



ASSIGNMENT

CV1014: Introduction to Computational Thinking

Mini Project Instructions

**SESSION 2023/2024
SEMESTER 2**

**SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE**

Mini-project

1 OBJECTIVES

The purpose of this assignment is to allow you to apply the various computational thinking (CT) concepts learned during the course in the form of a mini project, which will further improve your problem solving and programming skills. The program developed for the project must hence demonstrate the applications of the four aspects of CT taught in the courses, including abstraction, decomposition, pattern recognition, and algorithm design. Through this project, you will also practice and acquire hands-on knowledge with Python programming, in particular on data processing, branching, looping, data structure, function, and algorithm design.

2 THEMES FOR CHOICES

Some themes or topics are provided for students' selection to avoid plagiarism. Each group consisting of three students freely select one of the following topics. The topic "F&B Recommendation (Inside NTU) system" is used as an example to show you the implementation procedures. Please don't select this topic for the mini-projects!!!

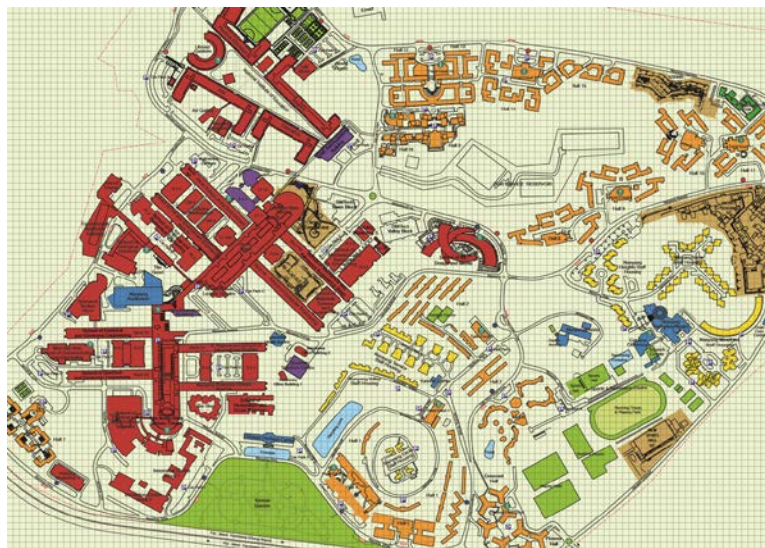
- a) Online movie recommendation system
- b) Online animation recommendation system
- c) Online college admission management system at NTU or other universities
- d) Student score management system at a university
- e) Safety training system in a lab, a campus, or a factory
- f) Mental health and wellness management system
- g) ebook library management system at a NTU or other universities
- h) Medical center recommendation system in Singapore or other countries
- i) Computer brand/model recommendation system
- j) Cell phone brand/model recommendation system
- k) Flower shop recommendation system in Singapore or other countries
- l) Clothes brand/shops recommendation system in Singapore or other countries
- m) Hiking trails and spots recommendation system in Singapore or other countries
- n) Fitness center recommendation system in Singapore or other countries
- o) Hotel recommendation system in Singapore or other countries
- p) Airflight recommendation system between multiple cities
- q) Green transportation recommendation system in Singapore or other countries
- r) Metro route recommendation system in Singapore or other countries
- s) Outdoor adventure gear recommendation system in Singapore or other countries
- t) Apartment rent/purchase recommendation system in Singapore/other countries

The following functions can be realized for the development of each system

- a) User Interface design
- b) Database development for the storing of the existing information
- c) Adding new information and updating the database
- d) Searching the information
- e) Sorting by different measures, e.g., sorting by distance, price, or ranking.
- f) Other advanced functions out of the lecture scope that learnt by yourself are also encouraged, and additional credits (a maximum of 5 scores) can be given.

3 SAMPLE THEME: F&B RECOMMENDATION SYSTEM

In this mini-project, you will develop a program coded in Python that can recommend a canteen in NTU for the user to have a meal based on the user's position and inputs. The information to be made available by your program should include at least 10 canteens in NTU (the list of canteens in NTU can be found in the file Canteens.pdf), containing various useful information such as their locations, booth names, signature food, price, rank, facility/environment, and service hours (but not limited to these - you are encouraged to be creative). This information is to be kept in the system, which can also be optionally updated. The location of the canteen might be kept using 2D coordinates (row, column). A sample image is shown below. You can use any image in your project.



4 SAMPLE PROGRAM DESIGN: F&B RECOMMENDATION SYSTEM

You might want to consider implementing this program using the following steps.

4.1 Computational thinking

The basic function of an F&B recommendation system is that the user can get a recommendation based on his/her inquiry such as using the following three steps:

- i. The user is asked to enter his/her location on the NTU campus according to 2D coordinates (row, column) if the distance is a concern.
- ii. The user is asked to enter his inquiry criteria
- iii. The recommendation information displayed

You should consider the following in your code:

1. Decomposition: (implement as major functions):
 - a. Information system set up, pre-store some information
 - b. Display the map to the user
 - c. Allow user to update information
 - d. User inputs inquiry and get the recommendation
 - e. Sort based on distance, price, or rank
2. Programming style with proper comments

3. Testing: Correctness of your solution.

4.2 Program design: the skeleton of the project and choice of the user interface

Before writing any program code, you should carefully study the requirements, and write the pseudo code (or flow chart) of your program design. You can then consider the various functions and their structures that need to be implemented, their input/output requirements, their goal, and how they fit into the overall structure of the entire program.

