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Ranking Algorithm of Summer Job Recommendation Based on Graph Distance

Abstract: We conducted a sampling survey of high school students in Beijing, China, to get their real ideas about "what factors should be considered when looking for a summer job". Based on the data obtained from the survey, we use the method of hypothesis test to determine the factors that should be considered when selecting summer jobs. We use three feature radar charts (Situation, Capability, Characteristic & Requirement) to show high school students' situation and preference. We construct 17 quantitative indicators to measure the features of persons and jobs, and we use graph distance to describe how well personal preferences fit into job requirements. The model will rank the recommended jobs according to a comprehensive evaluation index. We use the real data from survey to construct 10 fictional persons to do model testing. The results show that the algorithm can recommend the work they like or are good at according to their personal situation and preference. In most cases, the model will recommend jobs that are easy to master and do not require specific skills, such as waiter, cashier and courier. In model generalization, we discuss in detail how to expand our open model. The real data from our survey makes our model and test more reliable. Moreover, we design the final algorithm as webpages, which make recommendation more intelligent and humanized. The webpages give the recommended ranking of summer job options. For the recommended job, it will tell you what to do to prepare and how to improve yourself. The webpages can also tell you the nearest workplace, working hours per week and how much salary you will be paid.

Keywords: sampling survey, hypothesis test, feature radar chart, graph distance

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1. Introduction

1.1 Restatement of the Problem

A good summer job can help us develop ability, increase experience and enrich our résumé, while a summer job that is not suitable for us may only waste time and energy. Therefore, it is quite important to choose the most valuable and suitable one from many options according to our own situation and preferences. We need to complete the following tasks:

- Figure out factors high school students looking for a summer job should consider.
- Based on factors we find, develop a model to evaluate summer job options.
- Use fictional person to verify the rationality and reliability of our model.
- Design our model as an easy-to-use app or web page.

1.2 Our Work

In order to get the real ideas of high school students about summer job selection, we designed a survey to gather samples and information. In the survey, we set up some factors in advance and asked high school students to choose how much they care about these factors. We also collected their preferences, situations, personal abilities and other factors they will consider when looking for a summer job. This makes our analysis more reliable.

As for the core model, we use several radar charts to show high school students' situation, preference and mastered skills. We quantify the characteristics, capabilities and requirements required by various jobs into the same radar chart index. We construct a measure to describe how well personal preferences fit into job requirements, and then give the ranking of summer job options.

The real data from our survey help us to create fictional persons to test our model. Moreover, we design the final algorithm to make recommendation more intelligent and humanized. The algorithm gives the recommended ranking of summer job options. For the recommended summer job, it will tell you what to do to prepare and how to improve yourself. The algorithm can also tell you the nearest workplace, working hours per week and how much salary you will be paid.

2. Model Assumptions

1. It is assumed that the samples in the survey are randomly selected. The characteristics of the samples can represent the characteristics of the population.
2. It is assumed that the survey is true and effective and can reflect students' correct situation and personal preference.
3. It is assumed that the samples extracted from survey are independent and identically distributed.
4. It is assumed that the situation and preference of high school students can be quantified.
5. It is assumed that the working market is balanced, the salary of all the staff should fluctuate around the balance point, which means that it's reasonable to use the mean value of the salary to represent the salary job can give.

3. Notations

Symbol	Description
$P_{(factor)}$	The proportion of factor scores exceeding 2
H_0, H_a	Null hypothesis and alternative hypothesis
α	The level of significance of the testing
$X_{job}^{(feature)}$	Numerical level of job features after quantification
$X_{student}^{(feature)}$	Numerical level of personal features after quantification
$d_{job}^{(feature)}$	Graph distance of job features in radar chart
\mathcal{W}	Weight vector for weighted sum of graph distances
$w_{(feature)}$	The weight of each feature
M_{job}	Comprehensive evaluation index of job

4. Factors We Should Consider

4.1 A Survey about Summer Job Options

To figure out what factors high school students who are looking for a summer job should consider and make sure the factors we list can accurately reflect the true situation of the students, we design the survey mentioned in Chapter2 and conduct it on 264 students from a high school in Beijing, China.

In the survey, we firstly assume that the targeted students are selected randomly and uniformly, and that the behavior of these samples can finely represent that of the population. Considering the situation of the high school students looking for a summer job and some characteristics of most common jobs, we set up a series of questions to investigate the students' motivation and their specific demands for the job. In this way, we can directly compare the significance of the potential factors and analyze how these factors affect the students' decision.

4.2 Statistical Results of the Survey

After collecting all the information from the survey and dropping the invalid data, for each question, we count the number of people in favor of every option accordingly. Then we observe the numbers and analyze them from statistical perspective. To give a explicit and direct knowledge of the result of our survey, we display our analysis process in the form of charts or sheets as follow.

In the survey, we have given 11 factors that high school students may need to consider when choosing summer jobs. We use five quantitative scores (1 to 5 Points) to measure how much they value these factors.

1-Point means they don't care this factor at all, and 5-Point means they care it very much. In addition, if the factors they want to consider are not available, they can fill in other factors and tell us, so that we can find the common characteristics of the factors not considered from the survey. The score distribution of each factor is shown below:

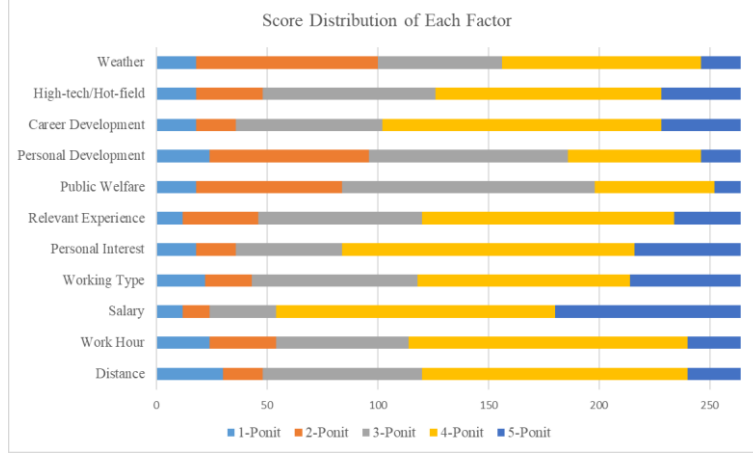


Figure 1: Score Distribution of Each Factor

We assume that: If the number of factors with 3 or more scores is statistically well-documented, we think that this factor should be considered when high school students choose summer jobs. Therefore, we calculate the proportion of each factor score more than 2 points, and then use the hypothesis test method to draw a conclusion.

