



EV Info Management System



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Acknowledgements

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Finally, we would like to thank to all our team members who contribute their effort and giving time to complete the EV Info Management System.



Abstract

The Electric Vehicle (EV) Info Management System is a desktop application developed using Python programming language and runs on Windows. The system allows the user to add the information of electric cars, modify the existing data, inquiry the required information that has been existed in the system and display the list of the electric cars with their specifications.



Chapter (1)

Introduction

Introduction

An electric car known as electric vehicle (EV), is powered fully by an electric motor and battery instead of a combustion engine powered by gasoline. Electric vehicles use energy stored in main battery, which are recharged by household electricity or charging station. EVs reducing greenhouse gas emissions. The most used electric cars can operate sufficiently to cover the average commute, they are ideal for around city use. The number of public charging stations is increasing every year, but most often battery charging is done at home.

Electric vehicles have other advantages over those powered by combustion engines:

- No fuel required so you save money on gas
- Environmental friendly as they do not emit pollutants
- Lower maintenance due to an efficient electric motor

An information management system (IMS) refers to any framework of software that facilitates the collection, storage, organization, and distribution of information. There are many management information systems, including:

- Process control.
- Management reporting system.
- Inventory control.
- Sales and marketing systems.
- Human resource systems.
- Accounting and finance systems.
- Decision support systems.

We have developed the desktop-based application that can provide the EV information and manipulation of these information. Admin and user will be available to access the system. Admin have full access right that are inserting data to the system, modifying and viewing all the records in the system. User will have limitation of access to the system that are search and view processing.



Objectives

The purpose of EV Info Management System is

- To build a desktop application to reduce manual work
- To allow users to easily store, retrieve and manipulate vehicle data
- To support users to view vehicle information together with vehicle image
- To increase productivity on daily processing



Chapter (2)

System Design

Flow Chart

A flowchart is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields

System Flow Chart of EV Information Management System

The admin is required to upload the EV car information using csv file. After that the user is available to view the list of the car's information with their specification, able to update and delete the records, these modify record will be saved to the file.

