User Survey Breakdown
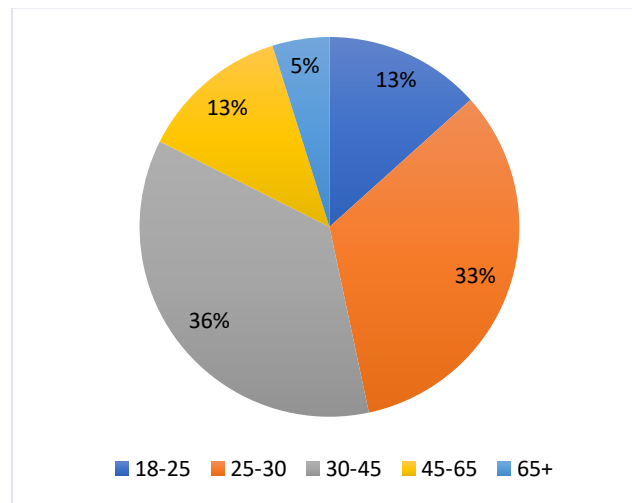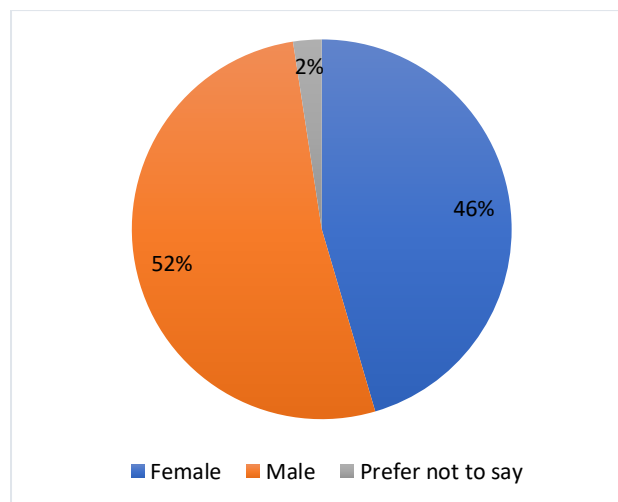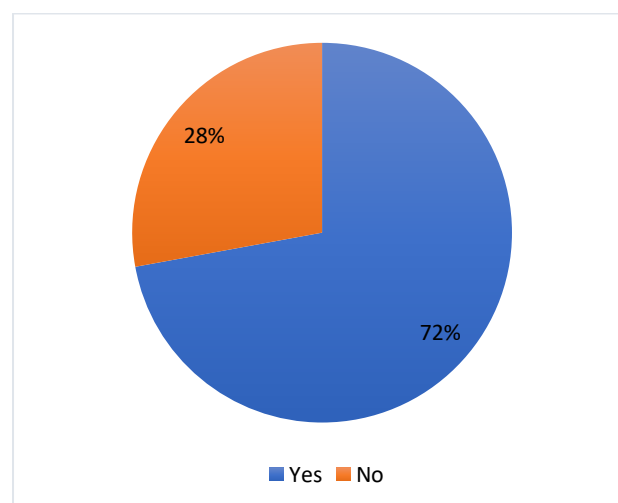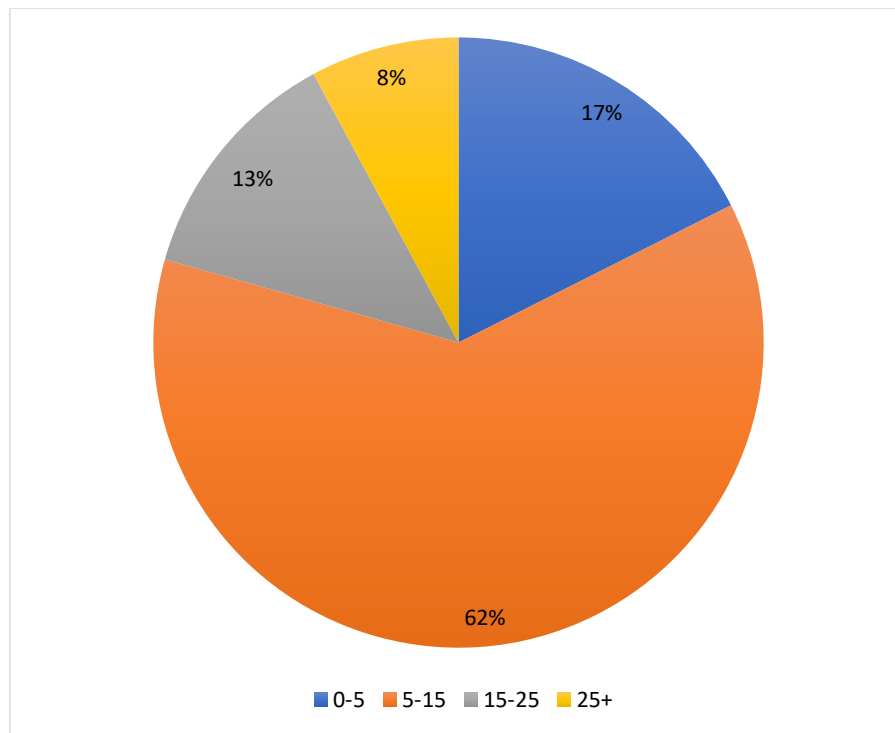
1. What is your age range?

