

OPERATION RESEARCH

Final Term Project

Team Name: King of planning diet

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1. Introduction

Some of university students, especially those living in dorms, always face financial difficulty at the end of every month because of limited living budget and many of us also suffer from the same pain. To escape from this predicament, we always eat less at the end of the month to save money. However, it is really painful because we can't eat what we like to eat and sometimes feel very hungry. To solve this problem, we design a customized program to help students arrange their every meal for several days with limited expenses. However, the result coming from this program can be as much as possible to satisfy our demand for calories and preference. We think this program can help many people to get through financial difficulty with less pain.

When the user uses this program, the first step is to input his or her basic information, such as gender, age, height, weight and frequency of exercise per week. By above information, program can calculate how many calories this user has to take every day. In addition, this program also requires the user to input his or her budget and how many days he or she want to plan for.

Before introducing the second step, we have to indicate there are two menus in our program, one for breakfast and the other for lunch and dinner. The reason for establishing two different menus is different property between breakfast and lunch or dinner. Normally, breakfast restaurants seldom sell lunch and dinner and people scarcely eat at breakfast restaurants at lunch or dinner time. In the same words, the restaurants for lunch or dinner also rarely sell breakfast simultaneously. For example, normal people never eat beef noodles as their breakfast. Now, let's introduce the user's second step when he or she uses this program.

Secondly, the user has to choose food they want to eat from two menus. In other words, the user eliminates those he or she doesn't want to eat from his or her food list. For example, some people really hate coriander and they never eat it. Through this process, they can remove some food from their list. Furthermore, the user has to input his or her preference (level 1 ~ level 5) for each food he or she has selected.

After the user completes above two steps, this program can help them plan each meal's food for next several days with enough nutrition, limited budget and maximized total preference value.

2. Methodology and Assumption

2-1 Method to establish menus

To get more information about what NTU students tend to eat when they have limited budget, we made a survey on NTU students' club in Facebook. In the questionnaire, we required students to provide one breakfast restaurant and three restaurants for lunch and dinner which are cheap and can fulfill most students' demand. Finally, we establish two menus as below shown.

```
[ '小小福' , '芋頭麵包+茶葉蛋' , 25 310.0 ]
[ '小小福' , '薯餅蛋糕' , 30 450.0 ]
[ '全家' , '吐司' , 40 500.0 ]
[ '全家' , '打折扣2片' , 2 200.0 ]
[ '全家' , '飯糰' , 30 200.0 ]
[ '全家' , '39元組合之鮪魚飯糰+豆漿' , 39 350.0 ]
[ '全家' , '49元組合之三明治+飲料' , 49 400.0 ]
[ '全家' , '59元組合之法式雞排飯團+牛奶' , 59 414.0 ]
[ '全家' , '39元組合之飯糰+牛奶' , 39 298.0 ]
[ '吃吐吧' , '麻糬飯' , 80 300.0 ]
[ '早餐店' , '火腿蛋三明治' , 30 270.0 ]
[ '自助餐' , '想吃甚麼都可以, 但會任夾菜' , 50 200.0 ]
[ '自製' , '牛奶蛋糕2個' , 30 440.0 ]
[ '自製' , '泡牛奶麥片' , 20 370.0 ]
[ '男一早餐店' , 'B餐(火腿蛋餅蘿蔔糕點塊)' , 60 700.0 ]
[ '活大施義' , '鮮奶吐司' , 40 nan ]
[ '義美' , '吐司2片' , 10 240.0 ]
[ '路邊攤甜甜圈' , '甜甜圈' , 10 250.0 ]
[ '聯發B1早餐' , '薯餅三明治' , 35 500.0 ]
[ '7-11' , '大亨堡+飲料' , 55 452.0 ]
[ 'Subway' , '單點嫩切雞肉' , 89 261.0 ]
[ 'Subway' , '6吋堡' , 93 314.0 ]
[ 'sukiya' , '牛滑青菜套餐' , 99 800.0 ]
[ 'sukiya' , '起司牛丼' , 99 646.0 ]
[ 'yu poke' , '隔壁的麵店XD' , '日式高湯全蛋麵' , 95 325.0 ]
[ '八方雲集' , '水餃10顆' , 50 560.0 ]
[ '八方雲集' , '鍋貼12個' , 60 762.0 ]
[ '大一女 華克山莊' , '馬鈴薯飯 附三樣菜/隨便吃' , 60 nan ]
[ '大一女美食廣場 南北麵館' , '肉燥湯麵' , 50 325.0 ]
[ '大季水餃' , '水餃12顆' , 60 720.0 ]
[ '大季水餃' , '水餃12顆' , 60 600.0 ]
[ '女九酒味' , '滷蛋+豆乾+麵+高麗菜' , 60 450.0 ]
[ '小木屋麵館' , '有肉的雞麵' , 55 400.0 ]
[ '小飯廳' , '北姑辣雞套餐' , 95 600.0 ]
[ '小福(1F)' , '傳統飯糰' , 30 400.0 ]
[ '小福(1F)' , '飯糰' , 35 550.0 ]
[ '文哥米粉湯' , '切仔麵大碗+滷蛋' , 55 500.0 ]
[ '文湯武醬' , '牛肉麵' , 85 870.0 ]
[ '台科' , '自助餐' , 80 500.0 ]
[ '四面八方' , '宜蘭乾麵' , 35 500.0 ]
[ '全家' , '飯糰' , 40 200.0 ]
[ '全家' , '下午5點後, 有點友善食光貼紙的微波食品/御飯糰/麵包' , 21 200.0 ]
[ '全家' , '泡麵' , 30 417.0 ]
[ '全家' , '微波食品' , 85 510.0 ]
[ '全家' , '地瓜' , 35 124.0 ]
[ '吉野家' , '豬丼 套餐附味噌湯跟韓國泡菜' , 139 616.0 ]
```