Let $P_{(factor)}$ denote the proportion of factor scores exceeding 2 and let $p_0 = 0.75$, We construct the null hypothesis H_0 and alternative hypothesis H_a as follows:

$$H_0: P_{(factor)} \geq p_0 \text{ v.s. } H_a: P_{(factor)} < p_0, \quad (1)$$

In our survey, the sample size is $n = 264$. We construct the following normal statistics Z :

$$Z = \frac{\bar{P} - p_0}{\sqrt{\frac{p_0(1 - p_0)}{n}}}, \quad (2)$$

Notice that $np_0 = 198 \geq 5$, $n(1 - p_0) = 66 \geq 5$, Under the condition that H_0 is true, we can get the distribution of Z (or \bar{P}) by central limit theorem:

$$\bar{P} \sim N\left(p_0, \frac{p_0(1 - p_0)}{n}\right), \quad \text{i.e. } Z \sim N(0,1), \quad (3)$$

From above, we can get the rejection region as:

$$\text{RR: } \bar{P} \in (0, P_L], \quad \text{with } P_L = p_0 - z_\alpha \sqrt{\frac{p_0(1 - p_0)}{n}}, \quad (4)$$

where α means level of significance of the testing, z_α is the quantile of the standard normal distribution.

In our model, we set the level of significance of the testing $\alpha = 0.05$ ($z_\alpha \approx 1.645$). The rejection region of the problem is obtained:

$$\text{RR: } \bar{P} \in (0, 0.7062] \quad (5)$$

When the proportion of a factor score more than 2 points falls into the rejection domain (i.e. $\bar{P} \leq 0.7062$), we have enough statistical evidence to reject the null hypothesis H_0 , then this factor should not be included in the selection of summer jobs by high school students. The proportion of each factor in our survey is calculated as follows:

Table 1: Proportion of Each Factor Score Exceeding 2 Points

Factor	Proportion	Factor	Proportion
Distance	0.8182	Public Welfare	0.6818
Work Hour	0.7954	Personal Development	0.6364
Salary	0.9091	Career Development	0.8636
Working Type	0.8371	High-tech/Hot-field	0.8182
Personal Interest	0.8636	Weather	0.6212
Relevant Experience	0.8258		

It can be seen from the above table that the proportion of “Public Welfare”, “Personal Development” and “Weather” is less than $P_L = 0.7062$. Therefore, in the statistical sense, we think that they should not be considered when choosing summer jobs.

4.3 Conclusions We Achieve

As the data and analysis showed above, we can have a comprehensive insight into the factors that may cast influence on the student’s decision-making when faced with several summer job options. We list the factors, their descriptions and units in the following sheet.

Table 2: Factors High School Students Should Consider

Feature	Description	Unit
Distance	How far is it from your home to the workplace	Kilometer
Working Time	How long you have to spend on working every week	Hour
Salary	How much each hour you will be paid	Dollar
Allowance	How much pocket money can be used every week	Dollar
Grade	Senior one, Senior two or Senior three	Levels
Working Type	Involve more physical activity or is sedentary	Levels
Relevant Experience	Whether you have done any relevant jobs or not	Yes or No
Personal Development	Whether the work can improve your specific skill or capability or not	Yes or No
Career Development	Whether the work have a positive influence on your further study or career or not	Yes or No
High-tech/Hot-field Relevance	Whether the work is closely linked to some high-tech or hot fields or not	Yes or No

5. Evaluation Model of Summer Job

A suitable summer job not only needs to consider our own situation, but also, we need to have the interest to engage in related work. Meanwhile, jobs have different requirements on our personal abilities. For example, Physical activities (e.g. cashier, waiter) require more physical effort, while some sedentary jobs (e.g. researcher, programmer) require us to master specific skills. We use radar charts to show high school students' situation, preference and mastered skills, and construct a measure to describe how well personal preferences fit into job requirements, then we can give the ranking of summer job options.

5.1 Feature Radar Charts

Personal preferences and job requirements should match each other. In order to quantify characteristics of students and jobs, on one hand, we divide personal situation and preference into several quantitative indicators according to different dimensions, draw them as feature radar charts, and then use them as input features of the model on the one hand. On the other, we investigate the job's requirements on these indicators and give the feature radar charts of each job in advance.

Based on the factors obtained from the survey, the personal situation and preferences are divided into three categories: Situation, Capability and Characteristics & Requirement. Each of these categories contains several features. Each feature, according to our survey and investment, is quantified into a numerical level for model to use.

Table 3: Descriptions of Features in Situation

Features	Descriptions
Grade	Senior one, Senior two or Senior three
Allowance	How much pocket money can be used every week
Rational	The degree of ration
Emotional	The degree of emotion
Distance	Distance between workplace and residence

(The value of the Situation features is an integer between 1 and 3)

Table 4: Descriptions of Features in Capability

Features	Descriptions
Skill	Does the job require a specific skill (e.g. programmer)
Research	Job's requirement on research ability
Art	Job's requirement of work for art knowledge and creativity
Social	Job's requirement on interpersonal skills
Management	Job's requirement on organization and management ability
Conventional	Is the job traditional or general (e.g. salesman)

(The value of the Capability features is an integer between 1 and 5)

Table 5: Descriptions of Features in Characteristic & Requirement

Features	Descriptions
Extraversion	The degree of extroversion
Introversion	The degree of introversion
Empirical	Whether the job require students to have a lot of experience or not
Work Hour	Working hours per week
PA or Sedentary	Whether job require more physical or not
Salary	Hourly rate

(The value of the Characteristic & Requirement features is an integer between 1 and 5)

The feature radar chart is bidirectional. On one hand, radar chart reflects personal situation and preferences; on the other, radar chart shows the requirements of job on students' ability. To illustrate this, here are some examples. According to our survey, Student A is in senior two, has enough pocket money every week, he is good at writing and painting, has the experience of writing competition. The personality of Student A is more perceptual and introverted. He is not interested in research and technical work. When looking for summer job, Student A hopes to work about 30 hours a week and work nearby, he doesn't want to do much physical activities, with an hourly salary of 7 dollars. Use feature radar charts to show personal situation and preference of Student A as below:

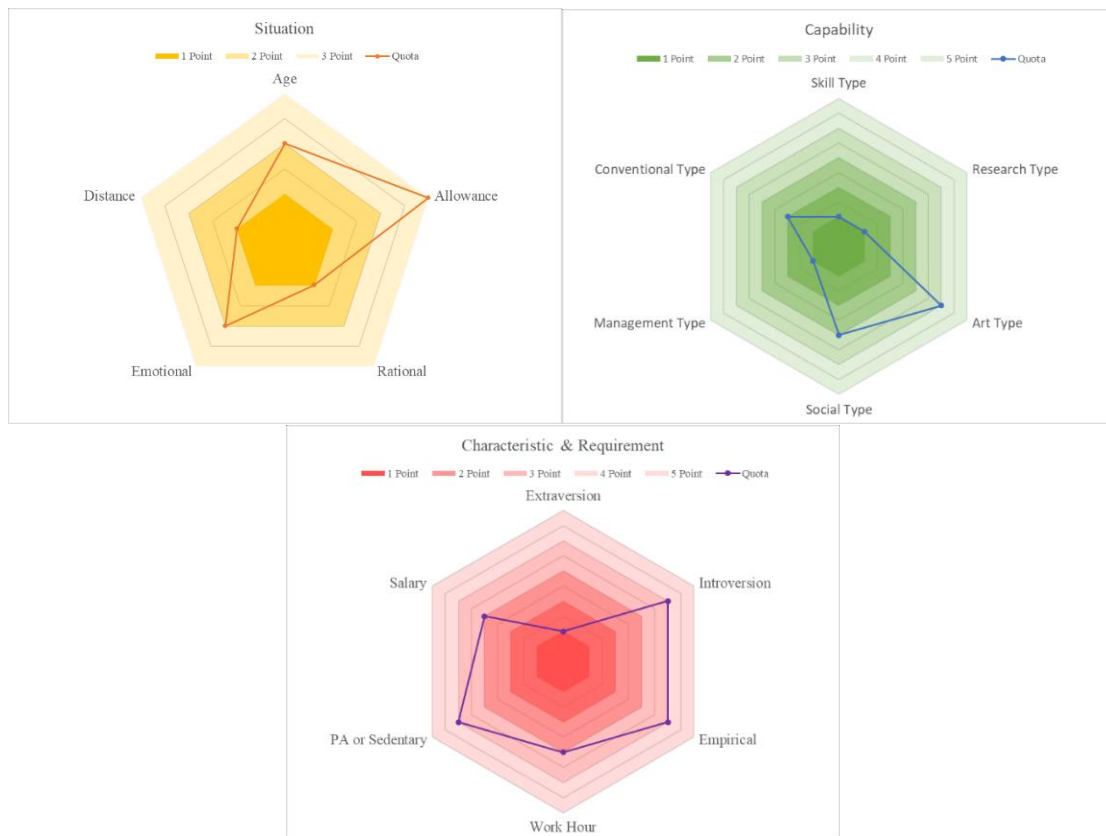


Figure 2: Feature Radar Charts of Student A

For the feature radar charts of the work, we take restaurant waiter as an example. Waiters do not require students to master specific skills, and do not require students' analytical ability. Waiters are more demanding on our communication skills. Most of the time, the work of waiters needs us to stand and do physical activities. The working hour of waiters is longer, and the hourly salary is relatively low. Use radar charts to show features of waiters as below:



Figure 3: Feature Radar Charts of Waiters

In short, the feature radar charts of students represent what we have, and the feature radar charts of summer jobs represent what they need. When the “supply” and “demand” balance is reached, the most suitable job is found.

5.2 Measurement Based on Graph Distance

The core idea of our model is to compute the graph distance between feature radar charts of student and that of jobs. For most of the same features in two graphs, we use the difference of the numerical level to calculate the graph distance, and then get a comprehensive index by weighted sum method. Because the types of features vary, there are differences in calculating the graph distance of each feature. In this section, we will discuss the calculation method of graph distance and discuss the meaning of each feature in the radar chart in detail. We will give a measurement model to describe how well personal preferences fit into job requirements.

For most of the features in radar charts, we call them “working one side matching” class. Specifically, when personal situation and preference meet the requirements of job features, we define the graph distance of these features as 0 and calculate their graph distances only when they do not meet the job requirements. The formula is as follows:

$$d_{job}^{(feature)} = \begin{cases} 0 & , X_{student}^{(feature)} \geq X_{job}^{(feature)} \\ X_{job}^{(feature)} - X_{student}^{(feature)} & , X_{student}^{(feature)} < X_{job}^{(feature)} \end{cases} \quad (6)$$

All features in Capability and several items in Characteristics & Requirements like Work Hour, Empirical, these features belong to “working one side matching” class. For high school students, the higher the numerical level of these features, the better they are, which means that they are very outstanding in the ability of work requirements, they have mastered specific skills, strong learning ability and strong adaptability.

Features like Salary, we call them “personal one side matching” class. In contrast to the “working one side matching” class, when the job feature meets personal preferences and needs, we define the graph distance of these features as 0 and calculate their graph distances only when job features do not meet the personal preference. The formula is as follows:

$$d_{job}^{(feature)} = \begin{cases} 0 & , X_{student}^{(feature)} \leq X_{job}^{(feature)} \\ X_{student}^{(feature)} - X_{job}^{(feature)} & , X_{student}^{(feature)} > X_{job}^{(feature)} \end{cases} \quad (7)$$

After calculating the graph distance of 17 features in all three feature radar charts, we set a weight vector $\mathcal{W} = \{w_{(feature)}\}$ and sum the 17 graph distances in a weighted way to get a comprehensive evaluation index M :

$$M_{job} = \sum_{feature} w_{(feature)} d_{job}^{(feature)} \quad (8)$$

The weight vector \mathcal{W} reflects the importance we attach to different features. When the same student faces different jobs, we can use our model to calculate the comprehensive score M_{job} of each job. According to the definition of graph distance, the lower the value of M_{job} , the better the match between personal characteristics and job requirements.

We take the feature radar chart’s data of Student A and Waiters in Section 5.1 as an example to calculate the graph distance of each feature in Characteristic & Requirement.

Table 6: Examples of Calculating Graph Distance

Feature	$X_{student}^{(feature)}$	$X_{job}^{(feature)}$	Graph Distance	Which formula to use
Extraversion	1	3	2	(1)
Introversion	4	1	0	(1)
Empirical	4	2	0	(1)
Work Hour	3	4	1	(1)
PA or Sedentary	2	4	2	(1)
Salary	3	1	2	(2)

6. Test Model with Fictional Persons

6.1 Urban Occupation Distribution Map

Considering that distribution of jobs may vary in different kinds of city and that this difference probably matters to students' summer job options, we decide to design an urban occupation distribution map (hereinafter referred to as UODM) with each city's basic information. First, we investigate into cities of different levels in China and evaluate the most representative characteristics and jobs in it. Then we choose a few typical cities of each level and form the UODM based on these cities' data.