2. What is your gender?

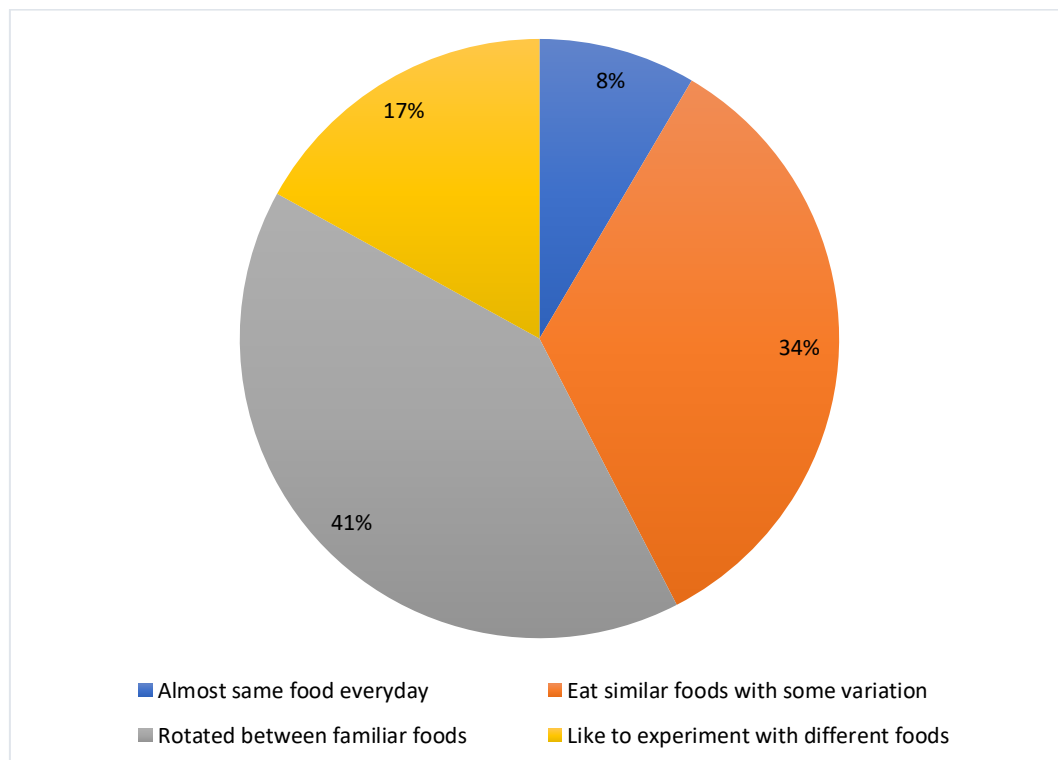3. Do you cook at home more often after the pandemic phase of COVID-19?