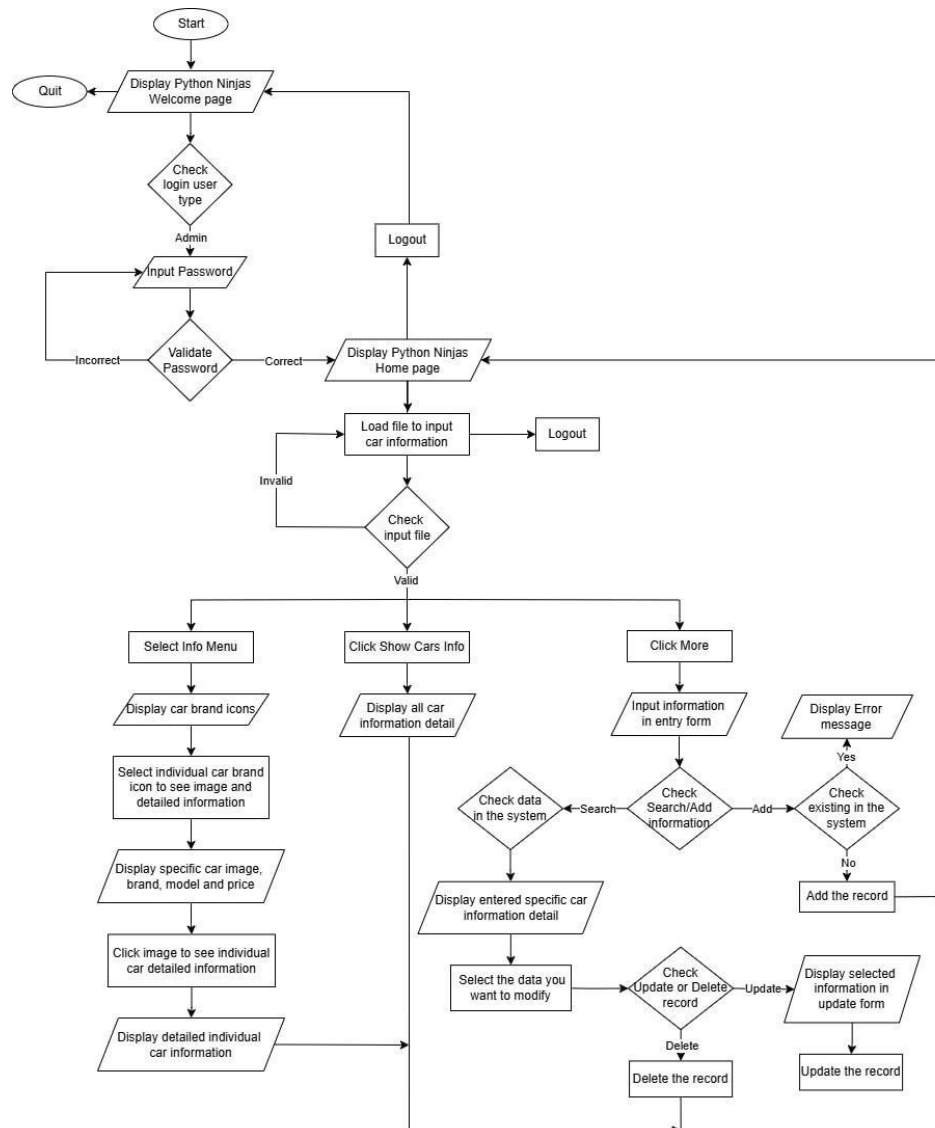


Figure: Admin Flowchart

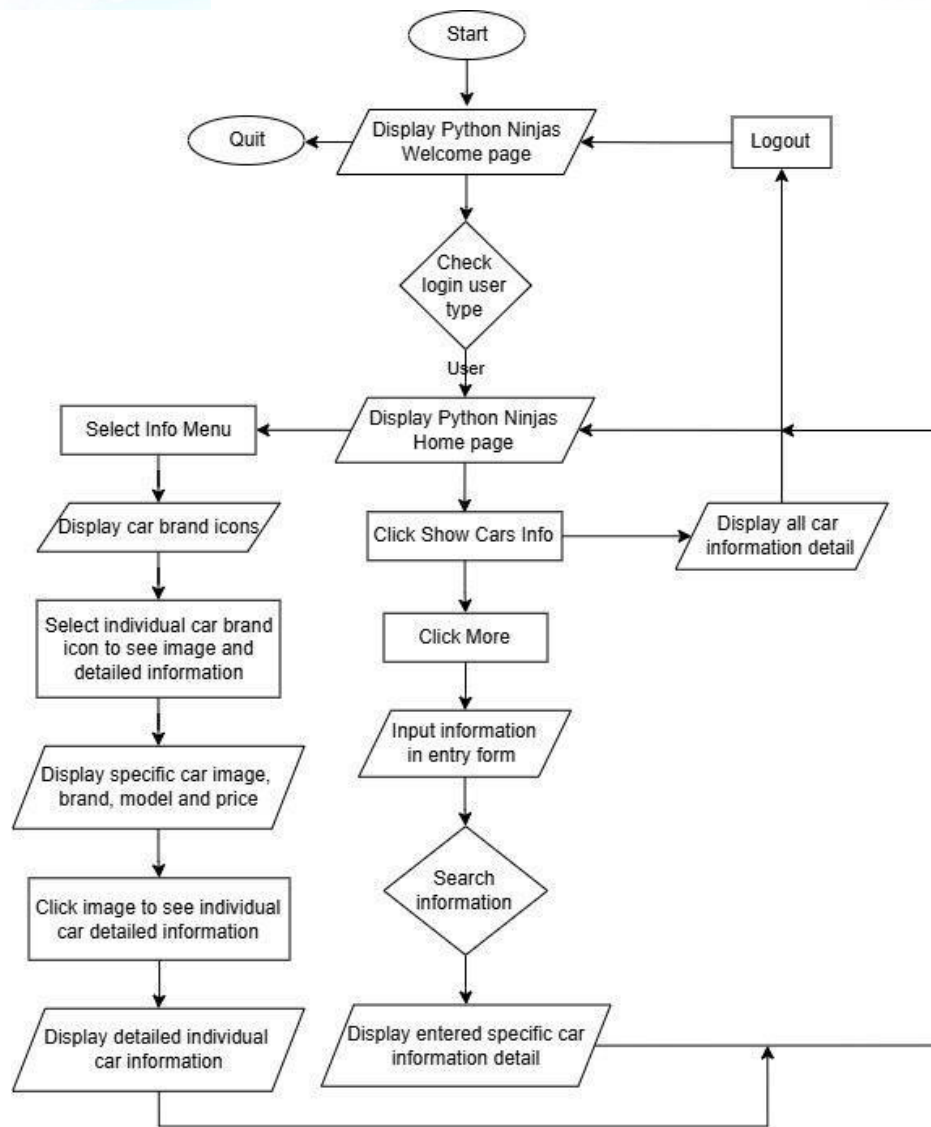


Figure: User Flowchart



Algorithm

1. Start

2. Welcome page requesting login info

2.1 Home menu (data is already loaded for user)

2.1.1 Main page showing 3 buttons

2.1.1.1 Click Show cars info

2.1.1.1.1 Display all information of car data

2.1.1.1.2 Clicking back will return to home page

2.1.1.2 Clicking More

2.1.1.2.1 Display Entry frame with two buttons

2.1.1.2.2 Fill desired entry and click search

2.1.1.2.3 Show searched output in treeview

2.1.1.2.4 Clicking back will return to main page

2.1.1.3 Click Log out will log out and back to welcome page

2.2 Info menu

2.2.1 Display brands logo of data

2.2.1.1 Click brand logo

2.2.1.1.1 Show all models of that brand

2.2.1.1.1.1 Click model image

2.2.1.1.1.2 Show information of that model

2.2.2 Clicking back will return to brands logo

2.2.3 Clicking back will return to main page

2.3 Home menu Admin (verify using log in password)

2.3.1 Main page showing 4 buttons

2.3.1.1 Load file has to be clicked first

2.3.1.1.1 Search and open csv file

2.3.1.2 Click Show cars info

2.3.1.2.1 Display all information of loaded datas

2.3.1.2.2 Clicking back will return to home pages



2..3.1.3 Clicking More

2.3.1.3.1 Display Entry frame with four buttons

2.3.1.3.1.1. Fill desired entry and click search

2.3.1.3.1.2 Show searched output in treeview

2.3.1.3.1.3 Fill entry and click add

2.3.1.3.1.4 If first 2 frames wasn't filled or second entry has same name with one data Display error info

2.3.1.3.1.5 If it satisfies desired conditions

2.3.1.3.1.6 Add data with default image(owned image

link can be provided in entry)

2.3.1.3.1.7 select desired one row from searched treeview and click update

