



**CSC4001: Software Engineering**

**An Integrated WeChat Mini Program:  
Habiter**

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# Executive Summary

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Since 2017, when the WeChat Mini Program come into being, the development of the WeChat Mini Program has contributed to a new generation of mobile Internet industry is developing toward the development of “micro, light, and small”, like the WeChat Mini Program, this revolutionary lightweight “APP” that does not require downloading, runs out, and simultaneously has information publishing, advertising, and service functions, will become the best choice to replace the mobile client APP [2].

The usage paradigm of WeChat Mini Program, “direct search and open without installation”, “use with wechat account” and “quit at anytime” are extremely suitable for software carrying daily light weight functions, including bookkeeping, habits cultivation, daily dressing or diet recommendation. In addition, the AI subsystem, incorporated Natural Language Processing algorithms and Convolutional Neural Network algorithms, is one significant component of our development plan, in order to advance the appeal and profitability of the program.

The most exciting thing is that “Habiter” is actually a chatbot. “Habiter” will interact with user in an artificial chatting manner. This method greatly increases the interest of the program and enhances the user’s interactive experience. By doing this, the problem that users often feel bored when using previous habit formation smartphone application will be solved efficiently.

# Problem

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## 2.1 Background

Everyone wants to form good habits and having a healthy lifestyle. Nowadays, however, habit formation is not an easy task. Habit formation is an important part of behavior change interventions: to ensure an intervention has long-term effects, the new behavior has to turn into a habit and become automatic. This is sometimes difficult to achieve even for a self-disciplined person on his own, let alone the vast majority of people. Therefore, how to help people form and maintain habits has become a popular social topic [3].

Nowadays, designing smartphone applications that support behavior change or habit formation has become an important theme within the HCI field in both industry and research. This is because of the common belief that due to their ubiquity, personal nature, and capabilities, smartphones have the potential to support individuals in the process of adapting and sustaining a new healthy behavior [1]. Stawarz et al. [4] express the performance of smartphone applications on habit formation with positive effects but still some limitations, one of which is that a lot of people cannot continue to use those software applications because they are likely to lose their interests in the simple “check and remind” based platforms.

## 2.2 Inspiration

Therefore, based on improving the shorting comings of previous smartphone applications, our goal is to provide an interesting and user-

interacted software application, called “Habiter”, which provides multiple healthy lifestyle formation services including good habit check-in reminders, cost accounting statistic, daily life recommendation and so on. The highlight of our system is that “Habiter” is actually more like a chatting robot who not only does the cost analysis, recommendation, and reminding jobs, but also can perform daily chatting. This design solves the problems of previous products by greatly enhancing the user experience and the interest of the product.

# Solution

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## 3.1 UI Design

Our program is designed to be convenient to used in a daily basis. Therefore, warm theme colors such as warm yellow and light green are chosen to highlight information or color the labels. The purpose is make the mini program less aggressive and more user friendly. In the meantime, white color is selected to be the major background color, to ensure the holistic colouring of the mini program will be gentle. More spaces are left for content as well.

Regarding the basic properties of WeChat Mini Program, our *Habiter's* user interface is specially design in different layers, including: Home Page, Personal Center, Bookkeeping, Daily Recommendation and Chat Box.

### 3.1.1 Logo Design

Before discussing our UI pages design, a special logo, Figure 3-1, is developed for our program brand.



Figure 3-1: *Habiter* Logo

The logo is composed of two parts, the words on the right and the overlapping figure on the right. The words are straight forward to understand,

which are “HABITER”, the name of our program, and a short introduction, “Just another Mini Program”.