4. How many times a month do you cook at home?

0-5   5-15   15-25   25+

5. What is your eating habits?

Almost same food everyday   Eat similar foods with some variation

Rotated between familiar foods   Like to experiment with different foods
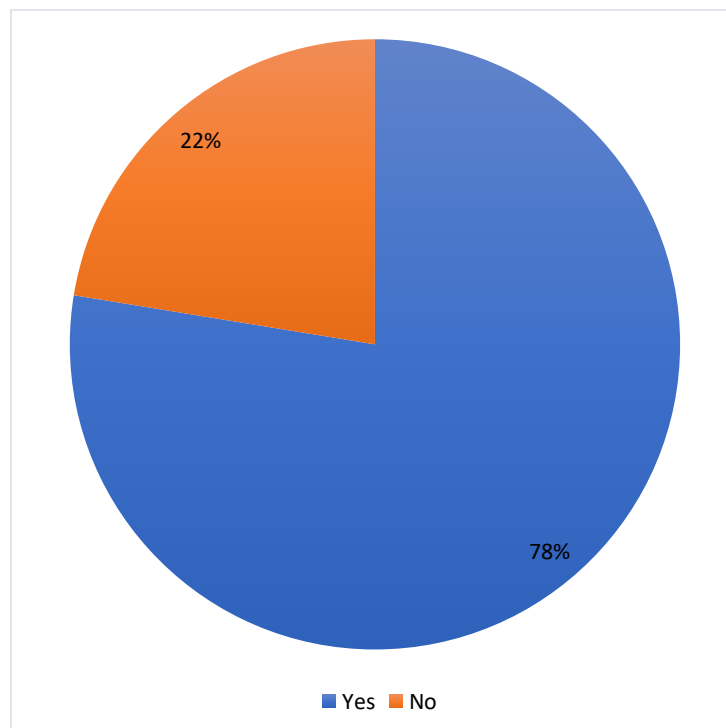
6. Do you ever make inaccurate estimates of what and how many ingredients you will cook/eat, so that cause the food waste?

| Very Often | Sometimes | Seldom | Never |
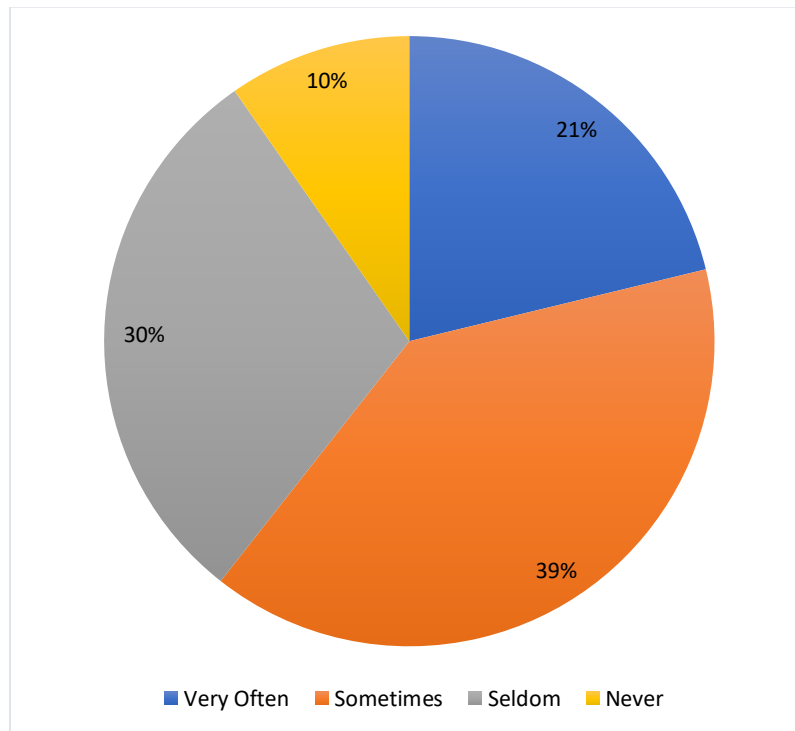
7. Will you choose or do you need to use a recipe to help yourself if you would like to cook at home?