You can use these approaches to develop the skeleton of the project that only handles the interface with the user (i.e. how the user will inquiry the place to recommend), the display of the map, and the initialization of the variables.

4.2.1 Define and initialize Data Structure

You will need to define an appropriate data structure that can be used to store information such as the location of each canteen, the operating hours of each canteen, list of food in each canteen, price of each food in each canteen, and rank of the canteen.

4.2.2 Skeleton of the project.

The following provides the list of functions that you should implement in the program (but you are not limited to only using these functions).

<code>get_user_location ()</code>	Get user location either though console input or mouse click
<code>distance_a_b (location_of_a, location_of_b)</code>	The function calculates the distance between two points.
<code>sort_distance(user_location, canteens_location)</code>	Display the sorted distances from the user's current location to each canteen in ascending order.
<code>search_by_food(foodname, foodlist_canteens)</code>	Search all canteens to return the canteen with wanted food
<code>sort_by_rank(ranklist_canteens)</code>	Display the canteens by rank
<code>Search_by_price(price, foodlist_canteens)</code>	Search all canteens to return the food within the searched range
<code>Mouseclick()*</code>	Optional: To return coordinate of a mouseclick
<code>Update_information()*</code>	Optional: allow users to update the information of each canteen
<code>transport (user_location, dest_location)*</code>	Optional: allow use to get transport information from current location to the destination

4.2.3 Display of map.

Display of map is not necessarily required in your project. But it can highly improve the quality of the user interface. You can use Pygame to display the map. You are free to use any map, either found from the Internet or draw by yourself.

"Pygame is a cross-platform set of Python modules designed for writing video games. It includes computer graphics and sound libraries designed to be used with the Python programming language." --<https://en.wikipedia.org/wiki/Pygame>

4.3 Program implementation.

4.3.1 Data Structure

You should make use of appropriate and efficient data structures in your program, such as string, list, tuple, and dictionary.

4.3.2 Coding

You should consider how to use the various techniques in your program: data processing, branching, looping, data structure, function, and algorithm design. The four aspects of CT taught in the courses, viz, abstraction, decomposition, pattern recognition and algorithm design should be considered in implementation.

Note that each time you add a feature to your program, you should test it thoroughly before continuing.

5 ASSIGNMENT GROUPING:

In preparation for the assignment, you will need to form group of 3 members according to the instruction of the lab supervisor. The group will be formed within your tutorial/lab slot. [Here](#) is a shared Google Excel link that help you to form a team. Some groups with less than 3 members may be combined at random, depending on actual situations. If you do not form a team by the end of Week 10 at your time slots, we will form the team randomly.

Once your group has finalized on the outline of the program flow (e.g., based on the pseudo-code), each member in the group must then be assigned to separately develop the various parts required by the proposed program (i.e., workload must be balanced. Code developed by each member should then be combined through importing of modules.

You are required to clearly indicate the parts that are handled by each of the team members. This will be used for individual assessment purposes as well as for the team collaboration assessment.

NOTE: Make sure your program can run on Python 3.4+ (the lab version).

6 SUBMISSION PROCEDURE AND ASSESSMENT

- i. This assignment will be due on the day of the last lab session of each group on week 13. Note: Last lab day for each lab means 1159pm of the lab day in week 13 of a particular group. E.g., CV1's lab session is THU 1330-1520. The last lab day for CV1 will be April 18 (THU of week 13). So, the deadline for the source code submission for CV1 is 1159pm on April 18.
- ii. In this project, you need submit three items:
 - 1) soft copy of python code zipped in a single file, labelled with your team ID, e.g., CV1_1, CV1_2. **We provide a coding framework (Framework.ipynb), and please use it for your project.**

- 2) “program assessment rubrics” (see Appendix 1) in which you should fill *Description/Comment*. More detailed instruction can be found in the appendix. **Please submit this file to NTULearn one day before the presentation date, so the tutor can mark based on it during presentation.**
 - 3) slides of your 5-min presentation. During Week 13, you are required to make a presentation in person at the related lab session. In your presentation, you should show the computational thinking process, program design, and demonstrate the running of your program using different test data.
- iii. You need submit the above three items through the “Assignment / Mini project submission” on the course website at NTULearn. Only one person in your group needs to submit the project files through the NTULearn. Do not submit the same project by multiple times from each of your group members.
 - iv. In Week 13, each group will make a presentation one by one and followed by a 5-min Q&A session. During the Q&A session, we will have following activities:
 - Other group students will ask questions.
 - The contribution part of each group member will be clarified.
 - The instructor will print the assessment form & grade overall performance.
 - v. Late submission could be penalized. Email your lecturers earlier if you experience critical issues, e.g., illness, accidents, etc.

7 PLAGIARISM

Please be reminded that **PLAGIARISM** (or copying part of/complete assignment from other students or the project in the previous years) is considered as **CHEATING**, which is strictly prohibited. We will use certain plagiarism-checking systems to check your work. You will get zero marks on your assignment if you are found guilty of plagiarism (copy from others OR give your work to others for a copy).

Reference:

<https://www.pygame.org/docs/tut/ImportInit.html>