AUT UNIVERSITY COMPUTER + MATHEMATICAL SCIENCES

Towards a Healthier Life: Food Library and Recommendations

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1. Terms of Reference

Background Information:

A well-balanced recipe is critical to a healthy lifestyle. As the rapid improvement of living standards in the past decades, healthy diet gains more attentions. In order to meet people's needs for healthy living management, a variety of apps raised, which are made to record what users eat every day. However, there still are some differences between people’ s expectations and facts. Users tend to use more convenient software. For instance, users still need to

manually type the name of food instead of just taking a picture and waiting for the system to analyze it automatically.

In this project, we are going to develop an application to help people record their food consumed every day, calculate the nutrition, as well as the energy (in Calorie) has been taken and provide a simple analysis result and recommendation for future recipes. The novel point of this project is that we allow the user by only taking a picture to upload what they eat every day, instead of manually inserting the food according to catalogue.

2. Rationale for the Project

As people pay more and more attention to dietary health, a convenient and scientific dietary guide is particularly important, while diet monitoring software plays such a role.

There are several existing means and algorithms used for image recognition. Machine learning procedures, especially for deep learning, like CNN with TensorFlow and SVM, will be used to achieve the project.

In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep, feed-forward artificial neural networks, most

commonly applied to analyzing visual imagery.

CNNs use a variation of multilayer perceptrons designed to require minimal preprocessing. They are also known as shift invariant or space invariant artificial neural networks (SIANN), based on their shared-weights architecture and translation invariance characteristics. CNNs use relatively little pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered. This independence from prior knowledge and human effort in feature design is a major advantage. (Wikipedia, 2018)

In machine learning, SVMs (support vector machines) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall. (Wikipedia, 2018)

3. Scope and Objectives

Objective:

The project objective is to develop an Android app to recognize food by only just taking a picture; and as a result, to help people record their food consumed every day, calculate the nutrition, as well as the energy (in Calorie) has been taken and provide a simple analysis result and recommendation for future food recipes.

Scope:

The estimated duration of this process is six months, and we will investigate the recording performance of food types using CNN with TensorFlow (Image recognition) and ML (Machine learning) techniques. The available methods include standard Android apps development, i.e., UI design. We also will build a large food image library for training purposes.

4.Project Approach

We choose Teambition, which is the founder of domestic team collaboration tools in China, and it's possible to help teamwork by

sharing and discussing tasks, files, sharing, schedules, etc. at work. Teambition creates a great application for web, desktop, and mobile environments, so you can work with your team anytime, anywhere, and your iPhone app is rated by Apple as the 2015 best app of the year. Currently, more than one million users have teamed up through Teambition, including leading companies in multiple industries.

Risk Management:

During the process, we will encounter many risks:

1. This is our first contact with the calorie calculation of food. We don't know much about the relevant expertise and skills. We may need to learn a lot of new things.

2. Some team members may need to work outside and do not have enough time to participate in each of our discussion sessions.

3. When discussing a problem, each team member has his own point of view, and sometimes it can cause heated debate.

4. It may not be possible to complete each phase of the task on time, resulting in an extended project completion time.

5. There is not enough budget.

5.Deliverables

Research report detailing:

Collect massive data about various kinds of food mainly from the following 3 websites:

- 58PIC : http://www.58pic.com/tupian/shiwu.html
- BOOHEE: http://www.boohee.com/food/
- FITNES: http://www.fitnes.cn/food/

Prepare data: Find pictures and related data (such as calorie, quality and so on) of various foods, then screen out foods to ensure the diversity and commonness of data.

Analyze the data sets: Associate food images with related data and store them in groups according to different criteria.

Test algorithm: Test whether the food picture and data match each other, and evaluate the richness of the food types in the database.

Use the LSTM algorithm.

1.Prepare large amount of image data on programs.

2.Set the rule of forecasting model.

3.Draw an expected result of this model.

