

**Ain Shams University**  
**Faculty of Computer & Information Sciences**

**Cyber Security Program**

Logo

Description automatically generated

**June 2023**



**By:**

Mohamed Ibrahim Mohamed [CS]

Waleed Mohamed Mohamed [CS]

Bavlly Magid Wadea [CS]

Mazen Mohamed Bakr [CS]

Mazen Khaled Ibrahim [CS]

Mohamed Sabry Youssef [CS]

**Under Supervision of:**

Hanan Hendy [BSc, MSc, PhD],

CS Department,

Faculty of Computer and Information Sciences,

Ain Shams University.

Yomna Ahmed [TA],

CS Department,

Faculty of Computer and Information Sciences,

Ain Shams University.

CalorieMe: Calories Estimation System

**Ain Shams University**  
**Faculty of Computer & Information Sciences**

**Cyber Security Program**

# Acknowledgement

If you want to include thank you notes to any one you should put it here. (The acknowledgement is optional)

# Abstract

The abstract is a one page summary of the whole project including: why the project is needed, what are the main features of the project and what are the final results obtained by the developed system.

It’s the most important page in the whole documentation, it should be the last thing you write.

**Table of Contents**

[Acknowledgement i](#_Toc417741593)

[Abstract ii](#_Toc417741594)

[List of Figures iv](#_Toc417741595)

[List of Abbreviations v](#_Toc417741596)

[1- Introduction 1](#_Toc417741597)

[1.1 Motivation 1](#_Toc417741598)

[1.2 Problem Definition 1](#_Toc417741599)

[1.3 Objective 1](#_Toc417741600)

[1.4 Time Plan 1](#_Toc417741601)

[1.5 Document Organization 1](#_Toc417741602)

[2- Background 2](#_Toc417741603)

[3- Analysis and Design 3](#_Toc417741604)

[3.1 System Overview 3](#_Toc417741605)

[3.1.1 System Architecture 3](#_Toc417741606)

[3.1.2 System Users 3](#_Toc417741607)

[3.2 System Analysis & Design 3](#_Toc417741608)

[3.2.1 Use Case Diagram 3](#_Toc417741609)

[3.2.2 Class Diagram 3](#_Toc417741610)

[3.2.3 Sequence Diagram 3](#_Toc417741611)

[3.2.4 Database Diagram 4](#_Toc417741612)

[4- Implementation and Testing 5](#_Toc417741613)

[5- User Manual 6](#_Toc417741614)

[6- Conclusion and Future Work 7](#_Toc417741615)

[6.1 Conclusion 7](#_Toc417741616)

[6.2 Future Work 7](#_Toc417741617)

[References 8](#_Toc417741618)

# List of Figures

[**Figure 1- DeepLabV3 Plus Model Architecture** 4](#_Toc417423219)

[**Figure 2 - YoloV5 Architecture** 5](#_Toc417423219)

Diagram

Description automatically generated

**Figure 1-** **DeepLabV3 Plus Model Architecture**

Diagram

Description automatically generated

**Figure 2 - YoloV5 Architecture**

# List of Abbreviations

|  |  |  |
| --- | --- | --- |
| Abbreviation | Description |  |
| YOLO | You Only Look Once, end-to-end neural network that makes predictions of bounding boxes and class probabilities all at once. |  |
| CNN | Convolution Neural Networks |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Introduction

## 1.1 Motivation

* In recent years community became more aware of health and fitness domain, which reflects on monitoring eating habits and dietary plans.
* CalorieMe is made to ease the process of monitoring calorie intake and encourage people to keep track of what they eat in an easy and usable way.

## 1.2 Problem Definition

* Estimating total amount of calories and portion sizes of food from phone captured image.

## 1.3 Objective

* The main objective of the project is to estimate meal calories, this can be achieved by:
  + Identifying meal ingredients.
  + Estimating of each ingredient quantity.
  + Calculating total meal calories based on each ingredient quantity.
* Build an interactive user-friendly platform that encourages users to manage their nutrition plan.

## 1.4 Time Plan

## 1.5 Document Organization

Include a paragraph for each chapter describing what was discussed in this chapter starting with chapter 2.