The overlapping figure, which is made up of two phone shape forms. One is in concrete dark, and the other is in light green frame. Regarding the color, green is used since it is the main decorating color participating in the program interface. Specifically, the logo incorporate dark because our program is an integrated system with convenient user interface which is backed up with solid algorithms such as database subsystem, AI subsystem. *Habiter* is expected to be a intelligent friend or steward. Therefore, the deep and mysterious dark is suitable to express the intelligent system. Beside, it will also be conspicuous to see dark and light green on white background program, which will impress the user with our brand. Another important feature of the figure is its layers. The back layer, concrete dark shape, stands for the smart phone devices. The middle empty light green frame aims to represent the mini programs reside inside the smart devices, which are “micro, light, clean and handy”.

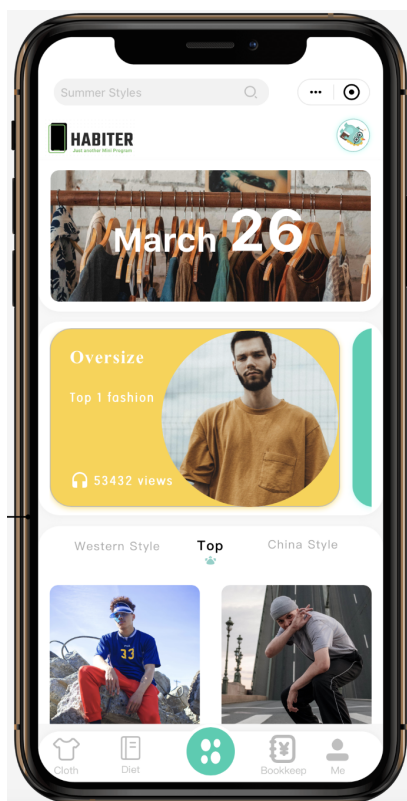


Figure 3-2: Home Page



Figure 3-3: Personal Center



### **3.1.2 Home Page**

The home page of our mini program is the recommendation page, as Figure 3-2 indicates. In this page, the mini program will recommend outfit combinations to the user, according to the the current trend, the list of popularity ranks, weather of the day and user preference collected. The user preference may include dressing style preference, age, today's main task and previous likes.

In this page, the user can not only check the program recommended dressing style, but also can slice down the screen and browse the moments shared by other masters in designing outfits. The users can even interact with each other by pressing the like button or comment below.

### **3.1.3 Personal Center**

Figure 3-3 demonstrates our personal page of our program, the account of the mini program can be easily linked with the WeChat account of the user. In this page, the user can easily navigate to different function units. It is also allowed for the user to modify the personal preference settings such as the profile photo, preferred style, scheme of the program etc.

As an example of functions to be navigate to in this page, Figure 3-4 provides a vivid example. The intelligent “Habiter”s are not limited to the initial one, the user can obtain different “Habiter”s by collecting “Habiter” Eggs and incubation. Different “Habiter”s may have different skills, personalities and appearances. What kind of “Habiter”s an egg can produce depends on some random probabilities.

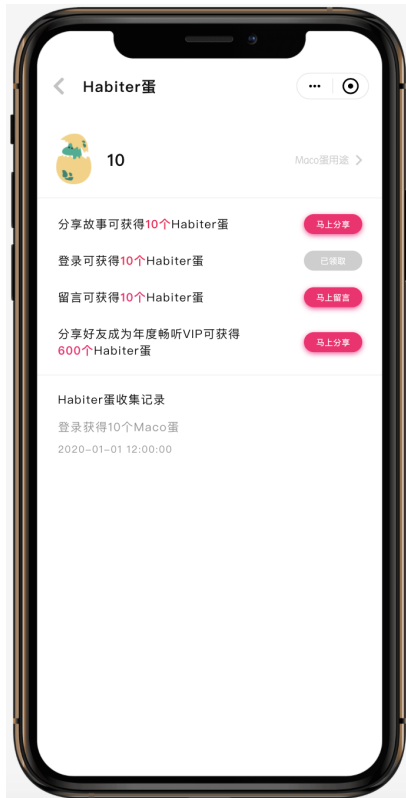


Figure 3-4: Habiter Eggs



Figure 3-5: Chat Box

### 3.1.4 Chat Box

In the chat box, the user can communicate and interact with his / her “Habiter”s. The “Habiter”s will chat with the user normally, and it is capable of sending voice messages and stickers. Moreover, whenever the user claims a class of expenditure or income in the message, the “Habiter” will automatically parse the information and record the transaction into the book kept.