Software Applications

1.Identify the food in the picture

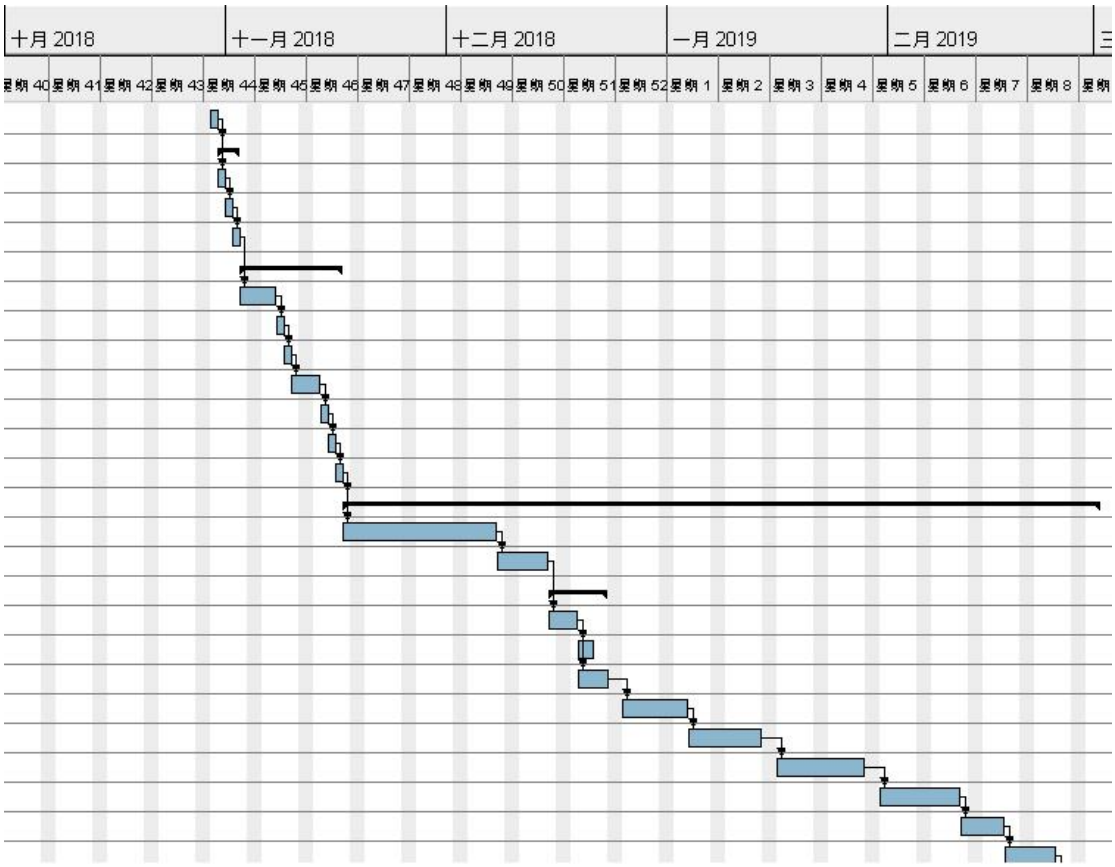
2.And give the detailed data of the food

3.Give relevant advice on this food

6.Project Plan

名称	开始日期	结束日期	持续	前置任务
project begins	18-10-29	18-10-30	1	
initation	18-10-30	18-11-2	3	3
talk with...	18-10-30	18-10-31	1	3
allocate ...	18-10-31	18-11-1	1	4
sign up t...	18-11-1	18-11-2	1	5
planning	18-11-2	18-11-16	10	
make scop...	18-11-2	18-11-7	3	7
risk anal...	18-11-7	18-11-8	1	8
make risk...	18-11-8	18-11-9	1	9
change ma...	18-11-9	18-11-13	2	10
make qual...	18-11-13	18-11-14	1	11
make GANN...	18-11-14	18-11-15	1	12
finish pr...	18-11-15	18-11-16	1	13
build LSTM model	18-11-16	19-2-27	73	14
build mod...	18-11-16	18-12-7	15	14
collect m...	18-12-7	18-12-14	5	15
prepare d...	18-12-14	18-12-22	6	
data c...	18-12-14	18-12-18	2	16
data m...	18-12-18	18-12-20	2	18
incomp...	18-12-18	18-12-22	4	18
normaliza...	18-12-24	19-1-2	7	19
analyze data	19-1-2	19-1-12	8	21
literatur...	19-1-14	19-1-26	10	22
informati...	19-1-28	19-2-8	9	23
determine...	19-2-8	19-2-14	4	24

名称	开始日期	结束日期	持续	前置任务
analyze data	19-1-2	19-1-12	8	21
literatur...	19-1-14	19-1-26	10	22
informati...	19-1-28	19-2-8	9	23
determine...	19-2-8	19-2-14	4	24
optimize ...	19-2-14	19-2-21	5	25
model test	19-2-21	19-2-27	4	26
Mid-project p...	19-2-27	19-3-13	10	27
LSTM mode...	19-2-27	19-3-5	4	27
software ...	19-3-5	19-3-9	4	29
plan for ...	19-3-11	19-3-13	2	30
Application p...	19-3-13	19-4-19	27	
features ...	19-3-13	19-3-20	5	31
model imp...	19-3-20	19-3-28	6	33
coding	19-3-28	19-4-11	10	34
testing	19-4-11	19-4-19	6	35
project repor...	19-4-19	19-5-4	11	36
abstract	19-4-19	19-4-20	1	36
model int...	19-4-22	19-4-25	3	38
software ...	19-4-25	19-5-1	4	39
recommend...	19-5-1	19-5-2	1	40
reference...	19-5-2	19-5-4	2	41
final present...	19-5-6	19-5-18	10	42
model exp...	19-5-6	19-5-10	4	42
software ...	19-5-10	19-5-18	6	44
Monitoring an...	19-5-20	19-6-4	11	45
project c...	19-5-20	19-6-4	11	45