| Yes | No |

DietChef

8. Which step of preparing food you feel can reduce the time with the help of technology?

- ■ Check the existing owned food materials
- ■ Think of what food to eat/prepare
- ■ learn the cooking methods
- ■ Evaluate the food nutritional content for your daily health
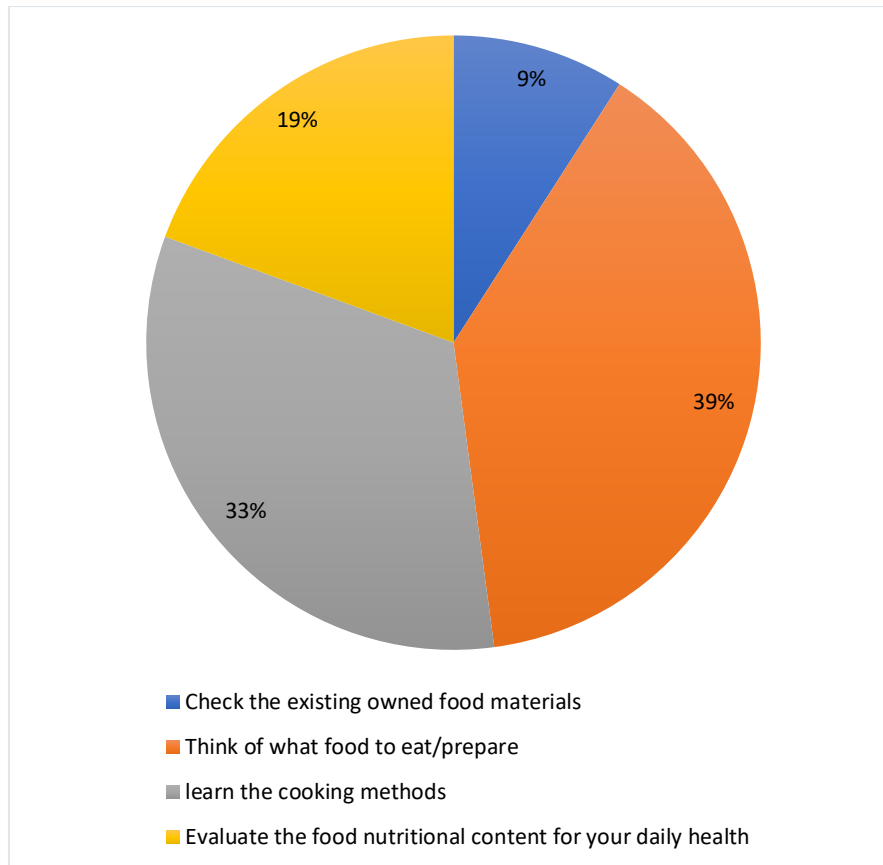
9. How willing are you to need a technology to help you know the nutritional ingredients of food that you cook, such as its calories, carbohydrate, protein content?