From this menu, we can see the restaurant, food , price and heat.

2-2 Method of Optimization

Before optimization, we first built a mathematical model. Our objective is to maximize the user's preference. For constraints, we take total cost and total calories into consideration. Of course, there are still other constraints and details about our mathematical model is introduced in chapter 3. After building model, we used python and gurobi to find optimized result and the result is introduced in chapter 4.

2-3 Assumption

In our project, we have some assumptions. First, we assume that all restaurants open every day. Normally, every restaurant doesn't open for one to two days per week. Therefore, in real life, we have to consider when these restaurants open. However, we don't consider about it to simplify our model. Moreover, we have to take opening time of each restaurant into consideration realistically. Nevertheless, for simplifying our model, we also don't consider about it. In addition, we also assume that calorie user need is same every day. Nevertheless, the need for calorie should be different every day based on health condition, exercise amount, etc. To simplify our model, we also don't consider about this factor.

3. Mathematical Model and Explanation

3-1 Parameters and Variables of Model

We introduce all parameters and variables in our mathematical model in this section so that you can read our project more fluently.

3-1-1 Binary Parameters

B_{ij} : Whether user chooses the j^{th} breakfast from the i^{th} restaurant.

$\begin{cases} B_{ij} = 1 : \text{User chooses the } j^{th} \text{ breakfast from the } i^{th} \text{ restaurant.} \\ B_{ij} = 0 : \text{User doesn't choose the } j^{th} \text{ breakfast from the } i^{th} \text{ restaurant.} \end{cases}$

NB_{pq} : Whether user chooses the q^{th} lunch or dinner in the p^{th} restaurant.

$\begin{cases} NB_{ij} = 1 : \text{User chooses the } j^{th} \text{ lunch or dinner from the } i^{th} \text{ restaurant.} \\ NB_{ij} = 0 : \text{User doesn't choose the } j^{th} \text{ lunch or dinner from the } i^{th} \text{ restaurant.} \end{cases}$

3-1-2 Integer Parameters

U_{ij} : Preference to the j^{th} breakfast from the i^{th} restaurant

NU_{pq} : Preference to the q^{th} lunch or dinner from the p^{th} restaurant

C_{ij} : Cost for B_{ij}

NC_{pq} : Cost for NB_{pq}

TC : Total budget the user has

TH : The least heat the user need per day

H_{ij} : Heat of B_{ij}

NH_{pq} : Heat of NB_{pq}

TH : Calorie the user needs per day

M : Number of days

I : Number of breakfast restaurant

J : Number of items sold in each breakfast restaurant

P : Number of lunch and dinner restaurant

Q : Number of items sold in each lunch and dinner restaurant

3-1-3 Binary Variables

E_{ij}^m : Whether user eats j^{th} breakfast from the i^{th} restaurant in the m^{th} day