十月 2018
十一月 2018
十二月 2018
一月 2019
二月 2019
星期 40
星期 41
星期 42
星期 43
星期 44
星期 45
星期 46
星期 47
星期 48
星期 49
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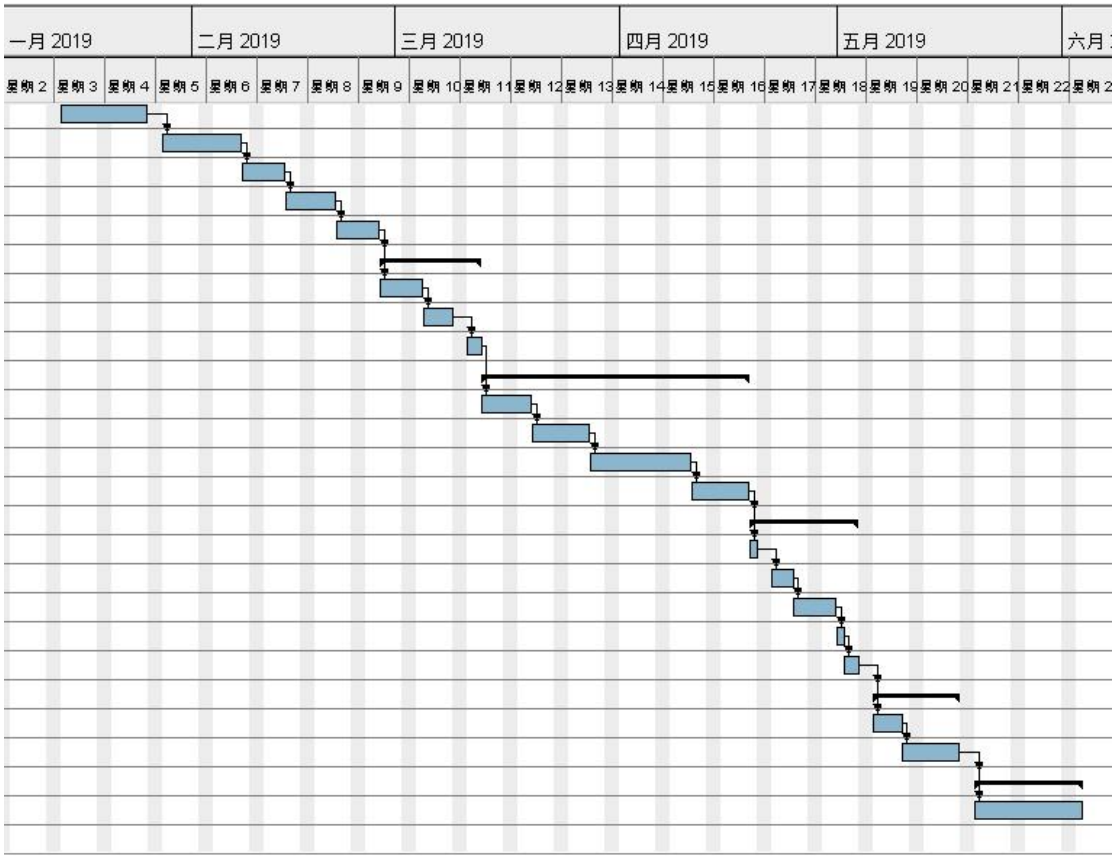
星期 8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二月 2019
三月 2019
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星期 18
星期 19
星期 20
星期 21
星期 22

7.Skills and Knowledge involved

IT specific skills

- Database System
- Algorithm Design and Construction
- IT Service Management
- IT Project Management
- Needs Analysis, Acquisition and Training
- IT Service Provision
- Program Design and Construction
- Image Comparison and Recognition Technology

Personal Capabilities

- Time Management
- Motion Management
- Work Efficiency
- Communication skills
- Precise and Scientific Attitude

Professional Skills

- Academic Writing
- Presentation Skills

- Data Collecting and Sorting
- Mathematical Modeling
- Fundamental of Healthy Diet

Technical Skills

- CNN with TensorFlow
- User Interface
- Java EE
- Python
- Numpy
- Keras
- Microsoft Office Project

8.Estimate all costs incurred

Time/labor cost:

1.Having a group meeting once a week for one to two hours.

2.Having a meeting with the tutor once two weeks for one to two hours.

3.One of team members needs to spend two days on environment configuration.

4.Each team member should spend ten hours per week in collecting and

sorting food data, cleaning and preparing data, analyzing data.

5.Each team member should spend nine hours per week in designing algorithm, testing algorithm and implementing algorithm.

6.Each team member needs to spend six hours per week in exploring and reading related materials and books.

7.One of team members needs to spend an hour a day for progress documentation.

8.One of team members needs to spend ten to twelve hours per week for modeling.

7.Three to four weeks for all report writing.

Resource cost:

1.The occupation of each member’s laptop

2. related materials and books on CJLU.AUT library and Internet.

3.Classroom where we have group meetings

9. Appendix:

Reference:

Wikipedia. (2018, November 2). *Convolutional neural network*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Convolutional_neural_network

Wikipedia. (2018, November 2). *Support vector machine*. Retrieved from Wikipedia:

https://en.wikipedia.org/wiki/Support_vector_machine#Definition