2.3.1.3.1.8 Show editable entry boxes filled with selected row data and image entry

2.3.1.3.1.9 click save

2.3.1.3.1.10 check changes If it has changes, display changes info with two buttons

2.3.1.3.1.11 Clicking confirm will show message box and save data

2.3.1.3.1.12 Clicking back will back to cancel display changes info

2.3.1.3.1.13 Show message box, save data and back to more page

2.3.1.3.1.14 Select one or more data from searched treeview and click delete

2.3.1.3.1.15 Display (ok, cancel)message box

2.3.1.3.1.16 Click cancel will cancel the process to delete and back to more page

2.3.1.3.1.17 Clicking ok will delete selected row(s), save data and back to more page .5. Clicking back will return to main page

2.3.1.4 Click Log out will log out and back to welcome page

2.3.1 Click Info submenu

2.3.1.1 Display brands logo of data



2.3.1.1.1 Click brand logo

2.3.1.1.1.1 Show all models of that brand

2.3.1.1.1.2 Click model image

2.3.1.1.1.3 Show information of that model

2.3.1.1.1.4 Clicking back will return to brands logo

2.3.1.1.2 Clicking back will return to main page

Technologies Used

Tkinter: Python's built-in library for creating graphical user interfaces (GUIs), to design the application window and handle user interactions.

CSV: You can use CSV files to store and manage data (e.g., vehicle details) in a structured format.

OS: It provides functions for creating and removing a directory (folder), fetching its contents, changing and identifying the current directory, etc.

Pandas: Pandas (styled as pandas) is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series.
It can do following:

- Import datasets comma-separated values (CSV) files

PIL (Pillow): PIL (Python Imaging Library) or its fork, Pillow, allows you to work with images, including resizing, cropping, and converting formats.