### 3.1.5 Bookkeeper

At any time, the user may check the bill by switching into the *bookkeep* tag. Inside the *bookkeep* tag, the recorded flow of money are demonstrated in different kinds of diagrams. The user can clearly examine the total amount of income and expense as well as each transaction happened, together with its date.



Figure 3-6: Bookkeeper 1



Figure 3-7: Bookkeeper 2



Figure 3-8: Login Page

## 3.2 Database Prototype

The database prototype of “Habiter” is currently designed as the following, Figure 3-9 in order to backup our proposed functionalities.

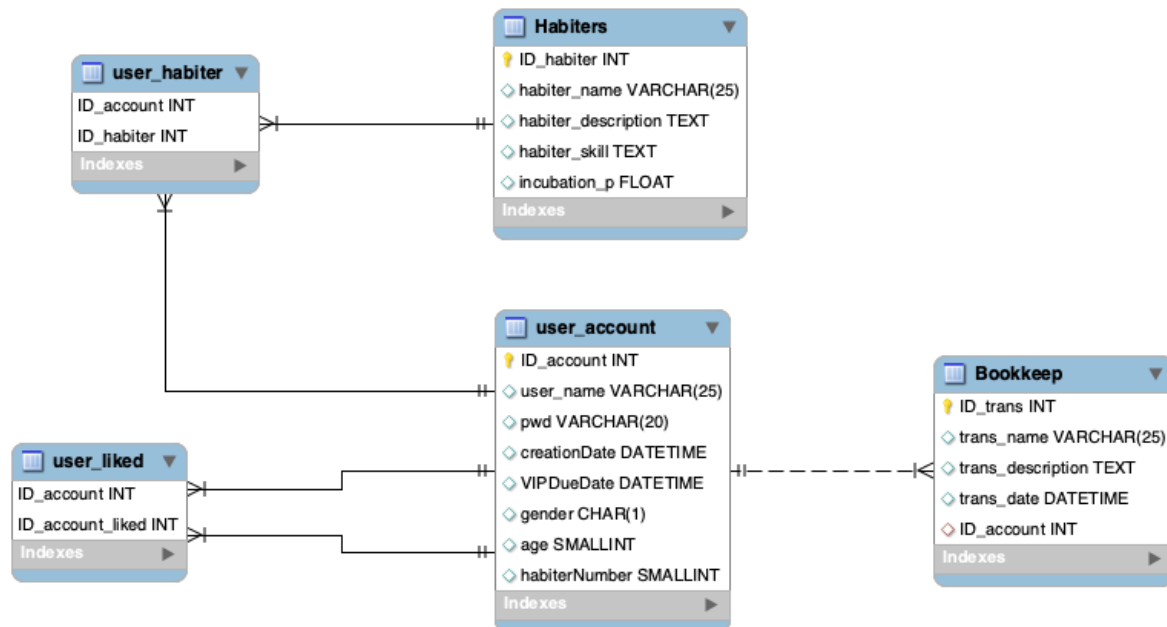


Figure 3-9: Database Design Prototype

The database is planned to be setup with Tencent Cloud IaaS services, which can be smoothly connected with the WeChat Mini Program data stream. Therefore, the program fluency can be ensured.

## 3.3 Book-Keeping and Habit Cultivation

“Habiter” allows users to keep records of their daily accounts in the form of communicating with the chatting robot. It can automatically generate pie charts and trend charts according to users’ book-keeping records, so as to more easily understand their own revenue and expenditure. Therefore, it will help users to manage and accumulate their property in a better way, and develop a sense in wealth management.

