A Minor Project Proposal Report on

Nutritional information extraction using Mask R-CNN deep learning model with food images

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Abstract

This application provides the nutritional facts about the food we consume in daily basis. Knowing what goes inside our body is critical to keep ourselves healthy and change our lifestyle. In this application we use Mask R-CNN (deep learning algorithm) to classify food and provide approximate nutritional value the food contains. Macronutrients such as protein, carbs , fats are available in every food we eat. This application updates user on how much such macronutrients they have consumed so that they could decide on what is needed and what not. This application also has flexibility that user can change the amount of food than the application has predicted and application will automatically updates it's nutritional contents in the database accordingly.

Keywords: Deep-Learning, Mask R-CNN, Protein, Carbs, Fats, Micronutrients

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1. Introduction

Knowing about nutrients of foods that we are consuming is very important to be fit and healthy. It helps us to live a beautiful and healthy life.

This application tries to provide the fact of nutrients that we consume with the help of photo that we capture. This application asks for camera permission and tries to classify the food in the image using the Mask R-CNN model which is a popular model for object classification in an image used by many. After successfully completing the classification process we take the name of the food and query on the database to extract it's additional nutritional information. As we are using the in-device database specifically for android devices we will be using SQLite as local database to store the nutritional information about the food.

In initial phase we are trying to extract nutritional information about some very common Asian foods such as Mo:Mo , Chowmin and Potato Fries.

1.1 Problem Statement

According to World Health Organization, almost 20% of deaths worldwide are due to an unhealthy diet. The problem here is not consuming sufficient food; the problem is that people do not knowing what's in their diet. If people are able to estimate their nutrient of food using the images of their food, they can easily decide on the amount of nutrients they want to consume. If people knew how much calories their food contains, then this problem will be somewhat controlled.

Almost every person has mobile in their hand today, people can get all the nutritional information regarding the food they consume which helps them control the unnecessary food from entering their body. People can easily monitor on doctor's prescription by knowing the amount of macronutrient they consume by just a simple image click.

1.2 Project Objectives

Our project objectives are to:

- Provide user the nutritional information about the food they eat and help them reach their fitness goal.
- Eliminate the irritating process of searching food preference in text-based database just to know about their nutrients value.
- It adjusts itself to the amount so don't need to manually calculate nutrients value for different quantity.

1.3 Significance of Study

The significance of study of this android application is to provide user with the information about the food they consume in their mobile screen. As android is one of the leading mobile operating system with around 70% market share we can provide the critical information about user's food preference in just a few clicks in the their device to majority. This will significantly save the user's time to search and surf to the internet for the same purpose time and again. Using real time images we have also reduced user's time of typing in the name of the food to search for it's nutrition value and manually calculate it's nutritional value according to quantity.

2. Scope and Limitations

2.1 Scope

The application has following scopes:

- It can be a useful application to be informed about what goes inside our body.
- With this application user don't have to remember the name of the food they consume and manually calculate it's nutritional value.
- User can also review their daily nutritional intake as we have the feature of editing and saving information locally.
- It is easy to use and affordable to everyone and everywhere as it doesn't require any internet connection.

2.2 Limitations

The application has limitations as mentioned below:

- This requires android version more than 4.0 (kit kat) to run.
- This application only has information about few common foods.
- The amount of food it predicts might not be exact though user can manually change the value according to their preference and the application will remember this.

3. Literature review

Mask R-CNN [1] is developed based on Faster R-CNN, which is a region-based Convolutional Neural Network. A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and can differentiate one type of image from the other.

Recently the implementation of Mask R-CNN was done by one of the employee at Leapfrog Technology [2] which was a reference point for us to learn and explore more about it.

