Functional Requirements

1. Login Page
    - 1.1. The user must be able to register for an account
        - 1.1.1. The user must input a valid email address
        - 1.1.2. Passwords must include at least one uppercase letter, one number, one special character, and a length of 8 to 20 characters
        - 1.1.3. The system must not allow identical usernames
    - 1.2. The user must be able to log in to their account
        - 1.2.1. The system must be able to validate the corresponding username and password
    - 1.3. The user must be able to continue with a guest account
        - 1.3.1. When logging in with a guest account, their search history and filter settings will not be saved for future uses.
    - 1.4. The system must display a “Forget Password” field
        - 1.4.1. When ‘Forget Password’ is chosen, the user must input their registered email address to receive an email from the system, allowing them to reset their password

2. Home Page
    - 2.1. The system must display an interactive map on the home page, with a search bar for entering locations
    - 2.2. The user must be able to zoom in or out on the map
    - 2.3. The user must be able to move the map in all directions
    - 2.4. The user’s current location must be shown on the interactive map

3. Search Page
    - 3.1. User must be able to enter a location in search bar
        - 3.1.1. The input can be either an address or a postal code
    - 3.2. The system must provide a filter button next to the search bar
        - 3.2.1. The user can click on the filter button to access filter options
    - 3.3. User Guidance:
        - 3.3.1. The search bar must include placeholder text such as “Enter an address or postal code” to guide users.
        - 3.3.2. The system must display examples or hints below the search bar if the user enters invalid input multiple times.
    - 3.4. Validation for Filters and Input Fields
        - 3.4.1. The system must validate the user’s input in the search bar to ensure it adheres to the following formats:
            - 3.4.1.1. Address: Must be alphanumeric and can include spaces, commas, and periods. Special characters (e.g., @, #, $, etc.) are not allowed.
            - 3.4.1.2. Postal Code: Must consist of exactly 6 numeric digits (e.g., 123456) and must match valid postal codes recognized by the system's database.

4. Car Park Filtering
    4.1. The system must provide 4 filter options for car parks:
        4.1.1. Shortest Distance: The system must sort car parks based on proximity to the user's entered location, starting from the nearest
        4.1.2. Lowest Cost: The system must sort car parks from the lowest to the highest rates, with the cost displayed to the nearest $0.10
        4.1.3. EV Charging Stations: The system must allow users to filter car parks that have EV charging stations available
        4.1.4. Sheltered Parking: The system must allow users to filter car parks that have shelters
    4.2. The system must allow for the toggling of filter parameters
        4.2.1. The user must be able to enable or disable each filter option independently

5. Result Page
    5.1. The system must display search result on a map view
    5.2. The system must display car parks with available spaces within a 500-meter radius of the user's input location
        5.2.1. If no parking spaces are available within that 500-meter search radius, the system must inform the user with a message that no results were found
    5.3. Upon clicking the search button, the system must generate and display a dropdown menu with available car parks based on the user's search input and selected filters.
        5.3.1. If no parking spaces fulfils the specified filter requirements, the system must inform the user with a message that no results were found
        5.3.2. The system must update the search results in real-time based on the selected filters, with changes reflected within 30 seconds
    5.4. The system must display the available parking car parks as markers on the map
    5.5. The system must display detailed information of each car park
        5.5.1. Information such as the number of available parking spaces, rates, availability of EV charging stations, sheltered parking, and distance from the user's current location should be displayed
        5.5.2. The distance to the car park must be accurate to the nearest 0.1km

6. Navigation Page
    6.1. The system must display a "Navigate" button when the user selects a car park from the search results
    6.2. When the user clicks the "Navigate" button, the system must calculate the most optimal route from the user's current location to the selected car park
        6.2.1. The system must determine the optimal route based on factors such as shortest distance and traffic conditions
        6.2.2. The calculated route must account for the user's current location, which should be dynamically obtained using location services

6.3. The system must display the calculated route visually on the map interface
6.4. The system must be able to generate and display turn-by-turn directions to guide the user to the selected car park

7. Parking Location Memory Feature
   7.1. The system must allow users to capture and save a picture of their parking location and add an optional text description
      7.1.1. The system must provide an option for the user to take a picture of their parking location using their device's camera
      7.1.2. The system must allow users to retake the picture before saving
      7.1.3. The system must allow users to edit the text description of the parking location
      7.1.4. The system must store the text description along with the image
   7.2. The system must attach a date and time stamp to the saved parking location entry

8. Error Handling
   8.1. If invalid input is detected on the search page:
      8.1.1. The system must display an error message such as "Invalid input. Please enter a valid address or postal code."
      8.1.2. The user should be prompted to re-enter the information.
   8.2. If the input passes validation but does not correspond to any recognized location:
      8.2.1. The system must display a message such as "No results found for the entered location. Please check the input and try again."
   8.3. The system must display an error message and allow the user to retry if image capture fails during the parking location memory feature

9. Settings
   9.1. The system must have a button from the home page to lead to a setting page
   9.2. The system must allow logged-in users to update their account details
      9.2.1. The system must allow logged-in users to change their password
         9.2.1.1. The system must provide a field for the user to enter their current password and new password.
         9.2.1.2. The system must enforce password requirements
         9.2.1.3. The system must validate the current password before applying the changes
      9.2.2. The system must allow logged-in users to update their email address
         9.2.2.1. The system must validate the new email address to ensure it is correctly formatted
   9.3. The system must provide a "Log Out" button on the settings page for logged-in users
      9.3.1. When the "Log Out" button is selected, the system must terminate the user's session and return to the login page

10. History
    - 10.1. The system must have a button from the home page to lead to a history page
    - 10.2. The user must be able to see their search history in the history page
        - 10.2.1. The search history must be sorted from the most recent search to oldest
    - 10.3. Only users with registered accounts must be able to view their search history
    - 10.4. Guest accounts must not have access to view search history
    - 10.5. The system must allow users to access saved parking location memories from the history page

Non-Functional Requirements

1. Usability
    - 1.1. The system should use 12 hour clock format to display current time
    - 1.2. The user interface should follow responsive design principles to ensure usability across devices, including desktops, tablets, and smartphones

2. Reliability
    - 2.1. The system should synchronize data with government and private databases every 60 seconds to ensure near real-time accuracy
    - 2.2. After a system reboot, the full system functionality must be restored within 2 minutes

3. Performance
    - 3.1. System should be able to show the desired search in 15-30 seconds
    - 3.2. On opening the website, it should be fully functional within 15 seconds
    - 3.3. The system must be able to support at least 100 000 concurrent users without significant slowdown

4. Supportability
    - 4.1. The system must be able to run and are compatible with most web browsers such as Google Chrome, Microsoft Edge and Safari
    - 4.2. The system should support multi-language functionality to cater to diverse demographics
    - 4.3. The system should allow for scaling to accommodate increased traffic or data demands as the user base grows
    - 4.4. The system should support regular maintenance and updates without requiring long downtime periods of 15 minutes per update