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CS 5002
Final Project Report
Project: Park and Facility Management System

A. Environment Setup

The project relies on the following libraries:

- Folium: Used for creating maps.
- Matplotlib: Used for generating pie charts and bar charts.
- Webbrowser: Used for opening HTML files.

Installation Steps:

- Install Folium: Run “pip install folium” in the terminal.
- Install Matplotlib: Run “pip install matplotlib” in the terminal.

B. Code Highlight

- model_3_parks_and_facilities_analysis_functions.create_neighbourhod_facility_dictionary

```
def create_neighbourhood_facility_dictionary(
        park_instances, facility_instances):
    '''...
    new_dictionary = {}

    for facility in facility_instances:
        for park in park_instances:
            if facility.park_name == park.name:
                # Set keys and values
                if park.neighbourhood_name not in new_dictionary:
                    new_dictionary[park.neighbourhood_name] = {}
                # Add facility count to value representing the facility details
                if facility.type not in new_dictionary[
                        park.neighbourhood_name]:
                    new_dictionary[park.neighbourhood_name][facility.type] = [
                        facility.count]
                else:
                    new_dictionary[park.neighbourhood_name][
                        facility.type][0] += facility.count

    # Calculate the distribution
    for value in new_dictionary.values():
        total_number = sum(value_list[0] for value_list in value.values())
        for value_list in value.values():
            distribution = round(value_list[0] / total_number, 4)
            value_list.append(distribution)
    return new_dictionary
```

During Milestone 1 time, I deeply struggled to choose which data structure to store the analysis data for the facilities’ type, count, and distribution in each neighbourhood. Firstly, I wrote at least three functions for it but found it would be too complicated soon. Therefore, after submitting Milestone 1, I tried to upgrade this part of the code. To make it easy to read and to be used for the following visualization progress, I decided to do it with a dictionary-dictionary-list structure that is represented as {'Neighbourhood1': {'Facility1': [3, 0.75], 'Facility2': [1, 0.25]}, 'Neighbourhood2': {'Facility1': [2, 0.5], 'Facility2': [2, 0.5]}}. While the keys of the first dictionary are neighbourhood names and values are dictionaries of facility details, every small dictionary inside the big one has keys representing as facility types and values representing a list of facility count and distribution. To make it, I used four for-loops in this function which almost confused me while

writing.

C. Next Steps

If given more time, I would further delve into learning Tkinter and develop a GUI for my program.

Additionally, I would design another data visualization chart by creating a scatter plot to illustrate the disparity in facility density across parks of different sizes. The x-axis would represent the park area, while the y-axis would depict the facility density, aiming to show the relationship between park facility density and area. This visualization would help program users in identifying parks that may require area expansion or facility augmentation. Although I had completed the basic code for this functionality in Milestone 1, given to the time limit, I decided not to visualize and implemente it further, leading to its removal.

D. Reflection

It's my first time completing a program all by myself, from selecting datasets to designing the code structure, and from determining which data structures to use to learning to visualize all the data analysis results. Although I didn’ t know how to use Folium and Matplotlib at first, I still found it interesting to learn them while working on the program. Besides acquiring visualization skills, the most valuable lesson I learned from the project is that I should never give up in the process of completing a project, even though it might be challenging at times. It's important to keep learning new things.

The reason I'm saying this is because I felt stressed and panicked when I initially started this project. As it is a flexible project where everyone can design a data analysis program they are interested in as long as it meets the requirements, there's no specific instruction telling me what functions I should code or where I should place these functions, unlike the homework assignments we had before. The stress of not knowing what to do next overwhelmed me at the end of March. That was also the most challenging part I encountered in this project - calming down, and persuading myself that I could do it and I would do it right.

I'm grateful to Dr. Ali and all the TAs for their instructions and encouragement, and I'm also thankful to myself. I finally made it! I was thrilled and rewarded to see my program actually operational and capable of performing all the tasks I designed it for. I believe that next time, I'll approach it with more ease and confidence, but putting in all my effort as always.