4. Use Case Diagram

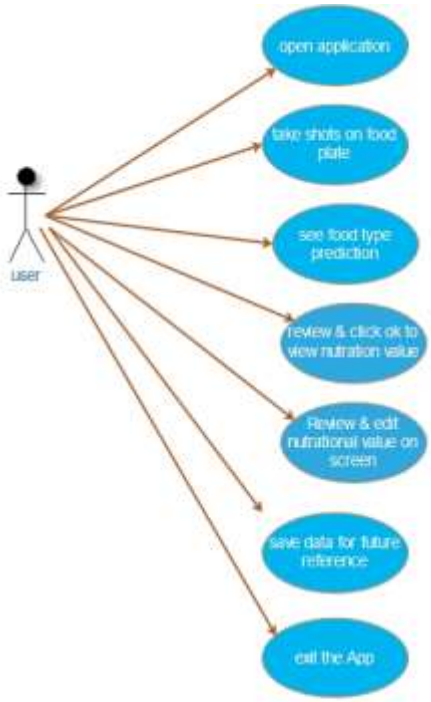

Fig. Use Case Diagram

5. Activity Diagram

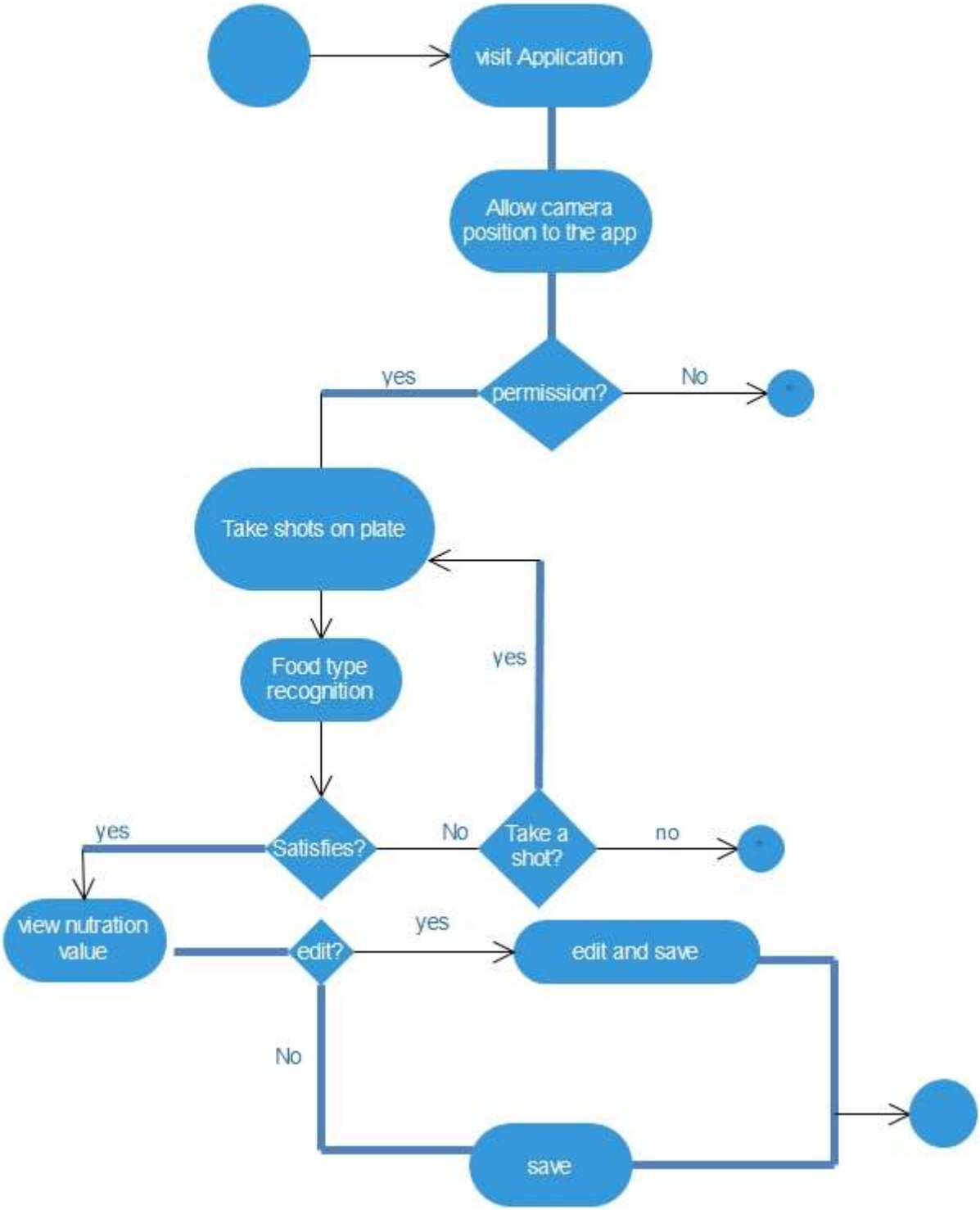

Fig. Activity Diagram

6. Proposed Methodology

Based on the nature and requirement of a project waterfall model has been chosen for developing this application. Using this model we can simplify the process of making an application. As our requirements are clear and well defined earlier we take waterfall model as a perfectly suitable model for us.