Ttk :The ttk module provides themed widgets for a more polished GUI appearance.

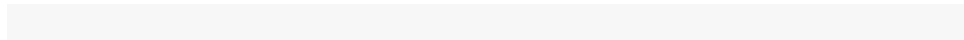
Code Explanation

Features

- **Tkinter GUI:** Create an intuitive user interface using Tkinter.
- **Data Management:**
 - Store vehicle information (brand, model, price, etc.).
 - Sorting data alphabetically.



- **User Interaction:**
 - Add new vehicle records.
 - Update existing records.
 - Search for specific vehicles.
 - Delete records.
- **File Handling:**
 - **Using csv module**
 - Load data from CSV files
 - Save data to CSV files.
 - **Using pandas module**
 - Search data using user provided info
- **Image Display:**
 - Show vehicle images using PIL (Pillow).
- **Event Binding:**
 - Bind events (e.g., button clicks) to specific actions.
- **Data Handling:**
 - In this project we target to use csv file contains less column numbers and it is easy to create, manage and work on. We refer our csv data from this [evcars](#) data set[1], and subset and store it in csv file. In code, we read and write csv files using csv module. We used Pandas module to handle search information that is nearly equal to user provided data.



Chapter (3)

System Implementation

Welcome Form

When starting EV info management system, the welcome page will be show and user need to login to use the system. There will be two user types, admin and user.

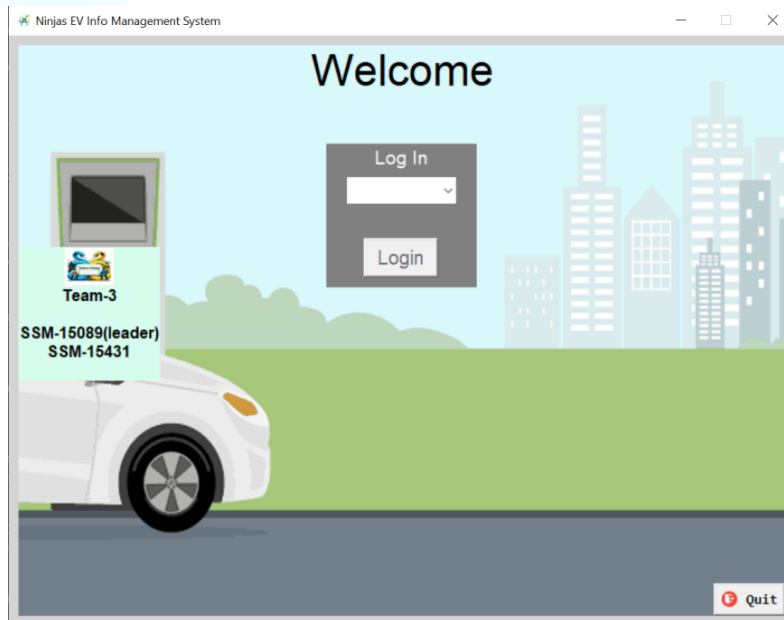


Figure: Welcome Form

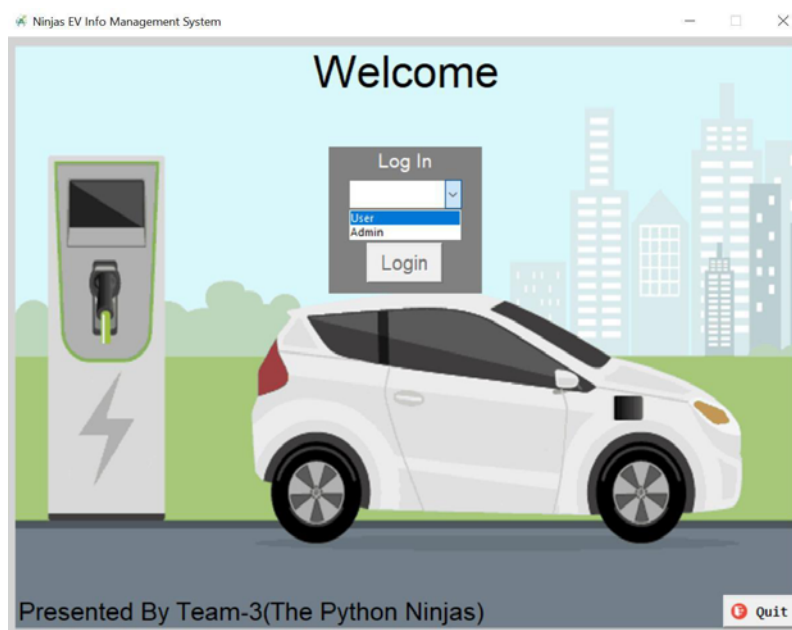


Figure : Login User Type

Password is required to be login as an admin user type.