### 3.3.1 Expense Tracker

In the chat box, users can declare the class and amount of the expenditure or income when chatting with the chatbot. “Habiter” will reparse the piece of information and record it in the database in order to keep accounts at the same time. Besides, as a direction of future improvement, we plan to adopt NLP (natural language processing) in identifying the catalogues of income and expenses, which allows “Habiter” to extract the key information from chatting messages without an especially claim. For NER (Named Entity Recognition) in the process of information extraction, we will use a neural algorithm based on bi-LSTM model.

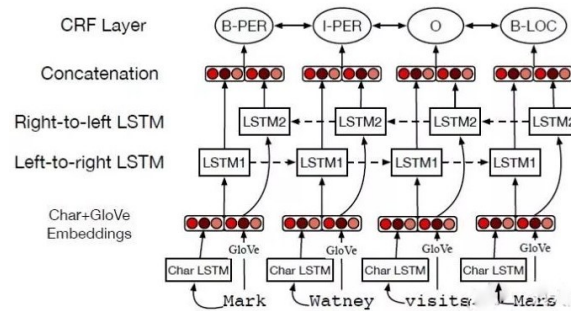


Figure 3-10: NLP Algorithm Identifying Consumption Records

As is clearly recorded in the database, the users are able to examine to track each record about their money, and have an overview of the total amounts. They can also delete or modify certain records they choose, or search for some record according to the partial title entered. To guarantee the users a concrete view of their consumption structures, “Habiter” allows them to change from weekly to monthly to annually view. The users can also check their income and expenses intuitively through observing various diagrams provided like column chart and curve trend.

### 3.3.2 Habit Cultivation

Users can choose good habits they want to have and set them as a goal, such as eating breakfasts every day, exercising regularly, and drinking enough water. Then, they can set daily clocks to remind themselves, and “Habiter” will take a time like 20:00 p.m. as default in the beginning. As long as the users punch the clock every single day and stick to the good habit for 28 days, they will be awarded with an achievement badge lit in their records. By this analogy, users will get achievement badges when they persevere for longer time such as 100 days and an year. However, if the user gives up halfway, the number of dates he or she holds on will be reset to zero. In this manner, users will be encouraged to persevere in good habits and finally cultivate good habits successfully.



Figure 3-11: Setting Good Habits as a Goal

### **3.4 “Habiter” Daily Recommendation**

In order to promote the user’s experience, we provide a daily recommendation in our system. “Habiter” will try to give users advice on the outfits based on the season and weather, it will also recommend a dish for the user every day.

#### **3.4.1 Outfit Recommendation**

With the rapid growth of fashion-focused social networks and online shopping, intelligent fashion recommendation is now in great need. We want to explore the use of deep neural networks, which jointly perform representation learning and compatibility modeling, for recommending outfits based on weather conditions and user’s preference. “Habiter” will get access to a third-party weather report application, and get access to the weather of that day, including the temperature, humidity, and UV index, and so on. “Habiter” will provide a whole outfit for the user. If the user does not like the current outfit, the user can press the “change” button to change another outfit and can press “like it” if the user likes this recommendation. “Habiter” will try to learn user’s preferences according to their decisions and RSR (Recommendation Success Rate) is willing to increase after several trials.

Here follows the demo that we want to achieve:



Figure 3-12: Cloth Recommendation Based on Weather

We plan to build the recommendation platform based on the collaborative filtering (CF) algorithm and DNN. It uses the preferences of the user on the outfit provided as the training data and further learns the user's habits. And it is also sensitive to the sparseness of the data, which is beneficial and prominent in our combined recommendation problem.