$\begin{cases} E_{ij}^m = 1 : \text{User eats the } j^{th} \text{ breakfast from the } i^{th} \text{ restaurant in the } m^{th} \text{ day.} \\ E_{ij}^m = 0 : \text{User doesn't eat the } j^{th} \text{ breakfast from the } i^{th} \text{ restaurant in the } m^{th} \text{ day} \end{cases}$

NE_{pq}^m : Whether user eat the q^{th} lunch or dinner from the p^{th} restaurant in m^{th} day.

$\begin{cases} E_{pq}^m = 1 : \text{User eats the } q^{th} \text{ lunch or dinner from the } p^{th} \text{ restaurant in the } m^{th} \text{ day.} \\ E_{pq}^m = 0 : \text{User doesn't eat } q^{th} \text{ lunch or dinner from the } p^{th} \text{ restaurant in the } m^{th} \text{ day.} \end{cases}$

3-2 Mathematical Model

After knowing all parameters and variables, we now can see the model and the explanations for objective function and each constraint are all in section 4-3.

$$\text{Max } z = \sum_{m=1}^M \sum_{i=1}^I \sum_{j=1}^J B_{ij} \cdot E_{ij}^m \cdot U_{ij} + \sum_{m=1}^M \sum_{p=1}^P \sum_{q=1}^Q NB_{pq} \cdot NE_{pq}^m \cdot NU_{pq}$$

s. t

Essential Constraint:

$$\sum_{m=1}^M \sum_{i=1}^I \sum_{j=1}^J B_{ij} \cdot E_{ij}^m \cdot C_{ij} + \sum_{m=1}^M \sum_{p=1}^P \sum_{q=1}^Q NB_{pq} \cdot NE_{pq}^m \cdot NC_{pq} \leq TC \dots\dots\dots (1)$$

$$\sum_{i=1}^I \sum_{j=1}^J B_{ij} \cdot E_{ij}^m \cdot H_{ij} + \sum_{p=1}^P \sum_{q=1}^Q NB_{pq} \cdot E_{pq}^m \cdot NH_{pq} \geq TH \dots\dots\dots (2)$$

$$\sum_{i=1}^I \sum_{j=1}^J B_{ij} \cdot E_{ij}^m = 1 \quad \forall m \dots\dots\dots (3)$$

$$\sum_{p=1}^P \sum_{q=1}^Q NB_{pq} \cdot NE_{pq}^m = 2 \quad \forall m \dots\dots\dots (4)$$

3-3 Explanations for Objective Function and All Constraints

In this section, we explain meaning of objective function and all constraints. By the way, to make readers realize our mathematical model much easier and faster, we assign i , j , p and q starting from one to I , J , P and Q . However, because of property of python, these parameters start from zero in python code. Hence, there are some difference between report and python code.

3-3-1 Objective Function

As we mentioned in the introduction part, our goal is to maximize total preference value with limited budget. Then, we divide our objective function into two part. The first part is to calculate maximized preference for breakfast and the other part is for lunch and dinner.

Based on these two parts' similarity, we only explain the first part.

From the previous section, we all know B_{ij} and U_{ij} are both known parameters. U_{ij} means the user's preference to the j^{th} breakfast from the i^{th} breakfast store and it can be determined by user in our program. B_{ij} means whether user chooses the j^{th} breakfast from the i^{th} breakfast store. If B_{ij} is zero, total value will be zero and we won't consider it. On the other hand, we only have to consider it when B_{ij} is one. In other words, the function of B_{ij} is to let us just focus on breakfast selected by the user instead of all breakfast. To get the optimal value, we should decide when the user eat the breakfast he or

she has selected. The same reason can be fitted to the second part of objective function.

3-3-2 Constraints

From the last page, we can find there are six constraints in our model. Now, let's explain them. The first constraint means the sum of cost for breakfast, lunch and dinner in planned period has to be less than the total budget. Also, we only have to consider those selected by the user. As similar as the first constraint, the second constraint means the number of total calories the user get per day has to be greater than that of they need at least every day. The third constraint means that the user only can eat one breakfast every day. The same reason is applicable to the fourth constraint, but the value on the right-hand side is two because the user has one lunch and one dinner every day.