A screenshot of the "Ninjas EV Info Management System" window. The main area displays a "Welcome" message at the top. Below it is a login form with a "Log In" title, a dropdown menu set to "Admin", a "Password" input field, and a "Login" button. The background of the form area shows an illustration of a white car at a charging station with a green lightning bolt. At the bottom, it says "Presented By Team-3(The Python Ninjas)" and has a "Quit" button with a red icon.

Figure: Admin Login Form

After admin login successfully, home form will be displayed.

A screenshot of the "Ninjas EV Info Management System" window after a successful login. The title bar shows "mode- Admin Home Info". The main area has a grey background with the text "Please load file first!". There are four buttons: "Load file" with a folder icon, "Show Cars Info" with a car icon, "More" with a circular arrow icon, and "Log Out" with a red exit icon. A small car icon is also visible on the left side of the main area.

Figure : Home Form



Admin need to upload the car information csv file to input the data into the system. Click 'Load file' button from home form and select the evcars_subset.csv file.

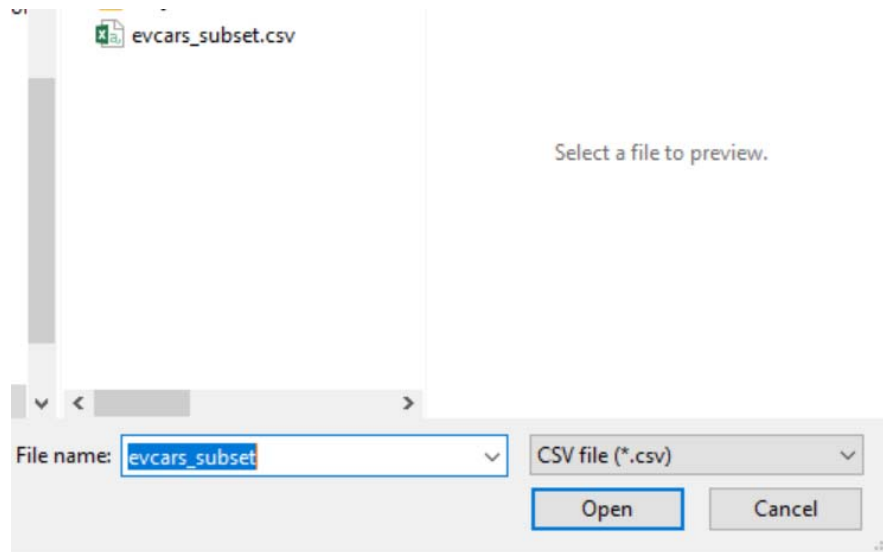


Figure: Upload csv file

After the file is uploaded, 'evcars_subset.csv is loaded' message will be shown.