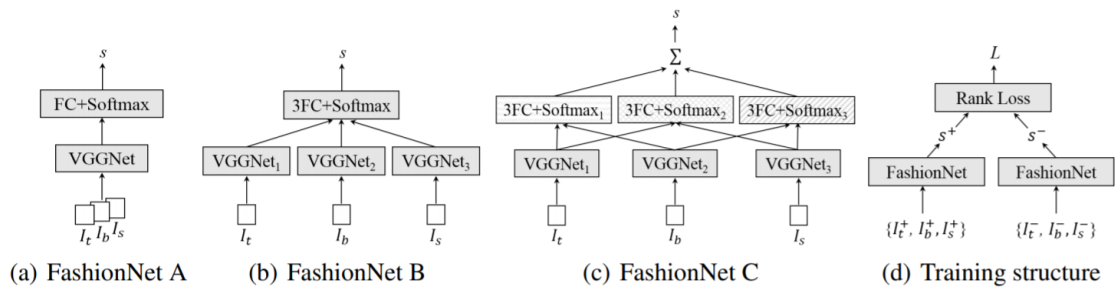


Figure 3-13: Cloth Recommendation Algorithm



### 3.4.2 Food Recommendation

Food not only affects a person's health, but also determines a person's mood. In order to cultivate healthy eating habits for users and enrich the lives of users, "Habiter" will recommend suitable dishes for users. We will still use the CF model to recommend dishes based on users' preferences.

## 3.5 Theory of Conversation Function in "Habiter"

### 3.5.1 The Origin of the Chatbot Design

The dialogue in Figure 3-14 comes from ELIZA, an primary natural language processing system that could have limited conversation with the user by mimicking the responses of the psychotherapist. Eliza is a very simple program that uses pattern matching to identify phrases such as "I need X" and convert them into appropriate output, such as "What would it mean to you if you got X?". This simple technique works well because Eliza does not actually need to know anything to mimic a psychotherapist. Many people who have interacted with Eliza have come to believe that she really understands them and their problems.

```
User: I am unhappy.
ELIZA: DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY
User: I need some help, that much seems certain.
ELIZA: WHAT WOULD IT MEAN TO YOU IF YOU GOT SOME HELP
User: Perhaps I could learn to get along with my mother.
ELIZA: TELL ME MORE ABOUT YOUR FAMILY
User: My mother takes care of me.
ELIZA: WHO ELSE IN YOU FAMILY TAKES CARE OF YOU
User: My father.
ELIZA: YOUR FATHER
User: You are like my father in some ways.
```

Weizenbaum (1966)

Figure 3-14: Dialogue Sample

### **3.5.2 Chatbot “Habiter” 1.0 — Based on Template Approach**

Chatbots using template approach have systems without a clear purpose, or with a vague purpose. Different from the question-and-answer system and the dialogue system, one of the expectations of the former two systems is that users can get the information as much as possible and then leave, quickly find the answer they want or quickly complete the task, so as to reduce the communication time with users as much as possible. To be more specific, the chatbots are often designed to occupy users’ time as much as possible, to extend the time of chatting and accompanying with users as much as possible, or to allow users to use them again as much as possible.

Chatbots themselves can serve a purpose, but a broader purpose, which aims to track the psychological state of users to a certain extent and help users adjust their psychological state. They are implemented primarily through template features, where a conversation template is manually defined to produce an intelligence-like effect.

Chatbot “Habiter” 1.0 is exactly designed by template Approach, which can be also called a non-task-oriented dialogue system, or a general dialogue system. “Habiter” 1.0 system does not need to accomplish a specific task, and its purpose is often to extend the conversation as long as possible, and to accomplish some vague goal, such as, solving user boredom, realizing some implicit psychological analysis and encouraging users.

### **3.5.3 Chatbot “Habiter” 2.0 — Based on Deep Learning**

The template approach is the most important approach to chatbot implementations, still exists in most conversational systems, such as Siri, and has been shown in some academic literature to still have better results than other systems. In contrast to the template approach, Neural Conversation Model is based on deep learning, which is a dialogue generation model evolved

from machine translation technology. Similar to machine translation which can translate an English sentence into its Chinese meaning, in a dialogue, the answer can be translated by the question. The previous sentence can be “translated” to the next sentence which can response the previous one.