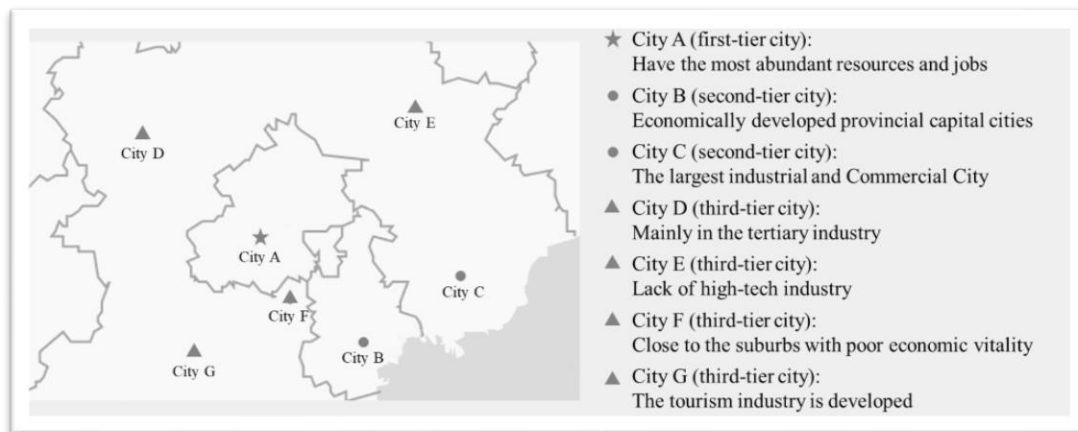


Figure 4: Urban Occupation Distribution Map

Also, we list out the jobs in each city according to its' economic development and industry orientation in order to provide help for our model's testing.

Table 7: Job List of Each City in UODM

City	Tier	Job List				
A	First	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input checked="" type="checkbox"/> Lifeguarding	<input checked="" type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input checked="" type="checkbox"/> Programmer	<input checked="" type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input checked="" type="checkbox"/> Craftsmen	<input checked="" type="checkbox"/> Photographer	<input checked="" type="checkbox"/> Translator	<input checked="" type="checkbox"/> Reporter
		<input checked="" type="checkbox"/> Editor	<input checked="" type="checkbox"/> Accounting	<input checked="" type="checkbox"/> Postproduction	<input checked="" type="checkbox"/> Consulting	<input checked="" type="checkbox"/> Planner
		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input checked="" type="checkbox"/> Offline Tutoring	
		<input checked="" type="checkbox"/> Data Analyst		<input checked="" type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	
B	Second	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input checked="" type="checkbox"/> Lifeguarding	<input checked="" type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input checked="" type="checkbox"/> Craftsmen	<input checked="" type="checkbox"/> Photographer	<input checked="" type="checkbox"/> Translator	<input checked="" type="checkbox"/> Reporter
		<input checked="" type="checkbox"/> Editor	<input checked="" type="checkbox"/> Accounting	<input checked="" type="checkbox"/> Postproduction	<input type="checkbox"/> Consulting	<input type="checkbox"/> Planner
		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input checked="" type="checkbox"/> Offline Tutoring	
		<input checked="" type="checkbox"/> Data Analyst		<input checked="" type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	
C	Second	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input checked="" type="checkbox"/> Lifeguarding	<input checked="" type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input checked="" type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input type="checkbox"/> Craftsmen	<input checked="" type="checkbox"/> Photographer	<input type="checkbox"/> Translator	<input type="checkbox"/> Reporter
		<input checked="" type="checkbox"/> Editor	<input checked="" type="checkbox"/> Accounting	<input checked="" type="checkbox"/> Postproduction	<input checked="" type="checkbox"/> Consulting	<input type="checkbox"/> Planner
		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input checked="" type="checkbox"/> Offline Tutoring	
		<input type="checkbox"/> Data Analyst		<input type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	

(Continued)

D	Third	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input checked="" type="checkbox"/> Lifeguarding	<input type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input type="checkbox"/> Craftsmen	<input checked="" type="checkbox"/> Photographer	<input type="checkbox"/> Translator	<input checked="" type="checkbox"/> Reporter
		<input checked="" type="checkbox"/> Editor	<input checked="" type="checkbox"/> Accounting	<input checked="" type="checkbox"/> Postproduction	<input type="checkbox"/> Consulting	<input type="checkbox"/> Planner
		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input type="checkbox"/> Offline Tutoring	
		<input type="checkbox"/> Data Analyst		<input type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	
E	Third	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input type="checkbox"/> Lifeguarding	<input checked="" type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input type="checkbox"/> Craftsmen	<input type="checkbox"/> Photographer	<input type="checkbox"/> Translator	<input checked="" type="checkbox"/> Reporter
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		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input type="checkbox"/> Offline Tutoring	
		<input type="checkbox"/> Data Analyst		<input checked="" type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	
F	Third	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input checked="" type="checkbox"/> Lifeguarding	<input checked="" type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input checked="" type="checkbox"/> Craftsmen	<input checked="" type="checkbox"/> Photographer	<input checked="" type="checkbox"/> Translator	<input checked="" type="checkbox"/> Reporter
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		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input type="checkbox"/> Offline Tutoring	
		<input type="checkbox"/> Data Analyst		<input type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	
G	Third	<input checked="" type="checkbox"/> Waiter	<input checked="" type="checkbox"/> Cashier	<input type="checkbox"/> Lifeguarding	<input type="checkbox"/> Librarian	<input checked="" type="checkbox"/> Salesman
		<input checked="" type="checkbox"/> Hamal	<input checked="" type="checkbox"/> Cleaner	<input type="checkbox"/> Programmer	<input type="checkbox"/> Researcher	<input checked="" type="checkbox"/> Courier
		<input checked="" type="checkbox"/> Illustrator	<input type="checkbox"/> Craftsmen	<input type="checkbox"/> Photographer	<input type="checkbox"/> Translator	<input type="checkbox"/> Reporter
		<input checked="" type="checkbox"/> Editor	<input type="checkbox"/> Accounting	<input checked="" type="checkbox"/> Postproduction	<input type="checkbox"/> Consulting	<input checked="" type="checkbox"/> Planner
		<input checked="" type="checkbox"/> YouTuber		<input checked="" type="checkbox"/> Online Tutoring	<input checked="" type="checkbox"/> Offline Tutoring	
		<input type="checkbox"/> Data Analyst		<input checked="" type="checkbox"/> Instrument Teaching	<input checked="" type="checkbox"/> Subtitle Translation	

6.2 Fictional Person Constructed According to Our Survey

Based on the real data obtained from the survey, we selected some representative high school students to help construct our fictional persons. These fictional persons are assigned to different cities in our UODM. They master different specific skills, have various personality and characteristics, and have diverse preferences for summer job options. We use letters A to J as the numbers of 10 fictional persons. Their details are as shown below:

Table 8: The Situation and Preference of Ten Fictional Persons

Person	Description
Student A	Student A lives in City F and is in senior two. He has less pocket money per week. He is outgoing and rational. Student A likes exercising rather than being sedentary. He has many years of swimming experience and obtained the relevant certificate. When looking for a summer job, Student A can accept heavy physical labor and work in a distant place. He expects to work 30 hours a week and his expected hourly salary is \$5.
Student B	Student B lives in City A and is in senior three. He has enough pocket money every week. He is rational and introverted. Student B likes mathematics and computer, has mastered the basic programming ability and has the related competition experience. When looking for a summer job, Student B can accept a certain amount of physical labor and hopes to work in his city. He expects to work 40 hours a week and to be paid \$10 an hour.