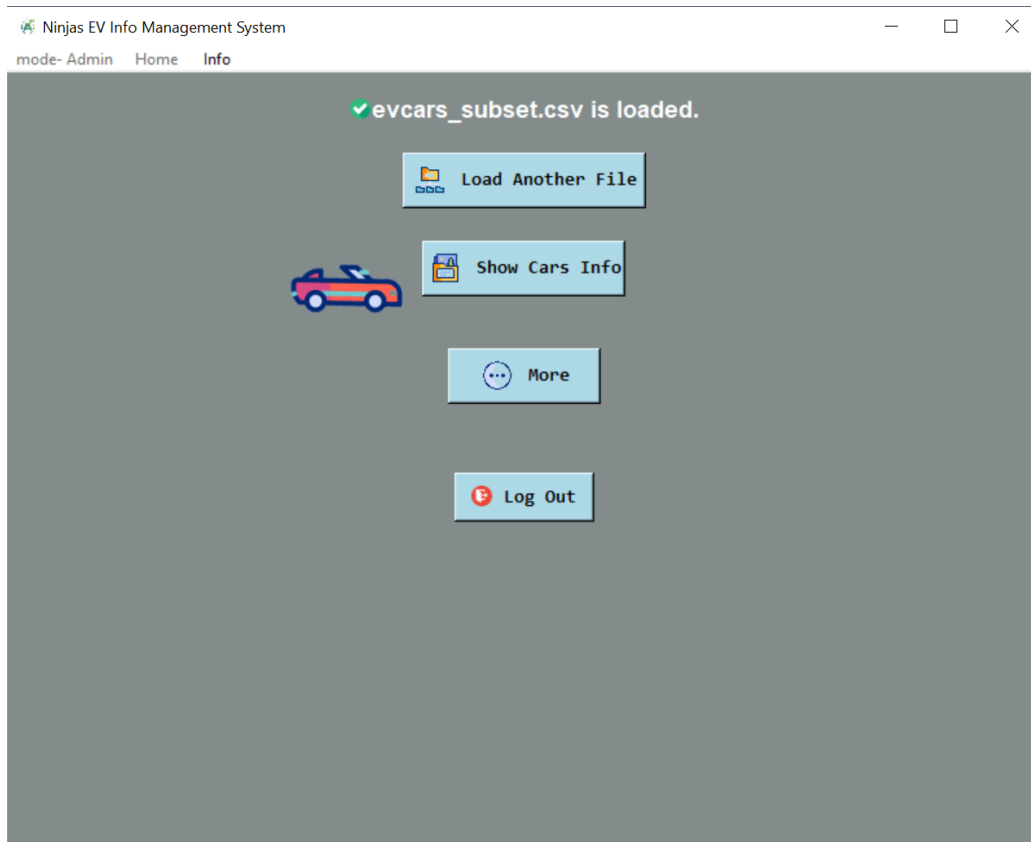


Figure: Uploaded CSV file



Admin click 'Show Cars Info' button from home page then all the information that are uploaded from the csv files will be displayed.

Ninjas EV Info Management System

mode- Admin Home Info

[Back](#)

There are 120 EVcars with 9 different types.

Brand	Model	Battery	Acceleration	Top_Speed	Range(km)	Efficiency(wh/km)	Fast
AUDI	Q4 Sportback e-t	77.0	6.7	180	435	177	650
AUDI	Q4 Sportback e-t	77.0	6.6	180	415	186	620
AUDI	Q4 Sportback e-t	77.0	5.4	180	415	186	620
AUDI	Q4 e-tron 45	77.0	6.7	180	420	183	630
AUDI	Q4 e-tron 45 quat	77.0	6.6	180	395	195	590
AUDI	Q4 e-tron 55 quat	77.0	5.4	180	395	195	590
AUDI	Q6 e-tron quattr	94.9	5.9	210	460	206	920
AUDI	Q8 e-tron 50 quat	89.0	6.0	200	425	209	660
AUDI	Q8 e-tron 55 quat	106.0	5.6	200	505	210	640
AUDI	Q8 e-tron Sportb	89.0	6.0	200	445	200	690
AUDI	Q8 e-tron Sportb	106.0	5.6	200	525	202	660
AUDI	SQ6 e-tron	94.9	4.3	230	445	213	890
AUDI	SQ8 e-tron	106.0	4.5	210	455	233	570
AUDI	SQ8 e-tron Sport	106.0	4.5	210	480	221	610
BMW	i4 M50	80.7	3.9	225	450	179	700
BMW	i4 eDrive35	67.0	6.0	190	430	156	580
BMW	i4 eDrive40	80.7	5.7	190	515	157	800

Figure: Show car list form

Admin user click 'More' button in home form, the following form will be displayed to search, add, update and delete functions are available to process.

Ninjas EV Info Management System

mode- Admin Home Info

Brand : Fastcharge :

Model : Drive_Configuration :

Battery : Tow_Hitch :

Acceleration(0-100km/h) Time : Towing_capacity_in_kg :

Top_Speed : Number_of_seats :

Range(km) : Estimated_US_Value :

Efficiency(wh/km) :

[Back](#) [Search](#) [Add](#) [Update](#) [Delete](#)

Figure: More function form



Admin provide data and click 'Search' button, the related information will be displayed.

mode: Admin Home Info

Brand : Fastcharge :

Model : Drive_Configuration :

Battery : Tow_Hitch :

Acceleration(0-100km/h) : Towing_capacity_in_kg :

Time :

Top_Speed : Number_of_seats :

Range(km) : Estimated_US_Value :

Efficiency(wh/km) :

19 results were found!

