NPS2001C Group Milestone 1

Ideation and Planning Report

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Which real world problem have you chosen to work on? Why is it an important problem?

There are many food options available in University Town (UTown). Despite this, we often experience crowding issues during peak hours, between 12pm-2pm and 5.30-6.30pm. In this project, we will quantify the problem of overcrowding with wait time, starting from the ordering of food, until its collection.

This problem exists as UTown is not only a place where students and staff come to eat, but also open to the public. From visitors overseas, to regular events held that invites the public, all these influx of external visitors exacerbates the crowding problem. This is even more evident in the two food courts in UTown, Food Clique and Fine Food. The average wait time at the food courts in particular during rush hours ranges anywhere from 20-40 min. This can be attributed to the attractiveness of the food courts as they offer value-for-money meals whereas the restaurants are more pricey. As such, many find themselves faced with large crowds of people in the food courts, not only struggling to find a space to sit to have their meals but also having to wait very long for their food.

In addition, patrons may become frustrated when they have to wait very long for their food and repeatedly ask the stall owners when their food will be ready. This is also distracting for the stall owners as they have to manage both their customers and the food, further slowing down the serving process. Some stalls have buzzers, so that customers will know when their food is ready and do not have to wait at the stall. However, some of these buzzers have limited bluetooth range where buzzers of customers who are seated further away from the stall will not buzz. Thus, customers are unable to go out of the vicinity should they wish to do anything else while waiting for their food.

This is an important problem as we want to make getting meals in UTown as hassle free as possible. Knowing that lunch time can be limited for students and staff, we hope that the app will be able to help patrons plan according to their schedule, and get their meals quicker, at their most convenient time. Furthermore, given that UTown is also a tourist spot and one that sees many external guests, we also wish to allow these patrons to have a better dining experience and enjoy their time in NUS. As such, we chose to target the issue of overcrowding in dining locations in UTown.

What will your app do and how will it help solve or mitigate the problem?

Our app will have a few main functions. Firstly, it allows people to see the wait time of each stall in Food Clique and Fine Foods as well as other restaurants in UTown. This allows patrons to estimate the crowd before heading down for lunch and would help ease the uncertainty of long waiting times and lack of seats. If patrons think that the estimated wait time is too long, they can choose to wait until the crowd reduces before heading down to have their meals, or choose to eat from a different place. The app will show the general crowd condition of the different food choices, and also the individual food court stalls' wait time. This will give patrons a gauge on how long they need to wait for their food.

Next, the app can give food recommendations based on the user's personal preferences. Some metrics include distance from their current location, taste preference (i.e. preferred cuisine), maximum wait time, etcetera. This allows users to better plan their time, to find food options that suit their tastes and also fit into their schedules.

Both functions serve to minimise the crowd and wait time by diverging the crowd to different stalls and restaurants, and also scattering the time at which customers patronize each location.

What is the central algorithm or class of algorithms that will enable this app to work?

There are three central classes of algorithms that will enable the app to work: sorting algorithms, content-based filtering algorithms and search algorithms.

<u>Sorting Algorithms</u>

This will be used to sort out the options of food stalls based on their wait time, in order to display

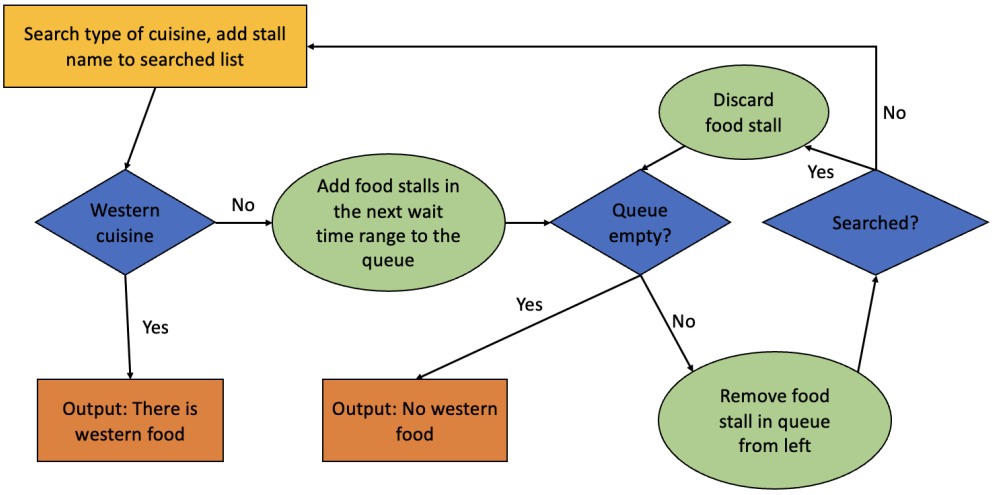
to users the stall with the least wait time. This can be done through quicksort as it is most efficient. The information for wait time as each stall will be crowd sourced and will rely on inputs from users based on their own experience. After a period of running the app, a statistical trend analysis can be run to display to users the predicted wait times for each stall based on trends.

Content-Based Filtering Algorithm

This algorithm will assist in providing recommendations and understanding user preferences, through an analysis of the frequency of clicks on a certain kind of stall or through the user's direct input of preference through filters (*Content-based Filtering,* 2022). Some of these filters include the range of acceptable wait timings, type of preferred cuisine, budget, and distance from the user.

Search Algorithms

Considering that people may want to order from stalls with a shorter waiting time while indicating their preference, we can use search algorithms such as the breadth-first search, in order to quickly help customers find their preferred stall type with the shorter waiting time (e.g., finding a stall selling western food with the shortest waiting time). This is in contrast to the depth-first search, which may be too specific, going down to the individual items sold in the stalls, something that users may not necessarily need and slowing down the speed of search.



Under what circumstances do you expect users to use your app?

The target demographics of our platform are people who visit UTown. This includes people who work or study in NUS, and external visitors such as the general public or tourists. As long as they have access to the platform, they can utilise it, anywhere and anytime. With our platform, they will be able to check the crowd in various food places in UTown before deciding where they would like to eat.

A potential issue could be inaccurate recommendations especially in the initial stages. The platform recommendations are made using data gathered from users also known as crowdsourced. As such, when there is insufficient data in the initial stage, wait time recommendations may be inaccurate. However, this will easily be resolved over time and with widespread usage of the platform. Since the platform also relies on vendors to update any changes to their menu (i.e. sold out food options, change in prices etc.), another potential issue we foresee could be inconsistency in updates from the stall vendors which could lead to inaccurate recommendations. Despite these limitations, this app can be useful for both stall owners and patrons as it can help with overall crowd control and reduce instances of frustration and disappointment during peak dining hours.

References

Content-based Filtering | Machine Learning. (2022, July 18). Google for Developers. Retrieved February 7, 2024, from https://developers.google.com/machine-learning/recommendation/content-based/basics