4. Python Code and Outcome of Model

```
Please input your gender (Male or Female): Male
Please input your age: 21
Please input your height(cm): 171
Please input your weight(kg): 64
Do you care about eating same food in two days row (Y/N): N
How many times do you exercise every week(0~5): 4
How many days do you want to plan (Please enter an integer): 5
How many budget do you have(Plese enter an integer): 1000
Part one: Breakfast
Which restaurant do you want to choose (Please input the integer number of restaurant): 0
Which food do you want to eat: 0
Please input your preference for this food (1~5): 1
Which restaurant do you want to choose (Please input the integer number of restaurant): 1
Which food do you want to eat: 0
Please input your preference for this food (1~5): 2
Which restaurant do you want to choose (Please input the integer number of restaurant): 2
Which food do you want to eat: 0
Please input your preference for this food (1~5): 3
Which restaurant do you want to choose (Please input the integer number of restaurant): 3
Which food do you want to eat: 0
Please input your preference for this food (1~5): 4
Which restaurant do you want to choose (Please input the integer number of restaurant): 4
Which food do you want to eat: 0
Please input your preference for this food (1~5): 5
Which restaurant do you want to choose (Please input the integer number of restaurant): q
Part two: Lunch and Dinner
Which restaurant do you want to choose (Please input the integer number of restaurant): 0
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 1
Which restaurant do you want to choose (Please input the integer number of restaurant): 10
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 2
Which restaurant do you want to choose (Please input the integer number of restaurant): 20
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 3
Which restaurant do you want to choose (Please input the integer number of restaurant): 30
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 4
Which restaurant do you want to choose (Please input the integer number of restaurant): 40
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 5
Which restaurant do you want to choose (Please input the integer number of restaurant): 50
Which food do you want to eat (Please input the integer number of food): 0
Please input your reference for this food (1~5): 5
Which restaurant do you want to choose (Please input the integer number of restaurant): q
```

From above picture, we can see that the user has to input his or her basic information, including gender, age, height, weight, etc. Next the user chooses the restaurant and food he or she want to eat. Finally, he input "q" to end choosing.

```

Optimal:
EB_0_4_0: 1.000000
ENB_0_40_0: 1.000000
ENB_0_50_0: 1.000000
EB_1_4_0: 1.000000
ENB_1_40_0: 1.000000
ENB_1_50_0: 1.000000
EB_2_4_0: 1.000000
ENB_2_40_0: 1.000000
ENB_2_50_0: 1.000000
EB_3_4_0: 1.000000
ENB_3_40_0: 1.000000
ENB_3_50_0: 1.000000
EB_4_4_0: 1.000000
ENB_4_40_0: 1.000000
ENB_4_50_0: 1.000000
Obj: 75.000000
mazihengde-MacBook-Pro:O R maziheng$

```

From above picture, we can find EB_1_4_0 equals to one, which means the user eat the first Food from the fifth restaurant in the second day.

5. Difficulties and Future Work

5-1 Difficulties

In this section, we discuss some difficulties we face when we do this project.

5-1-1 Infeasible Menu

In our project, the menus can't be changed by users. They can't add new food by themselves. Therefore, if there isn't their favorite food, the optimal plan produced by this program may not be applicable to them.

5-1-2 Calculating Calories

Calculating each food's calories is an important part for this project. However, we can't precisely calculate it because it is too complicated. Normally, each food's calorie should be measured by each substance's weight, but it is impossible for us to buy all food on our menus and measured their weight. Therefore, we only can approximately estimate each food's calorie, which impacts on our optimization.

5-1-3 Coding Problems

Moreover, we have two coding problems when doing this project. First, we don't classify lunch and dinner. Initially, we separated them from each other, NE_{pq}^{m1} meant whether the user eat the q^{th} food from the p^{th} restaurant in the m^{th} day lunch and NE_{pq}^{m2} meant whether the user eat the q^{th} food from the p^{th} restaurant in the m^{th} day dinner.

