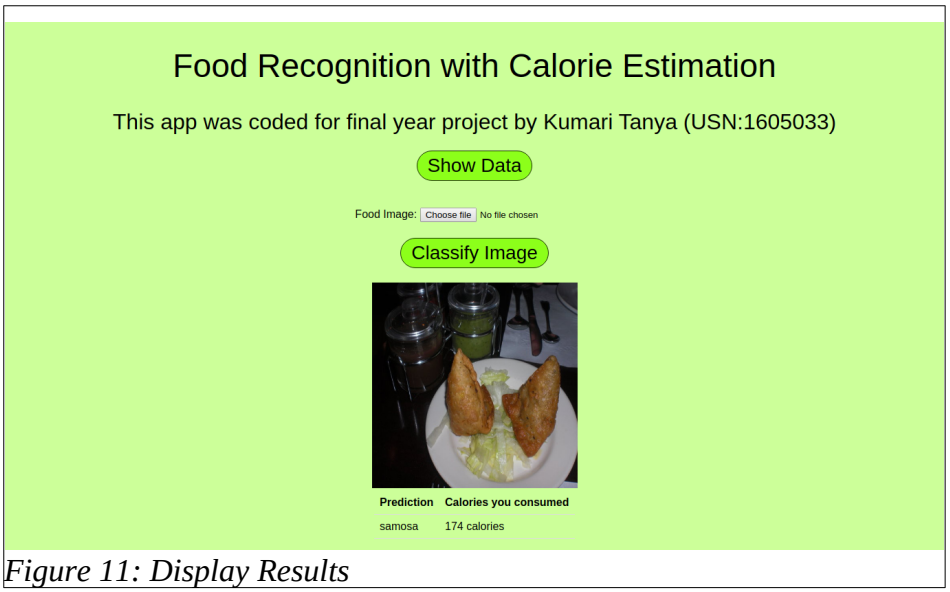


Figure 11: Display Results

Figure 12: View Data

Chapter 10

Conclusion and Future Scope

10.1 Conclustion

Given a picture of food as input to the system, it will quickly recognise the food item/items in the image with it's calorie value as output.

Today about 30% of the entire human population is obese and overight. Obesity has been directly linked with various diseases such as diabetes, high blood pressure and even cancer. Majority of similar applications come with premium packages, hover our application would is free. On a social level, it will help bring awareness among people with respect to the food items they consume as ll as the amount of calorie intake. This would in turn lead to a fall in the fraction of population suffering from obesity.

10.2 Future Scope

There is , hover one part of the project that can be worked upon. It is the calorie estimation part.

With the given time frame, I was only able to finish up a food item detection model. A calorie estimation model, consdering the wide aspects of it, would require a longer time frame. Other than this, one could work upon creating this aplication as a non-volative user food tracking system which my application is not,

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SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

Food Item Recognition with Calorie Estimation

Kumari Tanya
1605033

Abstract: I started with an idea in my mind. The idea was to build a salable web application that could be used on multiple devices. I also wanted the application to have a very low dependence on a user's device. This is the reason I chose to work on reactJs. It is an excellent java script framework that that can be scaled very easily. Once can code the front end of an application and node takes care of deploying the server.

Individual contribution and findings: The entire front end of the application was coded by me. Code written by me can be found in App.js file under src folder. Also I did the background research on which data set should be suitable for the project. I ended up with the food-101 data set.

Individual contribution to project report preparation:

- Responsible for the entire contents of the project report.

Individual contribution for project presentation and demonstration: Can present the project in its entirety.

Full Signature of Supervisor: Full signature of the student:

……. ……..