(Continued)

Student C	Student C lives in City B and is in senior two. She has abundant pocket money per week. She is a little introverted and emotional. Student C is good at writing and painting and has relevant competition experience. When looking for a summer job, Student C prefers to work nearby and work 30 hours a week. She is reluctant to do many physical activities. Her expected hourly salary is \$8.
Student D	Student D lives in City B and is in senior one. He has enough pocket money per week. He is outgoing, emotional and expressive. Student D masters the piano and guitar skills and has obtained the certificates of piano. When looking for a summer job, Student D is willing to work far away and accept heavy physical labor. He hopes to work 20 hours a week and to be paid \$8 an hour.
Student E	Student E lives in City A and is in senior two. She has enough pocket money per week. She is rational and neutral in character. Student E is good at biology and chemistry, but she has no experience in doing experiments and research. When looking for a summer job, Student E can accept moderate physical labor and wants to work in her city. She prefers to work 40 hours a week and expects to be paid \$7 an hour.
Student F	Student F lives in City C and is in senior three. He has less pocket money per week. He is emotional and neutral in character. Student F knows photography, postproduction and has his own artwork. When looking for a summer job, Student F can accept moderate physical labor and work far away. He prefers to work 50 hours a week and expects to be paid \$6 an hour.
Student G	Student G lives in City D and is in senior one. She has less pocket money per week. She is rational and outgoing. Student G has no unique skills, but she is good at communicating. When looking for a summer job, Student G accepts moderate physical labor and wants to work nearby. She prefers to work 50 hours a week and her expected hourly salary is \$4.
Student H	Student H lives in City E and is in senior two. He has enough pocket money per week. He is rational and outgoing. Student H is good at mathematics and physics. When looking for a summer job, Student E wants to do fewer physical activities and he wants to work nearby. He prefers to work 20 hours a week and expects to be paid \$6 an hour.
Student I	Student I lives in City F and is in senior three. He has less pocket money per week. He is rational and introverted. Student I likes exercise but has no unique skills. When looking for a summer job, Student I can accept heavy physical labor and wants to work in his city. He prefers to work 50 hours a week and expects to be paid \$4 an hour.
Student J	Student J lives in City G and is in senior one. She has abundant pocket money per week. She is emotional and neutral in character. Student J has mastered a second foreign language. When looking for a summer job, Student J can accept moderate physical labor and can work far away. She prefers to work 30 hours a week and expects to be paid \$6 an hour.

To make the characteristics of each person described in the table above become numerical features fed to the model. We quantify the above complex details into 17 features in the features radar charts, as shown in the table below:

Table 9: Numerical Level of Features of Each Fictional Person

Numerical Level of Features	Fictional Students									
	A	B	C	D	E	F	G	H	I	J
$X_{student}^{(grade)}$	2	3	2	1	2	3	1	2	3	1
$X_{student}^{(allowance)}$	1	2	3	2	2	1	1	2	1	3
$X_{student}^{(rational)}$	3	3	1	1	3	1	3	3	3	1
$X_{student}^{(emotional)}$	1	1	3	4	1	3	1	1	1	3
$X_{student}^{(distance)}$	3	2	1	3	2	3	1	1	2	3
$X_{student}^{(skill)}$	4	3	3	4	4	3	1	4	1	3
$X_{student}^{(research)}$	1	1	1	1	3	1	1	1	1	1
$X_{student}^{(art)}$	1	1	1	2	1	3	1	1	1	1
$X_{student}^{(social)}$	1	1	1	3	1	1	4	2	1	3
$X_{student}^{(management)}$	1	1	1	1	1	1	1	1	1	1
$X_{student}^{(conventional)}$	3	1	1	2	1	2	3	2	2	2
$X_{student}^{(extraversion)}$	4	1	2	4	1	1	3	3	1	1
$X_{student}^{(introversion)}$	1	3	1	1	1	1	1	1	3	1
$X_{student}^{(empirical)}$	4	3	3	3	1	3	1	1	1	1
$X_{student}^{(work\ hour)}$	3	4	3	2	4	5	5	2	5	3
$X_{student}^{(PA/sedentary)}$	5	3	2	5	3	3	3	2	5	3
$X_{student}^{(salary)}$	2	5	4	4	4	3	2	3	2	3

6.3 Model Test and Results Analysis

We determine the numerical level of features of each job through investigation. There data, along with each fictional person's features, will be put into the model. For each fictional person, based on the graph distance model, we can get the score of each work. By sorting the scores from small to large, the recommended order of "The best summer Job" is obtained. In the table below, we list each person's top 5 recommended jobs and analyze the correspondence between the recommended results and the fictional person's situation and preference.

Table 10: Recommended Jobs of Each Person and Results Analysis

Student	Recommended Jobs	Results Analysis
A	Lifeguarding	Student A is proficient in swimming. He can accept a lot of physical labor and the salary requirements are low. He lives in the city F, where there is a lifeguard occupation, so the most recommended job of the model is Lifeguard. The algorithm also recommends some traditional jobs.
	Courier	
	Cashier	
	Waiter	
	Hamal	
B	Data Analyst	Student B is good at computer and mathematics and has certain programming ability. The model recommends Data Analyst according to his preference. However, due to the programmer's high requirement for ability, the algorithm does not recommend the Programmer.
	Courier	
	Librarian	
	Cashier	
	Cleaner	
C	Editor	Student C is good at writing and painting and she expects a higher salary. The model recommends Editor according to her ability. Introverted personality makes the model think Cashier, Librarian suits her situation. The algorithm also recommends several traditional jobs.
	Cashier	
	Librarian	
	Waiter	
	Reporter	
D	Instrument Teaching	Student D master piano and guitar, meanwhile, he is outgoing and expressive. With his proficiency in musical instruments, the model thinks Instrument Teaching is the most suitable summer job for him. His other features indicate that he can also do work like Waiter, Salesman.
	Waiter	
	Cashier	
	Salesman	
	Courier	
E	Cashier	Student E has excellent abilities in some subjects, so the model believes that she can do a job like Researcher or Tutoring. However, perhaps because of her lack of research experience, thus the algorithm did not rank Researcher first.
	Researcher	
	Courier	
	Librarian	
	Online Tutoring	
F	Waiter	Student F's unique ability and experience in photography and postproduction made the algorithm recommend Photographer and Postproduction. City C happens to have these two occupations. His other features indicate that he can also do work like Waiter, Cashier.
	Cashier	
	Photographer	
	Cleaner	
	Postproduction	
G	Waiter	Student G has no unique skills, but She is good at communicating. The first five jobs recommended by the model are traditional jobs that do not require specific skills. Due to her good social skills, the algorithm ranks Waiter and Salesman in front.
	Cashier	
	Salesman	
	Cleaner	
	Courier	
H	Online Tutoring	Student h is outgoing and good at mathematics and physics. According to his situation and preference, the model ranked Online Tutoring and Offline Tutoring in the top five. Considering that he wants to work nearby,
	Cashier	
	Waiter	
	Courier	