However, there is one more parameter in variable if we used this way. Also, our python code would be more complicated than we had expected. Of course, we tried several ways to solve this problem, but all of them were inefficient. After discussion, we decided to simplify this variable because of similarity between lunch and dinner. Normally, people can accept to switch food sequence of lunch and dinner. For example, we can eat beef noodles at lunch and eat at cafeteria for dinner. Also, we can eat at cafeteria at lunch and eat beef noodles at

lunch. Therefore, we think this sequence is less important. Another coding problem for us is that we can't prevent people from eating same food in two days row. At the beginning, we tried to avoid this problem by below two inequalities.

$$E_{ij}^k \neq E_{ij}^{k+1} \quad \forall i, j \quad (k = 1, 2 \dots, M - 1)$$

$$E_{pq}^r \neq E_{pq}^{(r+1)} \quad \forall p, q \quad (r = 1, 2 \dots \dots, M - 1)$$

The upper inequality can prevent the program user from eating same breakfast in two days row and the lower one can prevent him or her from eating same lunch or dinner. However, if we added these inequalities into python code, it doesn't work. In our opinion, main reason for this condition is that the variety of food is too low so that some food must be selected in two days row.

5-2 Future Work

After improving the problems mentioned in section 6-1, we can do something to make this program simpler to use and spread it to other people.

5-2-1 Develop a Website for this program

It is hard for general people to use python code to input the information we need, so this program can't be used widely. To spread this practical program, we think developing a website is a good manner. In this way, most people can easily use this program and plan their meals when they only have a little money.

5-2-2 Develop a Smartphone App

People nowadays generally have one or more smartphones. If we want to further spread this program, we think developing an app will be a great method. People can use app and plan their meals for next several days at any time, which is really convenient for them.

5-2-3 Add other functions

So far, this program can only help people plan everyday meals with limited budget and maximize the sum of preference. In the future, we can add some new functions, such as planning for people on a diet. People can choose which mode they want to use at the beginning of using this program and this program can satisfy people's demand based on their choices. This is an excellent way to spread this program.

6. Previous Proposal

In fact, we didn't decide to do this project in the beginning of the semester. Instead, we planned to do a project related to a computer game, Age of Empires (AOE). This game has three eras. They are darkness era, feudal era and castle era respectively. When a player enters this game, this player has to upgrade from darkness era to castle era and complete some missions in castle era to get the victory. Therefore, at the beginning of semester, we tended to calculate the minimum time for upgrading from darkness era to castle era and

finishing those missions. However, we faced three problems. The first one is that the rules of AOE are too complicated to design a mathematical model, so we simplify many rules and tried to make our project feasible. Moreover, in our initial proposal, we planned to calculate the minimized time for a player upgrading from darkness era to castle era. Our method is to minimized the time for upgrading from darkness era to feudal era and that for upgrading from feudal era to castle era. Finally, we add these two results and get the minimized time value. Nevertheless, we can not sure that this result must be the optimal solution. Maybe we increase the time for upgrading from darkness era to feudal era, but the total time become smaller. The last reason, also the most crucial factor to let us change our project topic, is that the model is too complicated to build. While we were trying to build the model, we found we can't change variable value independently. If we change a variable value, other variable or parameter values are also changed. This problem bothered us seriously. In addition, this model's objective function is non-linear and we aren't able to solve this problem. Hence, we finally decided to change our project topic.

7. Reflection and Work Distribution

7-1 Reflection

許文瑜

I have already worked 3 years and found that I forgot how to do a team project with students. When I do a project, my supervisor would tell me what I should do, who is my teammate and the deadline. I would report to my supervisor regularly and finish work by deadline. If we have to do a big project, we would have a standard operation procedure and schedule. For example, I am in charge of planning the traffic management on national freeway during the Chinese New Year long weekends. The work starts from October,2019 to February, 2020.

As for final project, I thought what team leader should do is like what my supervisor do, but the situation is very different. I think the reason is we should choose an interesting project, there are too many members in a team, and I don't have any acquaintances in this team. (My acquaintances are all working student.) So we can give some interesting opinions.

We changed the project in this final project. We had two group meeting at first project, I think we participated actively at these two meeting, everyone told their idea, and two members and I had another meeting to discuss our assignments. However, the first project is too complex to build a modal, we changed the project. Due to the time limit, the group meeting held on 9:30 p.m. and there is no public transportation to the place I live, I only can use messenger to discuss.