# Background

This chapter should introduce the following:

* A detailed description of the field of the project.
* All the scientific background related to the project.
* A survey of the work done in the field.
* Description of existing similar systems.
* Description of any technology used: Bluetooth, GPS… etc.

# Analysis and Design

## 3.1 System Overview

### 3.1.1 System Architecture

Diagram

Description automatically generated

**Figure 3 - System Architecture**

**Description:**

1. **Presentation Layer**

User Interface and communication layer of the application where the end-user interacts with the application.

* 1. **Application Interface**
     + It works on collecting the image captured by the user and sending it to logic layer (server) along with the reference object pixel count to apply the segmentation and calorie estimation process.
     + It’s also works on retrieving and displaying the data after being processed.

1. **Logic Layer (Application Layer)**

information collected from presentation layer is processed by the included models to prepare it for comparison against other information in the data layer.

* 1. **DeepLabV3+ Plus**
     + - semantic segmentation architecture that improves upon DeepLabv3 with several improvements, such as adding a simple yet effective decoder module to refine the segmentation results.
       - it takes the input image and produces mask with label.
  2. **Volume Calculation Equation** 
     + - Assuming that the volume is directly correlated to the weight and the weight is directly correlated to the size of surface of the ingredient, so the model will compare its size with the size of reference object based on their pixels using mathematical formula:   
         (ingredient weight = real size of reference object ∗ Food pixels / Reference pixels).

1. **Data Layer**

data access layer or back-end, is where the information processed by the application is stored and managed.

* 1. **Food And Their Calories**
     + - The dataset contains a csv file with more than 300 foods each with the amount of Calories, Fats, Proteins, Saturated Fats, Carbohydrates, Fibers labelled for each food.
       - We take ingredient label & volume and compare it against the dataset and return the calorie count per ingredient volume.

Include a figure of the system architecture and a description of all modules.

You may add Functional and non-functional requirements section –If needed–

### 3.1.2 System Users

1. *Intended Users:*

The traditional way to calculate the calories is tedious way and it takes a lot of time and calculations. CalorieMe is made to make this process easier for the intended users whom are:

* 1. Fitness enthusiasts: as fitness enthusiasts’ main goal is to stay in shape and keep track of what they eat during the day. CalorieMe will speed up this process.
  2. People who suffer from chronic diseases: People who suffer from chronic diseases such as heart diseases, diabetes, .. etc must keep track of their diet and their macro nutrient portions (fats/carbohydrates) to insure their safety. CalorieMe should help them to monitor their health.
  3. Casual users: are the people who aim to keep track of their calories intake throughout the day to keep a healthy lifestyle. Calorie me will encourage them to do so.

To whom the system is built, and how each group of users will use the system.

1. *User Characteristics*

Basic knowledge about what’s meant by calorie intake and macro nutrients (proteins/fats/carbohydrates).

What kind of experience or skills are required from the users to be able to operate the project effectively.

## 3.2 System Analysis & Design

### 3.2.1 Use Case Diagram

The use case diagram + fully dressed use cases describing each function of the project if applicable.

### 3.2.2 Class Diagram

The diagram + description of all the main classes if applicable.

### 3.2.3 Sequence Diagram

if applicable

### 3.2.4 Database Diagram

If you are implementing a database include the database schema plus a description of the tables.

# Implementation and Testing

This chapter should include:

* A detailed description of all the functions in the system.
* A detailed description of all the techniques and algorithms implemented.
* Description of any new technologies used in implementation.
* UI Design and Wireframes
* Testing procedures and levels used

# User Manual

This chapter should describe in details how to operate the project along with screen shots of the project representing all steps.

This chapter should also include an "Installation Guide" that would describe how to install the program, and all required third party tools that needs to be available for the project to run. The installation guide will also be included as a readme file in the CDs delivered at the end of the year.

# Conclusion and Future Work

## 6.1 Conclusion

A complete summary of the whole project along with the results obtained.

## 6.2 Future Work

What can be done in the future to improve the performance of the project and what additional functions could be added?

Add Appendices if you think it’s needed like:

1. Main code segments
2. Any surveys made

# References

The list of references used during the project or in writing the document. The references should be formatted properly, you can refer to http://education.exeter.ac.uk/dll/studyskills/harvard\_referencing.htm for details on how to format your reference list.

It’s preferable to use word references to make it easier.