■ 1 ■ 2 ■ 3 ■ 4 ■ 5
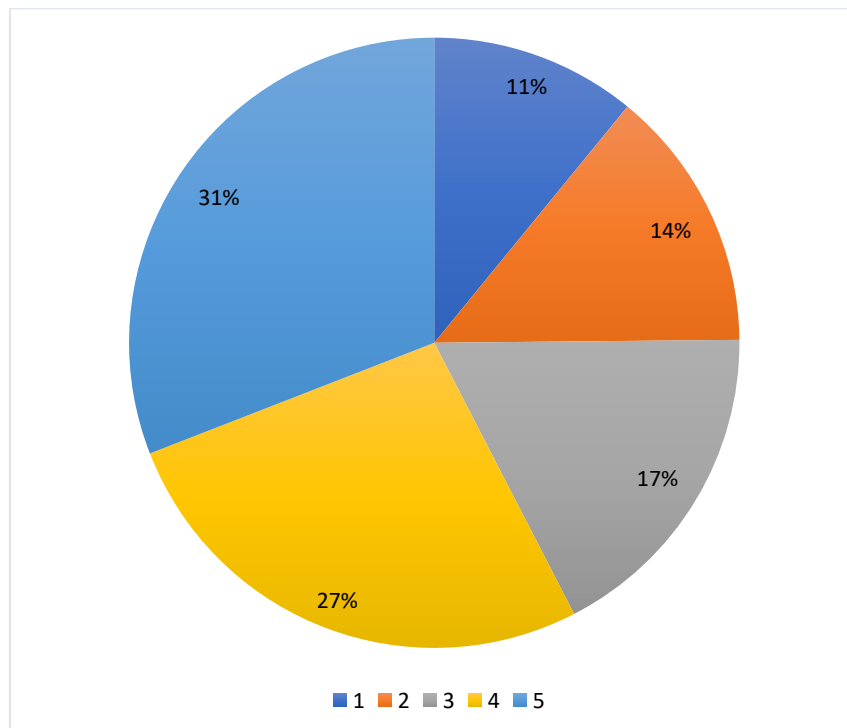
10. How willing are you to choose an AI recipe recommendation system based on your dietary habits/ preference, instead of you searching online?

Pie chart legend: ■ 1 ■ 2 ■ 3 ■ 4 ■ 5

Values shown: 11%, 14%, 28%, 23%, 24%
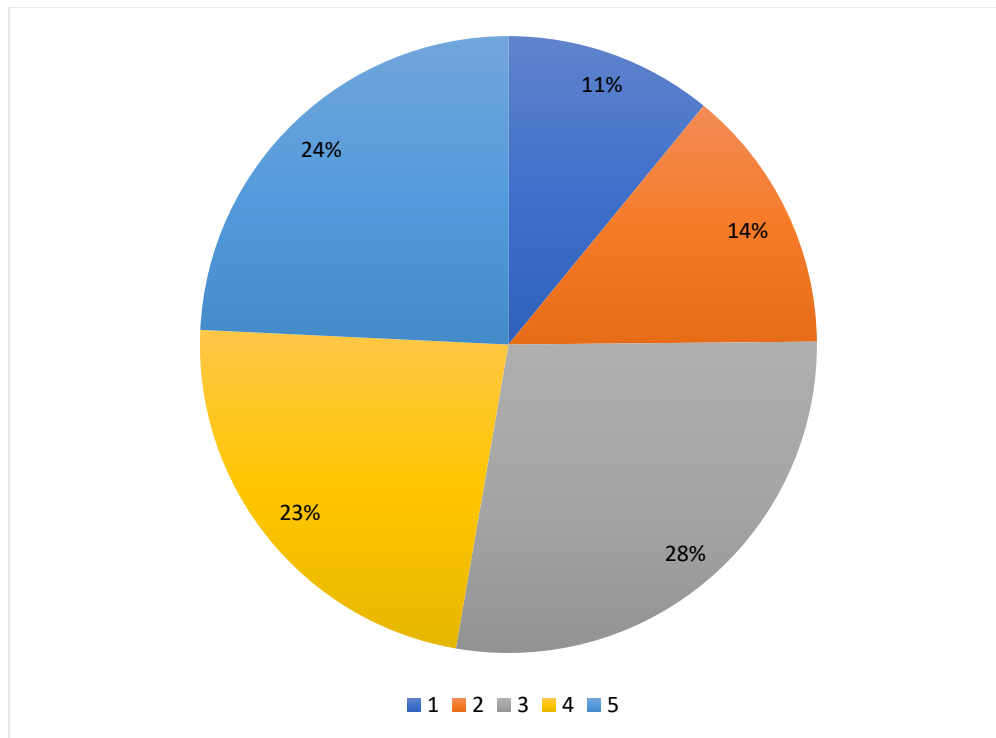
11. What features would you like to see in an AI recipe recommendation system?