Chatbot “Habiter” 2.0 covers two closely related deep learning architectures designed to realize this recurrent neural networks (Figure 3-15) and transformer networks (Figure 3-16). Both approaches have mechanisms to deal directly with the sequential nature of language that allow them to handle variable length inputs without the use of arbitrary fixed sized windows, and to capture and exploit the temporal nature of language.

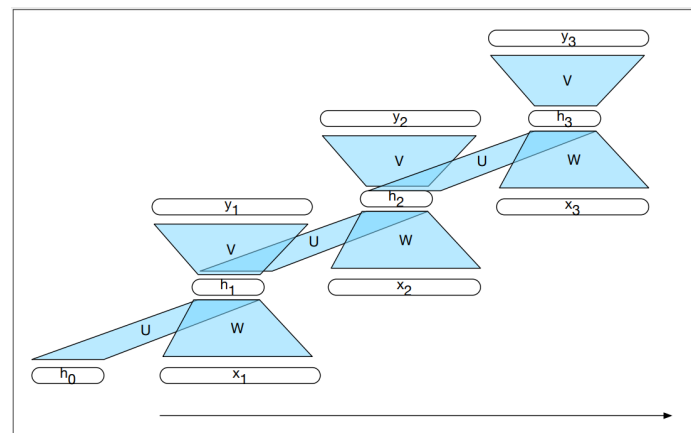


Figure 3-15: Recurrent Neural Network

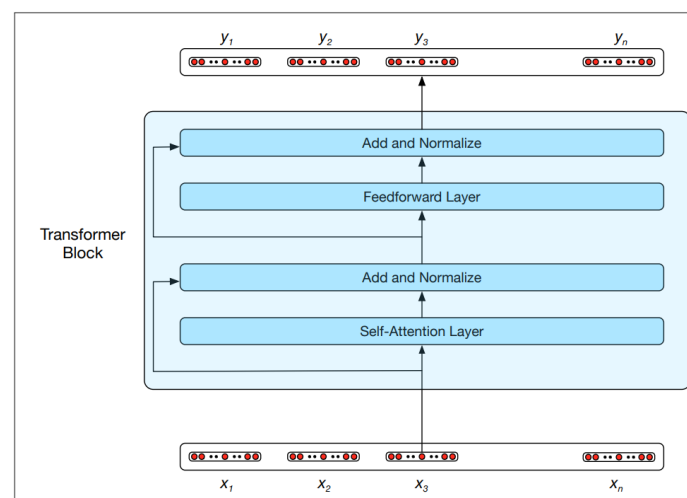


Figure 3-16: Transformer Network

# Objectives

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Our design of “Habiter” aims to provide an integration of life management software, focusing on helping good habit formations of users. It will allow users to access easily to daily light weight functions like bookkeeping and good habits cultivation, daily dressing and food recommendation. The application covers two presented objectives.

## 4.1 Rational Consumption Habits

Bookkeeping is only our means, our ultimate purpose is to solve the financial problems of life, to help people achieve a variety of financial goals. Since we were born, every process of our life can not be separated from money. Every life goal is basically linked to money. No matter it is a gold medal, a family, or a career ideal, every life goal must be measured by money. When we are not clear about the monetary value of our corresponding life goals and our current financial situation, it is easy to cause money anxiety, which is a kind of instinctive anxiety for unknown things. Besides, bookkeeping and financial planning can help us alleviate this situation very well. By planning and sorting out your financial situation, you can put the messy thoughts in your brain on paper, and see your income and expenditure flow clearly, liberating your brain. Through scientific planning and adjustment, develop rational consumption habits.

Bookkeeping is a valuable and meaningful objective. With bookkeeping, you can understand your financial situation, make sound financial planning, and maximize the efficient use of your wealth. Moreover, by keeping an account,

you can see clearly what your life is like, what we are based on, and even find out what our values are.