Brand	Model	Battery	Accel	Top_Spe	Range	Effici	Fastch	Drive	Tow_Hi	Towing	Number	Estimat
BMW	i4 eDrive	80.7	5.7	190	515	157	800	Rear Whe	Towbar	1600	5	72130
BMW	ix xDrive	71.0	6.1	200	360	197	480	All Whee	Towbar	2500	5	87101
BMW	ix3	74.0	6.8	180	385	192	520	Rear Whe	Towbar	750	5	79949
BMW	ix1 xDrive	64.7	5.6	180	380	170	510	All Whee	Towbar	1200	5	59141
BMW	i4 M50	80.7	3.9	225	450	179	700	All Whee	Towbar	1600	5	88571
BMW	i7 xDrive	101.7	4.7	240	510	199	760	All Whee	Towbar	2000	5	142006
BMW	i4 eDrive	67.0	6.0	190	430	156	580	Rear Whe	Towbar	1600	5	62293
BMW	ix xDrive	105.2	4.6	200	505	208	680	All Whee	Towbar	2500	5	128032

Figure: Search Form

Admin input the data to add to the system and click 'Add' button, then the record will be inserted to the system.

mode: Admin Home Info

Brand : Fastcharge :

Model : Drive_Configuration :

Battery : Tow_Hitch :

Acceleration(0-100km/h) : Towing_capacity_in_kg :

Time :

Top_Speed : Number_of_seats :

Range(km) : Estimated_US_Value :

Efficiency(wh/km) :

Your data is added!

Brand	Model	Ba	Accel	Top_Spe	Range	Effici	Fastch	Drive	Tow_Hi	Towing	Number	Estimat
BMW	iX M60 xDrive	-	-	-	-	-	-	-	-	-	-	0

Figure: Add Form



Admin search data, select record and click 'Update', then update form will be displayed. The user input information will be saved after confirming changes when click 'Save' button.

Ninjas EV Info Management System

mode- Admin Home Info

Brand :	BMW	Fastcharge :	-
Model :	iX M60 xDrive	Drive_Configuration :	-
Battery :	-	Tow_Hitch :	-
Acceleration(0-100km/h) Time :	-	Towing_capacity_in_kg :	-
Top_Speed :	-	Number_of_seats :	5
Range(km) :	-	Estimated_US_Value :	20000
Efficiency(kwh/km) :	-	Upload Image	bmw/iX M60 xDrive.png

Back Save

Cancel Confirm

You are going to do following changes..

Number_of_seats --> - with 5
Estimated_US_Value --> 0 with 20000
iX M60 xDrive.png with iX M60 xDrive.png

Figure: Update form




Ninjas EV Info Management System
mode- Admin Home Info

Brand : BMW
Model : iX M60 xDrive
Battery :
Acceleration(0-100km/h) Time :
Top_Speed :
Range(km) :
Efficiency(wh/km) :

Fastcharge :
Drive_Configuration :
Tow_Hitch :
Towing_capacity_in_kg :
Number_of_seats :
Estimated_US_Value :

Back
Search
Add
Update
Delete

1 results were found!

Brand	Model	Battery	Acceler	Top_Spe	Range(k	Efficie	Fastcha	Drive_C	Tow_Hi	Towing	Number	Estimat
BMW	iX M60 xI	0.0	0.0	0	0	0	0	no value	no value	0	5	20000

Figure: The updated record

Admin can delete the existing record from the system by selecting record from the list then clicking 'Delete' button from More function form.