Values shown: 5%, 15%, 18%, 11%, 23%, 28%

Legend:
■ Collect food ingredients via user input / camera scanning
■ Provide the recipe details based on the existing food materials you have
■ Calculate the nutrition data (e.g. calories, carbohydrate, fat, protein)
■ Recommend the similar recipes according to your diet history
■ All the above
■ None of the above
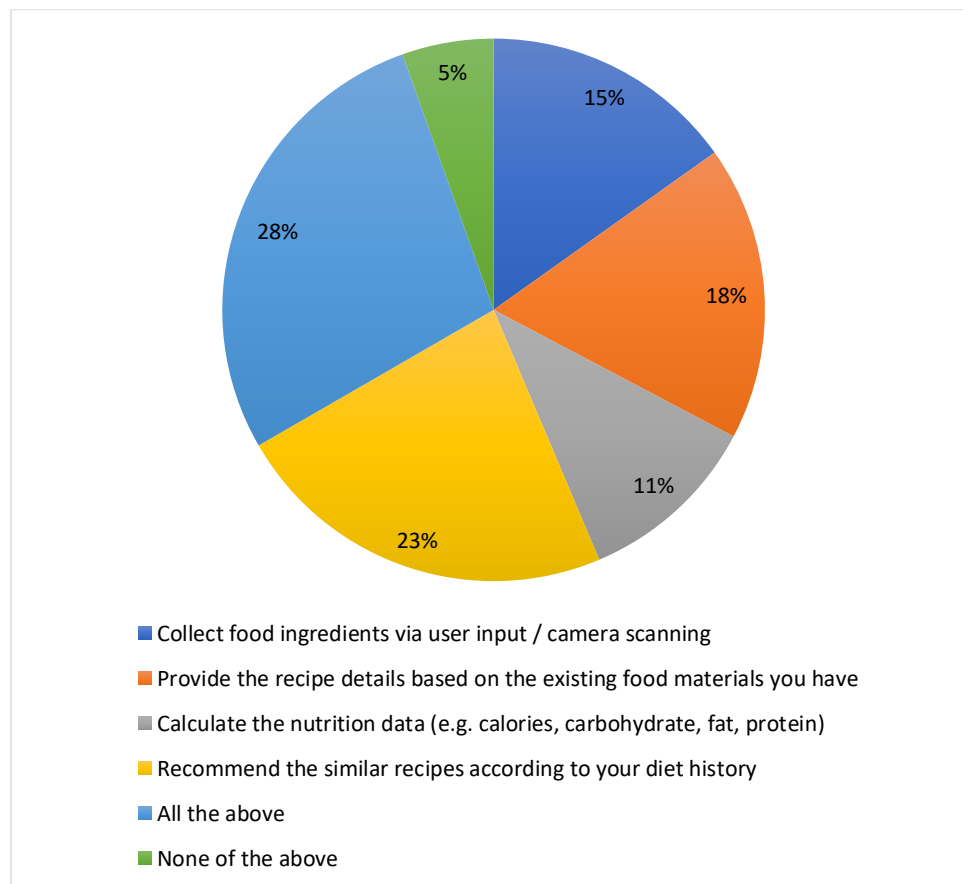
Other features input by respondents:

1. Incorporate this system into the Intelligent home appliances, e.g. smart fridge, and connect to IoT mobile apps
2. Create online community to interact with other users
3. Provide the function to track user's die history and propose customized healthy eating schedule
4. Interesting page design e.g. colourful icons to guide the user experience.
5. Cooking skill lessons
6. Personal inventory for the food in fridge

Interview with Mr Jeffrey Lew, an accredited dietitian

1. Could you please introduce about your job scope as a dietitian, since for us, this kind of job seems like very newly emerging?

    Working as a dietitian in a local hospital after returning to Singapore made me realized that nutrition and dietetic services were more concentrated at the hospitals and polyclinics. But the health literacy level of overall Singaporeans is relatively low compared to other developed county. Hence, my job is to help the public equip with the knowledge and power to make healthful decisions. I can help my clients lead a healthier lifestyle through food choices and behaviour modification.