My job is questionnaire data cleaning. Because there is all open question in our questionnaire, only few people fill in, and I spent lots of time to deal with. In addition, I don't know others work except the member do data cleaning. So I give an average score.

代錦東

Glad to be working on this project with seven other students. Because I am not Taiwanese, and I came to Taiwan to study in my first year, I do not know any friends or classmates. When a seven-person squad was to be formed, everyone else had discussed it in advance. I couldn't find anyone else to be a teammate, and I was a bit shy to ask strangers, but at this time, Xiao actively asked me if I wanted to join them, and I was very grateful for his kindness. Most of the students in the group were from the university department. Everyone seemed to be busy, so there was no progress at the beginning. And at the beginning, my idea was to build a model similar to the AOE game. Everyone also liked it and put in some efforts, but the game is too complicated, and various conditions are mutually restrictive and difficult to achieve. So later we changed other topics and it went well, but time was hurry. In short, thank you all for completing this thing together, good job.

邱泳霖

I think this final project is very special, because it requires us to develop an objective from zero in real world. Our group used to conduct a model of age of empires II, and our original target was to find a best way to exceed most point in a fixed time. It's incredible to apply a familiar game on final project in a course! However, we failed, but the new target is awesome too.

For me, the new target can also be applied in real world, sometimes I struggle to manage my money and end up exhausted, so the model is very suitable for me. The best part for me is even if I'm not good at coding, I could still provide some useful suggestion for the model building process. Besides, by discussing with each other, we are able to conduct the best model and execute efficiently.

陳冠忠

Throughout the semester, I learned a lot of problems solved with mathematical models. At the end of this semester, due to the deadline, I couldn't make a very large program to meet very life problems. They are all very complicated. As far as GPS is concerned, there are a lot of algorithms for the shortest path. There must be a lot of constraints. In the process, I also determined that I love writing programs to deal with problems in life. Hopefully, I could use something I learned in this class someday.

費聿暄

Our project was about a computer game in the beginning of semester. I was very interested in this because I was familiar with this game. I was happy to discuss with other members. However, we faced some difficulties just two weeks before deadline, and we decided to change the topic. At that moment, I was kind of disappointed, because what we had spent was wasted. But we still finished the new one. I'm lucky to have these excellent members. They handled most of work. I'm very grateful for all they have done.

簡捷

The deepest feeling about this report is that it is really not easy to translate abstract concepts into actual programs. First, we wanted to optimize Age of Empires II (a classic strategy game). We want to find the most efficient way to play. However, after collecting data, when we really started to build models, we found that it was too complicated and difficult to program. Therefore, we changed the theme—the most economical way to eat out. Although this is much simpler than the previous theme, we still encountered a lot of difficulties in creating models and programming. After this final report, I deeply feel that my programming ability is insufficient, and I still have to continue to strengthen it in the future.

馬子恆

Throughout the semester, I learned a lot of problems solved with mathematical models. At the end of this semester, due to the deadline, I couldn't make a very large program to meet very life problems. They are all very complicated. As far as GPS is concerned, there are a lot of algorithms for the shortest path. There must be a lot of constraints. In the process, I also determined that I love writing programs to deal with problems in life. Hopefully, I could use something I learned in this class someday.

蕭鈞謙

In my opinion, this report is the most complicated in my university life. Compared to other report, we need more math ability in this project so that we can built a proper model. Moreover, to solve complicated mathematical model, we must know how to use python code. In the past, I seldom use the programming to help me complete term project. Even though this project is more complex than those I did in the past, I learn more skills and knowledge than before, such as programming and mathematical model. In addition, cooperation is an important issue for our group because there are eight people in our group. This number of people is also greater than most projects I did before. Although we face some difficulties in this semester, especially changing our project topic, I still learn a lot of things from this process. Furthermore, I have to thank my friends, they all spare no effort to complete this term project.

7-2 Work Distribution

許文瑜	代錦東	邱泳霖	陳冠忠
14.46%	12.87%	10.89%	7.52%
費聿暄	簡 捷	馬子恆	蕭鈞謙
6.93%	16.63%	14.06%	16.63%

We also attach evaluation standard excel file, Professor can refer it.