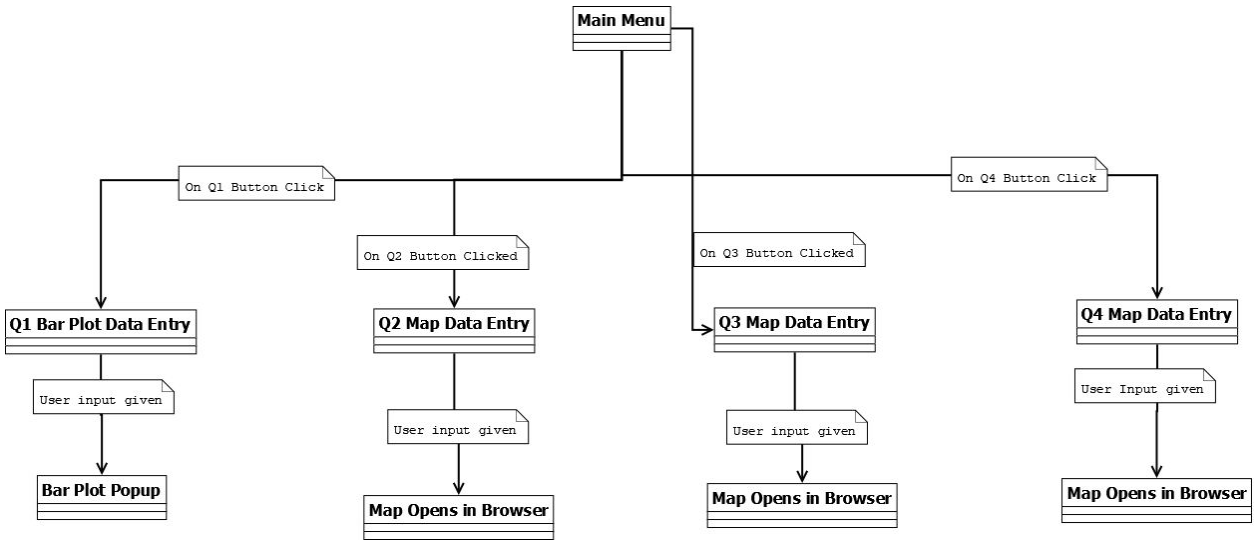
Overview and User Guide:

The User interacts with the application using a tkinter based GUI interface using the following pattern



Main Menu:

- Presents the user with 4 button, each labeled with one of the four functionalities offered by the program
- Upon clicking one of the buttons, the user will be taken to a new page for further input

Q1 Bar Plot Data Entry:

- The user is prompted to enter a range of years, and a crime type

Bar Plot Popup

- Once the user is finished completing the entries, a bar plot is generated of the frequency of the given crime in the given time frame, organized by month
- Invalid input is rejected

Q2 Map Data Entry:

- The user is prompted to enter a number N

Q2 Map Opens in Browser:

- N*2 circles generated

Q3 Map Data Entry:

- The user is prompted to enter upper and lower bound years, a number N, and a crime type

Q3 Map Opens in Browser

- The user is presented with a map with the top N neighbourhoods where the given crime type occurred the most in the given range of years

Q4 Map Data Entry:

- The user is prompted to enter a range of years, and an additional number N

Q4 Map Opens in Browser

- Once the user is finished, a map is generate with N circles on it, indicating the N areas with the highest crime to population ratio within the given time frame
- Upon clicking on one of these circles, the name of the area, its crime ratio and the most frequently committed crime are shown

Software Design:

The implementation of this application is centered around two classes. A database class, which supplies the necessary data for each function, and a UI class, which takes the data and formats and presents it in the required way.

Database class:

The database class is comprised of a collection of functions, each tasked with retrieving a specific set of data from the database through SQLite queries, and stored in pandas dataframes

UI class:

The GUI interface for this application is created using the tkinter python library. Each step in the application is treated like its own “view”, which are exchanged every time the user clicks a button to move to the next part of the program.

Bar Plot Creation

When the user presses the Q1 button, they are prompted for further input. Upon clicking the confirm button, the input is retrieved from the input fields, which is fed to the appropriate database function. The resulting data is then formatted into a bar plot using a pandas dataframe and the matplotlib libraries. Once completed, the bar plot is shown to the user in the form of popup, and the plot is also saved locally as a png file.

Map Creation:

The other three functions are all formatted in a similar fashion to one another. The user chooses a function, they are prompted for any required user input. The input is once again retrieved from the input fields and fed into a database function. The program then generates a folium map centered on Edmonton, Alberta. The resulting data is then used to create scaled red circles on the map centered on areas of interest, with additional information being shown upon clicking one of the circles. Upon processing completion, the map is opened in the default internet browser of the computer, and the map is saved locally as an html file.

Testing Strategy:

Testing was done mostly through user-style testing to ensure that the GUI interactions were producing correct behaviour. SQL query correctness was checked by first writing the queries in a DB management software, and checking for correct results. Those results were then used to ensure the python embedded versions of these queries also produced the correct result.

Group Work Breakdown:

- Group work was mainly distributed based on point value for the assignment. Resulting in both partners doing 30 points worth of work

Brian:

- 1. Given a range of years and crime type, show (in a bar plot) the month-wise total count of the given crime type. (10 marks).
- 4. Given a range of years and an integer N, show (in a map) the Top-N neighborhoods with the highest crimes to population ratio within the provided range. Also, show the most frequent crime type and the ratio in each of these neighborhoods. (20 marks)

Liam:

- 2. Given an integer N, show (in a map) the N-most populous and N-least populous neighborhoods with their population count. (15 marks)
- 3. Given a range of years, a crime type and an integer N, show (in a map) the Top-N neighborhoods and their crime count where the given crime type occurred most within the given range. (15 marks)