2. According to your recent work experience, do you find any change on Singaporeans' dieting habits after the COVID-19 pandemic?

    Yes, actually we did research on this issue and the results suggested an association between customers' diets and unhealthier eating habits during the COVID-19 lockdown/restriction. The food contained vegetables decreased by 15%, while the probability of food is barbecue/fried food or beverage category increased by 11% and 4%, respectively.

3. Do you have any idea on the reason of this phenomenon?

    I would like to say various stressors brought about by the pandemic, including increased workload, retrenchment and longer work hours at home, as well as a surge in the availability of food delivery options will overwhelm individuals and cause negative emotions. So, when they are browsing the food recommendation/order APP, they are more likely to choose unhealthy food to destress. More importantly, there is no alert function highlighting the healthy food for people and asking them to make the correct choice.

4. So as you mentioned, in the current market, there are vacancies for a food recommendation system equipped with both nutrition contents and users' dietary habits?

    Yes, as we can see in our daily life, most APP only provide the basic data for one certain recipe after user requesting for it. If that's the case, people will mostly ignore to check for their daily meal.

5. If we would like to create a recipe recommendation system including its basic statistic, what advice you may want to give?

    My daily job includes one important part which is to let my clients know their diet. Our dietetic consultation helps people understand their dietary habits and preferences and offer alternatives and portion advice to optimize your diet for your desired weight and nutrition goals. Hence I would suggest you could consider the similarity between different food and make the intelligent recommends based on user's preference.

6. From your point of view, what is the key component of the similarity between different food as you mentioned just now, like ingredients or flavour?

I reckon the determining factor of the similarity between different food will be the ingredients combination, which means if there will be more overlapping ingredients, these two recipes will be more similar.

7. If AI is utilised in the daily food recommendation system, what concern will you have?
First, I would suggest having a database verified by domain experts such as dietitian or nutritionist. Second, if the machine recommendation does not match user's expectation, I would advise to have a feedback channel to revise your system algorism. Third, I would wish this technology is cheap and accessible, so the world will benefit from it.

Interview with Mr Huang Weijie,

an AI engineer in the Technology Company

1. Could you please make a general update for us on the AI and IoT development in household appliance industry?

   Today, technology has evolved to such an extent that there's a possibility to design meaningful collaboration between humans and machines, primarily due to advancements in AI. Moreover, digital assistants, also called virtual assistants, work on voice-controlled AI, which can do functions like searching the internet, making calls, and connecting to other devices. These assisted devices can be embedded into smartphones or can also be used as a standalone device. This is a great approach to enhance and automate with working of home appliances. IoT is one of the key focus areas of digital transformation projects in the consumer electronics and home appliances industry.

2. What is the current market demand for the intelligent household appliance after the COVID-19 pandemic?

   After the epidemic, the "kitchen fever" and "stocking tide" have caused people's demand for smart appliances such as refrigerators. The concept of health priority has received continuous attention, bringing new opportunities for product and service innovation to industries such as diet and life services. The intelligence of the home appliance industry is an important development trend for enterprises, and this incremental market is a blue ocean for traditional home appliance enterprises. With the gradual improvement of the national consumption level, the differentiation and personalization of user groups are more obvious. Refrigerator companies urgently need to further subdivide the market to make products meet the differentiated needs of users.

3. If we would like to incorporate an intelligent recipe recommendation system into the fridge, what will be suggestion on the critical selling point for this system?

   Refrigerator products in the existing market are seriously homogenized. Refrigerators need targeted innovation, and it is necessary to systematically improve the user's refrigerator experience in combination with the specific life habit of users. Therefore, research on the characteristics of user situations has become an important way to innovate smart refrigerator product design. Taking the recipe recommendation system as an example, it shall be "intelligent" enough to recommend the food as per user's history data. On this basis, it would also provide the necessary food data for caring user's health condition.

4. Will this function work well in the household IoT system?

   Yes, in the process of using this system, the relevant information generated by the user and the corresponding influencing factors between user and the system interaction will achieve better target for understanding the user needs/preference from a context-aware perspective.