Our Final product will go through the below mentioned steps in waterfall model:

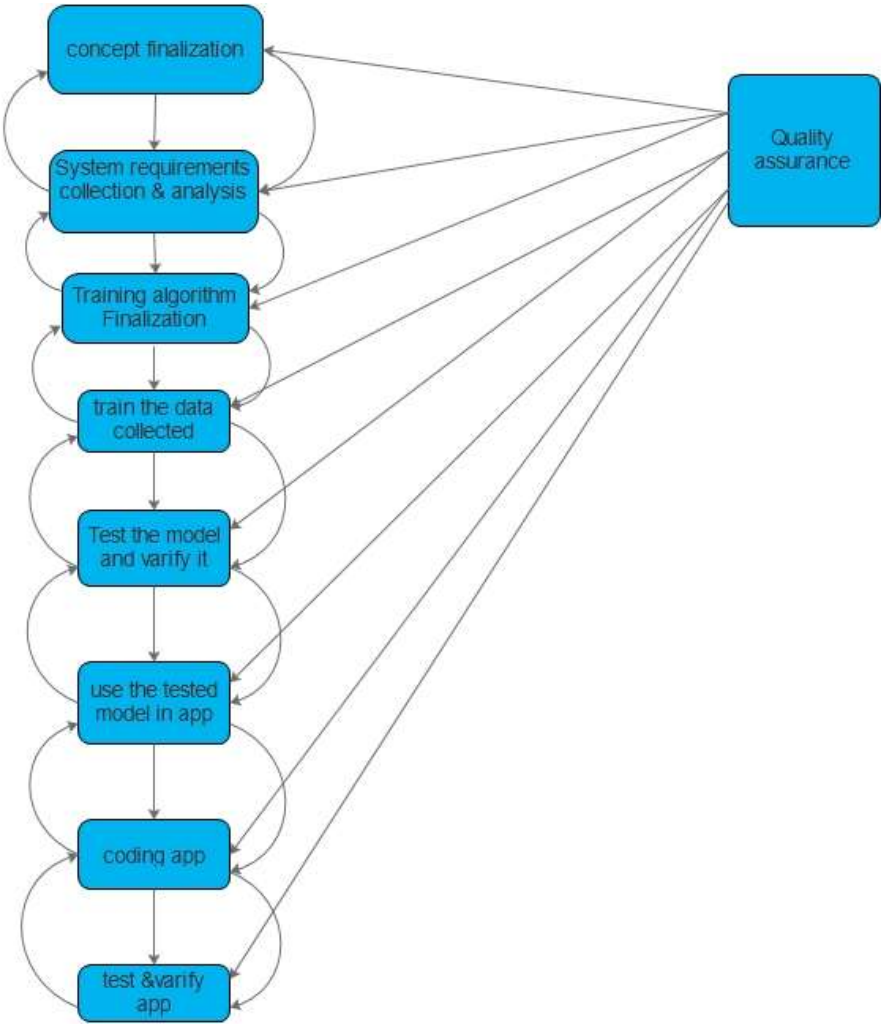

Fig. Water fall Model of software development process

7. Tools and technology used

While developing the software we have made use of following tools and technologies for different purpose as mentioned below.

Tools and Technology	Uses
Java	Programming Language for android with native support
Flutter	Framework for developing cross-platform mobile app
Android Studio	Native environment for android application development
Adobe XD	User Interface design using Adobe Experienced Design
R-CNN	Popular Deep learning model for instance segmentation of images.

Table 1.Tools and technology used

8. Expected outcomes

Our application is informative and useful for almost everyone who wants to maintain their healthy lifestyle.

Our expected outcomes are:

- Reliable nutritional information regarding the food consumed.
- Daily report on calorie and macronutrients intake.

9. Project time and task schedule

The project schedule has been designed as per requirements and constraints involved. This project is scheduled to be completed around 2 month. Learning Deep learning algorithms and implementing R-CNN model as we mentioned above has been challenging part and has been given more time. Once the training is completed with the data collected by us we'll simply use it in the application we are developing. We also are researching on fixing weather to use a high end device or using cloud computing resources to train our models. The coding parts won't take much time and has been given less time.

9.1 Project Schedule

TASK	APPROX.DURATION(in days)
Learning the basics of Deep Learning	15
Implementing Basics algorithm in Java	10
Learning about Mask R-CNN model and it's use cases	5
Training on collected data using Mask R-CNN	5
Application analysis and Design	5
Data Collection and cleaning up the data	Ongoing until training
Application Coding and debugging	5
Testing and verification	2
Final documentation	2

Table 2

Fig. Project Schedule

9.2 Gantt Chart

Fig. Gantt Chart

11. References

[1] https://arxiv.org/abs/1703.06870 accessed at 27, July 2019 at 2:30pm.

[2]https://www.lftechnology.com/blog/image-calorie-estimation-deep-learning/accessed at 27 , july 2019 at 5:00 pm.