(Continued)

H	Offline Tutoring	the algorithm thinks Online Tutoring is more suitable.
I	Courier	Student I and Student G are similar in that they do not master a specific skill, but Student I can accept a lot of physical labor. Therefore, the model recommends some traditional jobs like Courier, Hamel, Cleaner which do not need to master specific skills.
	Cashier	
	Librarian	
	Hamal	
	Cleaner	
J	Cashier	Student J has mastered the second foreign language. Besides the traditional manual jobs, the model thinks she can do translation work like Subtitle Translation. However, because there is no Translator in the job list of her city, the algorithm does not recommend it in top 5.
	Courier	
	Subtitle Translation	
	Waiter	
	Librarian	

From the model results and analysis in the table above, we can see that: The algorithm mainly recommends jobs such as Waiter, Courier, Cashier, Cleaner that do not need to master specific skills or need to have relevant work experience. For those who have mastered special skills (such as computer, musical instruments, photography) and have relevant preferences, the algorithm will rank the corresponding occupation in front according to the personal situation. Generally speaking, our model can make correct recommendations according to the situation and preference of high school students.

7. Apply the Model to the Webpage

In this section, we apply our algorithm to webpages, these webpages contain the filling of personal information, the presentation of recommended summer job options and some useful information. The layout of the webpage is simple and easy to understand. When high school students use it to test the most suitable summer job for themselves, they only need to fill in the information and submit it step by step according to the prompts of the webpages. Our webpages contain the following six sections:

- (1) Welcome Page: We use this page to introduce our project and guide users to start the test.
- (2) Basic Information Page: This page is used to collect basic information of users and evaluate their own personal situation.
- (3) Survey Page: This page contains a simple survey, and the model will assess users' personal preferences and abilities based on their answers.
- (4) Results Page: This page presents the summer jobs recommended by our algorithm.
- (5) Guide Page: This page provides useful information about the recommended job. For example, skills to master, links to knowledge, nearest work location, working hours per week or per day, salary to be paid.
- (6) Principle Introduction Page: This page briefly introduces the core idea of our model and explains the principle of the algorithm in simple language.

The design of our Webpages is as follows:



Test Which Summer Job Is Most Suitable For You!

Hold on! Just fill in your basic information and answer some simple questions, then we can provide you with several summer job options that are most suitable for you! In the meantime, we'll tell you how to prepare for it! Click the **LET'S BEGIN!** below to start the test and click **WHAT'S THE PRINCIPLE?** to know details about our algorithm.

LET'S BEGIN!

WHAT'S THE PRINCIPLE?



BASIC INFORMATION

Don't worry! The information you fill in is for testing only. We will not collect them! This information can help us assess your personal situation.

1. What grade are you in?

☒ Senior One ☐ Senior Two ☐ Senior Three

2. How much is your weekly allowance?

☒ \$0 ~ \$10 ☐ \$10 ~ \$15 ☐ \$15 ~ \$20 ☐ More than \$20

3. How far is your residence from a commercial area?

☒ Nearby ☐ A little far ☐ Far away

4. Which city do you live in?

SEARCH YOUR CITY

NEXT STEP!



A SIMPLE SURVEY

To answer some questions below, we will assess your capabilities and preferences through this survey. Don't worry! Your information won't leak!

1. How many days a week do you expect to work

☒ 1~2 days ☐ 3~4 days ☐ 5 days ☐ More than 6 days

2. What is your expected hourly salary?

☒ Less than \$4 ☐ \$4 ~ \$7 ☐ \$7 ~ \$10 ☐ More than \$10

3. How long do you expect to work every day?

☒ 1 ~ 3 hours ☐ 3 ~ 5 hours ☐ 5 ~ 8 hours ☐ More than 8 hours

4. How far can you accept working distance

☒ Work nearby ☐ Work in my city ☐ Work far away

.....(More survey questions can be found in the attachment)

Congratulations! You have completed the filling! Click the **SUBMIT!** button below to view your results!

SUBMIT!



YOUR BEST OPTION!

According to your personal situation, preferences, and ability to compare with the work needs, the summer jobs below may be your best choice!

LIFEGUARDING	★ ★ ★ ★ ★
COURIER	★ ★ ★ ★
HAMAL	★ ★ ★ ★
WAITER	★ ★ ★
CASHIER	★ ★ ★

For the most recommended jobs, we have collected some useful information for you so that you can be prepared! Click the **GIVE ME A GUIDE!** button below to see the details.

GIVE ME A GUIDE!



WHAT YOU NEED TO KNOW

This contains detailed information about the recommendation, the abilities you need to master and the precautions. GOOD LUCK!

1. Capability & Requirement

To be a **LIFEGUARDING**, you must make sure you are proficient in swimming and have certificates. Lifeguard work has a certain risk and need a strong sense of responsibility.

The links below contain knowledge about **LIFEGUARDING**:

<https://americanlifeguard.com/>

<https://www.redcross.org/take-a-class/lifeguarding>

2. Job Recommendation

The nearest swimming pool offers **LIFEGUARDING** work.

The workplace is about **3 kilometers** away from your home.

You need to work **four days a week, four hours a day (13:00 – 17:00)**

3. Salary

If you stick to summer job for two months, we estimate that you will get: **\$528**



OUR ALGORITHM

We assess your personal situation and preferences through some questions and quantify these information into different feature indicators. At the same time., we get the requirements of each job for these indicators after investigation. The algorithm compares the quantified personal indicators with the work indicators, scores each job and gets the recommended ranking of them, to find the most matching one.