## **4.2 Self-Discipline Consciousness**

The most exciting thing is that “Habiter” can communicate with users as a chatbot. This makes it not only a life manager, but also a companion that always keeps in touch with users and encourages them to the better.

It is known that it is always easier for human to carry on together than alone. “Habiter” can be a friend who goes along with you whenever you need, and an assistant who helps you to better manage your daily life and get rid of bad habits like spending money without a plan. In the process of punching the clock everyday, users gradually get used to regulating themselves and finally develop a sense of self-discipline. This is to say, “Habiter” works as a virtual companion and supervises users to persevere in forming good habits. As a result, users will become more self-disciplined and have a better control over their life.

Just as Kant suggested, freedom as autonomy. A person can choose where to go only if he or she is self-discipline. This is what “Habiter” is aimed at: to give you the freedom.

# Benefits

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There are applications have similar intentions as “Habiter” before. The following are the reasons why “Habiter” is better than other smartphone applications.

## **5.1 More User-Friendly Bookkeeping and Recommendation System**

“Habiter” has a disruptive innovation in the function of bookkeeping. The entry point of “Habiter” is completely different from traditional products. It turns the accounting process into a process of accounting and chatting with chat-bot, which enhances users’ willingness to keep accounts and check in, so as to achieve the purpose of forming good habits.

“Habiter” also provides users with recommendations for outfits and food which in a highly interacted method. This crabs users interest to continue using this app. According to the information obtained from our market research, “Habiter” is superior to most existing software in terms of user experience.

Moreover, suggestion of “Habiter” on outfit is related to weather condition, which few products on the market currently provide. Food recommendation of “Habiter” will be based on nutritious and healthy food. The recommendation of food will combined with habit cultivation part to improve healthy live style formation.

## 5.2 Creation on Deep Learning Model

To better answer the question, “Where is the capital of China?”. Simply put, the models can be divided into question answering system with data, and question answering system without data. The idea of question answering system with data is that we already have some structured data, or knowledge. For example, a common way to store knowledge is to use triples: (“China”, “with its capital”, “Beijing”), (“Beijing”, “the capital of a country”, “China”). In the first two triples above, there are two entities, “Beijing” and “China”. There are two relations, namely “with the capital” and “the capital of a country”. Literally, they can answer the question “What’s the capital of China?” And “Beijing is the capital of what country?”. These two problems, that is, based on a relationship and an entity, query another entity.

Academically speaking, this field is called Knowledge-Based Question Answering — which is, when we have knowledge or data, we can build a answering system based on it. Where can people get all this knowledge? Generally, a lot of these kinds of problems have been studied in other fields of work; therefore, there has been an accumulation of similar data. However, “Habiter” does not need data from previous project of study. In our model, the data can be collected by the “Habiter” itself. With the database that records the bill of user, the “Habiter” can finish knowledge graph modeling and query without external data. On the other hand, the daily conversation is flexible and decided by favor of individuals in a large extend. The bill information can perfectly describe the life and customs of an individual.

# Timeline

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Our development plan is proposed as the following,

Table 6-1: Project Timeline

<b>Date</b>	<b>Mission</b>	<b>Sub-project Leader</b>
Mar 26	Project Proposal	*
Apr 2	UI: Personal Page	Jiarui Li
Apr 9	UI: Login Page	Yuncong Cui
Apr 16	UI: Bookkeeping Page	Ran Zhuo
Apr 23	UI: ChatBox Page	Zhixuan Liu
Apr 30	UI: Recommendation Page (Outfit & Diet)	Jiarui Li
May 1	All Individual Modules Completed	*
May 8	System Integration and Global Testing Finished	*
May 14	Final Report Done	*

Except for the above time stones, a meeting will be hold every week for our group to keep up with the progress of the development.



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