Don't worry! All information in the evaluation process is confidential!

8. Generalization

In the model above, we evaluate each job's requirements of students from 17 factors which can be divided into three aspects: Situation, Capability, Characteristic & Requirement. In fact, for those new jobs that are not mentioned in our model, we only need to give their corresponding values of the 17 factors, then we can add new jobs to the model to perfect our recommendations of summer job options.

Before the model's recommendation, we also need values of the 17 factors for the high school students, which give a description of their personal situation and preference. As a result, we can give the corresponding values of the factors based on personal information.

We collect the values of the 17 factors of an actual person based on Likert Scale of Five and match the collected values to the model's factor. For subjective factors related to personality, we can use results of some personality tests like MBTI Occupational Personality Test, which means that we can use several questions to represent one specific personality from different perspectives.

Above we explained the scalability of the model and how to add new personal data to our model. Next, we want to discuss how to add new work to the model in detail:

(1) Assumptions:

As mentioned before, we only need to give 17 values of corresponding factors, then we can add the job to the model. Suppose that one factor takes its value in $\Omega = \{1, 2, \dots, n\}$. The job's requirement on specific factor means that the individual's value on this factor should fall into the interval ω at least, in which ω is a subset of Ω .

Firstly, denote the value for the factor (requirement or capability) of some person who is taking part in or temporarily taking part in the job by a random variable ε . Then we have:

$$p(\varepsilon = k) = p_k, \quad k \in \omega, \quad (9)$$

$$\sum_{k \in \omega} p_k = 1, \quad (10)$$

Secondly, we assume that the random variable ε obey normal distribution and denote the mean value of ε by:

$$E(\varepsilon) = C, \quad (11)$$

(2) Model:

We assume that the values of a student who hopes to take the job should reach the mean value C in aspects of capability, characteristic and situation, and only in this way will we recommend the job. In other words, in this circumstance, the distance between the student's expectations and the job's requirements calculated by the model will be zero. If distance is not equal to zero, the gap will be evaluated by the distance.

Therefore, if we want to add a new job in the model, we only need to collect its 17 mean values on corresponding factors.

(3) Complements:

For the special factor Salary, its mean value reflects how much money the job can offer. Therefore, if the working market is balanced, the salary of all the staff should fluctuate around the balance point, which means that it's reasonable to use the mean value of the salary to represent the salary job can give.

Similarly, in the discussion of other factors, we also give the market balancing assumption: the staff's capability, characteristic and situation should be balanced with salary requirement, otherwise it will cause the flow of staffs which will help the market related to the factor back to its balance point.

(4) Carry it out:

Based on the method of how to add new fictional person's data to the model, we conduct a survey on people who is taking or temporarily have participated in some job about their ability and personal characteristics. When we gather enough data from survey, we can use statistical method to calculate each factor's mean value.

9. Reference

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- [4] Stephen B. Lawton. "Part-Time Work and the High School Student: Costs, Benefits and Future. A Review of the Literature and Research Needs. " *Academic Achievement* (1994):30.
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10.Attachment

Attachment 1: Code of our algorithm

```
1. import pandas as pd
2. import numpy as np
3.
4.
5. # Distance Function
6. def skill_distance(skill_personal,skill_work,weight=1):# Graph Distance
   produced by Capability
7.     if int(skill_personal) >= skill_work:# Meet the requirements
8.         return 0
9.     else:
10.         return weight*abs(int(skill_personal) - skill_work)
11.
12.
13. def Distance_distance(distance_para,weight=1):# Graph Distance produced
   by distance
14.     return 0
15.
16.
17. def normal_distance(work,personal,normal=True,weight=1):# Graph Distance
   produced by others
18.     if normal==True:
19.         if work > personal:# Do not meet the requirements
20.             return abs(weight)*abs(work-personal)
21.         else:
22.             return 0
23.     elif normal==False:
24.         if work < personal:# Beyond the limits of work
25.             return abs(weight)*abs(work-personal)
26.         else:
27.             return 0
28.
29.
30. # Sorting and Reporting
31. def sort_order(num,reverse=True): # Sort the score
32.     num_sort=sorted(num,reverse=reverse)
33.     order=[0]*len(num)
34.     before=num_sort[0]
35.     k=1
36.     for i in range(len(num_sort)):
37.         for j in range(len(num)):
38.             if i>0 and num_sort[i] == before:
39.                 continue
40.             if num[j] == num_sort[i]:
41.                 order[j]=k
42.                 k=k+1
43.             before=num_sort[i]
44.     order_r=[0]*len(num)
```

```

45.     for i in range(len(num)):
46.         for j in range(len(num)):
47.             if i+1==order[j]:
48.                 order_r[i]=j+1
49.                 break
50.     return order,order_r
51.
52.
53. def report(num,distance_all,works_name,skill,works,n=3,reverse=False):#
    Rank and recommend jobs
54.     distance=distance_all[num]
55.     skill=skill.iloc[num]
56.     print("Recommended Jobs Order:\n\t%-
    20s"%str("work name")+'\tdistance'+'\tskill level(person/work)')
57.     order,order_r=sort_order(num=distance,reverse=reverse)
58.     if n>len(works_name):
59.         n=len(works_name)
60.     for i in range(n):
61.         print('%d:'%(i+1)+'\t%-20s'%works_name[order_r[i]-1]+' \t%-
    10.2f'%distance[order_r[i]-1],end='')
62.         print('\td'%int(skill[works_name[order_r[i]-
    1]])+'/%d'%int(works[works_name[order_r[i]-1]][5]))
63.
64.
65. # Read Parameters
66. works=pd.read_csv(r'para_work.csv',header=0) # Read jobs' requirements
    parameters
67. works_name=works.columns[2:] # Job List
68. features=works.iloc[:,0] # Features, factors
69. work_weight=works.iloc[:,1] # Weights vector
70. para=pd.read_csv(r'para_personal.csv') # Read persons' parameters
71. person_name = {(i-65):chr(i) for i in range(65, 65+10)} # Persons' name
72. name_list = [chr(i) for i in range(65, 65+10)]
73. skill=pd.read_csv(r'skill_personal.csv',header=0) # Read fictional perso
    ns' parameters
74. distance_weight=1 # Weights of distance
75. skill_para=skill[0::2] # Personal information
76. skill_weight=skill[1::2].iloc[:,1:]*5 # Work weight of different persons
77. skill_para.index=range(10)
78. skill_weight.index=range(10)
79.
80.
81. # Calculate All Distances
82. distance_all=[[]]*len(person_name) # Calculate the distance of the perso
    n to all work
83.
84. for m in range(len(person_name)):
85.     para_person=para[person_name[m]]
86.     distance_person=[0]*len(works_name)
87.     k=0
88.     for i in works_name:

```

```

89.         total=0
90.         for j in range(len(features)):
91.             if features[j]=='Distance':
92.                 distance=Distance_distance(distance_para=para_person[j],
weight=skill_weight[i][j])
93.             elif features[j]=='Skill Type':
94.                 distance=skill_distance(skill_personal=skill_para[i][m],
skill_work=works[i][j],weight=skill_weight[i][j])
95.             elif work_weight[j]>0:
96.                 distance=normal_distance(works[i][j],para_person[j],norm
al=True,weight=work_weight[j])
97.             elif work_weight[j]<0:
98.                 distance=normal_distance(works[i][j],para_person[j],norm
al=False,weight=work_weight[j])
99.                 total=total+distance
100.                 distance_person[k]=total
101.                 k=k+1
102.                 distance_all[m]=distance_person
103.
104.
105.         # Report Recommendation
106.         num=0 # Set test number
107.         report(num,distance_all,works_name,skill_para,works,n=303)

```

Attachment 2: Survey

A Survey About High School Students' Summer Job Options

Introduction:

Gender: ☐ Male ☐ Female Senior: _____ Age: _____ Subject: _____

1. How much pocket money do you have each week?

☐ less than \$14 ☐ \$14-21 ☐ \$22-30 ☐ \$31-40 ☐ others

2. How far is it from your residence to the prosperous area in your city?

☐ by walk ☐ by bicycle ☐ by taxi ☐ by subway

Please select to what extent do the following factors influence on your summer job option.
Mention: 1-Point means you don't care the factor at all, and 5-Point means you care it very much.

1. Distance from your residence to work place:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

2. Working hour:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

3. Salary:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

4. Whether work is influenced by the weather or not (outdoor work):

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

5. Working form (physical work or mental work):

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

6. Whether work is related to personal interests or not:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

7. Whether have related work experience or not:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

8. Whether work does good to public welfare or not:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

9. Work's influence on personal ability and skill improvement:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

10. Work's influence on academic development and future employment:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

11. Whether work is related to high-tech and hot areas (big data, new media) or not:

☐ 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05

12. Do you have any other suggested factors: _____

About the summer job:

1. The most commuting time (one way) that you can accept is:
☐ 10 min ☐ 30 min ☐ 60 min ☐ more than 60 min
2. The daily working hour you can accept is:
☐ less than 2 hours ☐ half-day (4 hours) ☐ whole day (8 hours) ☐ more than 8 hours
3. The number of working days every week that you can accept is:
☐ 1-2 days ☐ 3-4 days ☐ 5 days ☐ more than 6 days
4. The least hourly rate that you can accept is:
☐ less than \$2 (like waiters) ☐ \$2-7 (like physical work) ☐ \$7-14 (like tutor) ☐ above \$15

Do you have interests in following industries?

Mention: 1-4 point represents the lowest level, and 5-5 point represents the highest level.

1. Service Industry (restaurant waiter, cashier, barkeeper and etc.)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 4 questions:

How do you think about your interpersonal communication ability?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

To what extent can you accept the main tasks of this industry?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Have you ever engaged in jobs or part-time jobs in this industry?

- ☐ Yes ☐ No

Select summer jobs that you probably will choose (multiple choice):

- | | | | | | |
|-----------------------------------|---------------------------------------|----------------------------------|--|------------------------------------|------------------------------------|
| <input type="checkbox"/> Waiter | <input type="checkbox"/> Barkeeper | <input type="checkbox"/> Cashier | <input type="checkbox"/> Public security | <input type="checkbox"/> Librarian | <input type="checkbox"/> Dormitory |
| <input type="checkbox"/> Salesman | <input type="checkbox"/> Flyer-sender | <input type="checkbox"/> Hamal | <input type="checkbox"/> Cleaner | <input type="checkbox"/> Courier | <input type="checkbox"/> 其他 |
| <input type="checkbox"/> Others | | | | | |

2. Education Industry (online & offline tutor, etc.) :

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 2 questions:

Do you have any subject that you master well?

- ☐ Yes, to be specific _____ ☐ No

How do you think about your interpersonal communication ability?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Select summer jobs that you probably will choose (multiple choice):

- ☐ Tutor ☐ Assistant
☐ Others: _____

3. Technical Industry (researcher, IT, etc.):

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 3 questions:

How do you think about your logic ability?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Do you master any related skills? (programming, experiment designing, etc.)

- ☐ Yes, to be specific _____ ☐ No

Do you have any related competition or research experience?

- ☐ Yes ☐ No

Select summer jobs that you probably will choose (multiple choice):

- ☐ Experiment Researcher ☐ Programmer ☐ Data Analyst
☐ Others: _____

4. Design & Art (musician, photographer, design, handicraft, art, etc.):

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 3 questions:

Do you master any specific skills? (music instrument, photography, PE, PS, handicraft, etc.)

- ☐ Yes, to be specific _____ ☐ No

Do you have any related competition experience?

- ☐ Yes ☐ No

Have you ever published/sold issue any related work?

- ☐ Yes ☐ No

Select summer jobs that you probably will choose (multiple choice):

- ☐ Photograph assistant ☐ Post-production ☐ Illustrator

<input type="checkbox"/> T design	<input type="checkbox"/> Instrument tutor	<input type="checkbox"/> Craftsman	<input type="checkbox"/> Others: _____
-----------------------------------	---	------------------------------------	--

5. **Language & Art/tes**(translator, writer, reporter, etc.):

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 3 questions:

-How do you master any specific skills?(second foreign language, writing, etc.)

☐ Yes, to be specific: _____ ☐ No

-Do you have any related experience?

☐ Yes ☐ No

-How do you think about your following ability?

Expression ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Writing ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-Select summer jobs that you probably will choose (multiple choice):

☐ Subtitle ☐ Translation ☐ Reporter ☐ Editor ☐ Writing

☐ Others: _____

6. **Finance** (accountant, consultant, etc.):

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 4 questions:

-To what extent can you accept digits (bill, finance)?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-How do you think of your logical ability?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-How well do you master office software like Excel?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-Select summer jobs that you probably will choose (multiple choice):

☐ Accountant ☐ Insulating & Industry Research ☐ Statistics & Analysis

☐ Others: _____

7. **Operation** (new media operation & planning, etc.):

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

If you are not interested, then you don't need to answer the following 3 questions:

-How do you think about your team cooperation/communication ability?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-How do you think about your insight & analysis ability?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-How do you think about your organization and management ability?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

-Select summer jobs that you probably will choose (multiple choice):

☐ Upload, YouTuber ☐ Blog operator ☐ Planner

☐ Others: _____