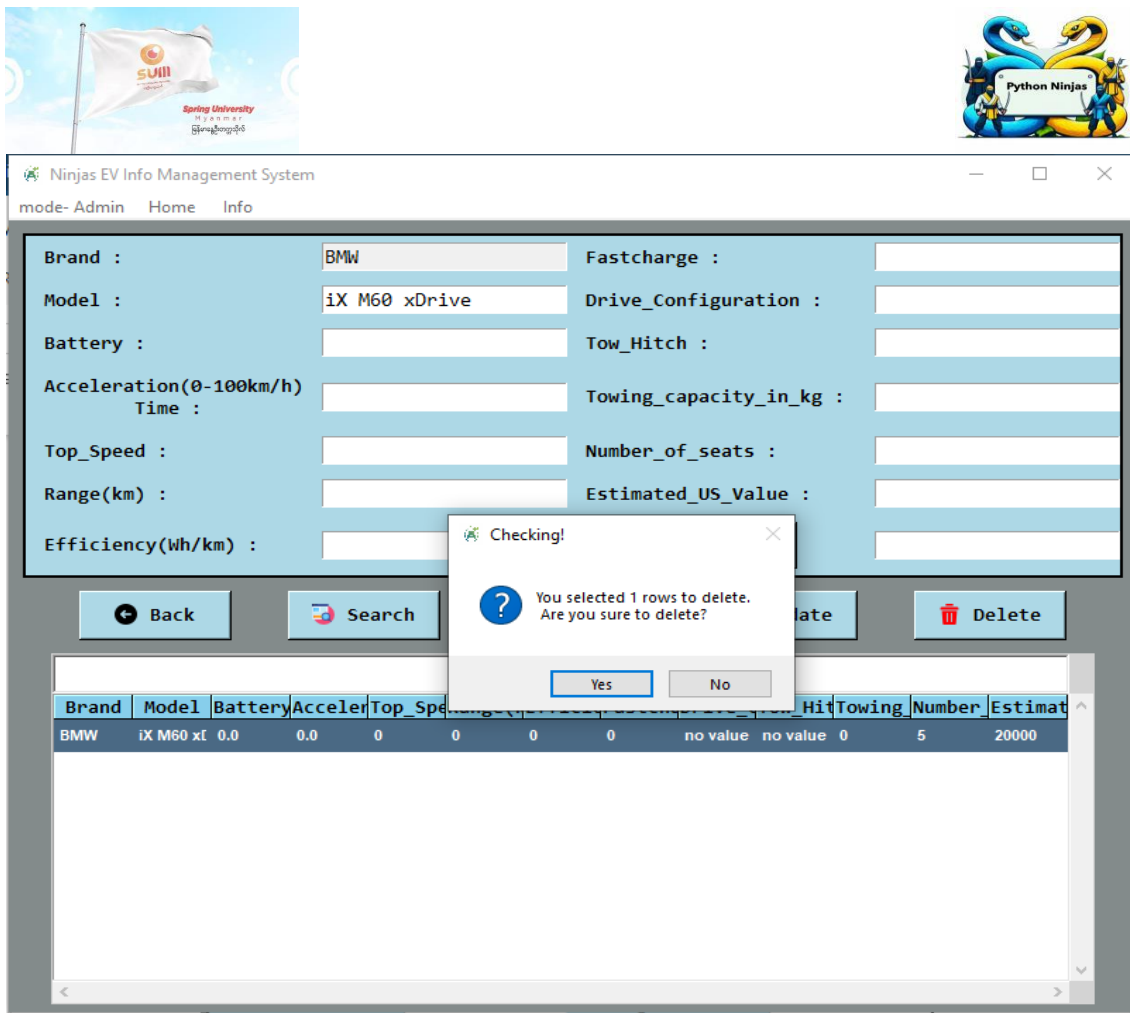


Figure: Delete form



Ninjas EV Info Management System

mode- Admin Home Info

Brand :	BMW	Fastcharge :	
Model :	iX M60 xDrive	Drive_Configuration :	
Battery :		Tow_Hitch :	
Acceleration(0-100km/h) Time :		Towing_capacity_in_kg :	
Top_Speed :		Number_of_seats :	
Range(km) :		Estimated_US_Value :	
Efficiency(wh/km) :		Upload Image	

Back Search Add Update Delete

0 results were found!

Brand	Model	Battery	Acceler	Top_Spe	Range(km)	Efficie	Fastcha	Drive_C	Tow_Hi	Towing	Number	Estimat
-------	-------	---------	---------	---------	-----------	---------	---------	---------	--------	--------	--------	---------

Figure: Deleted Record

Click 'Info' menu and car brand icons will be displayed and click the icon to see the car lists of each brand.

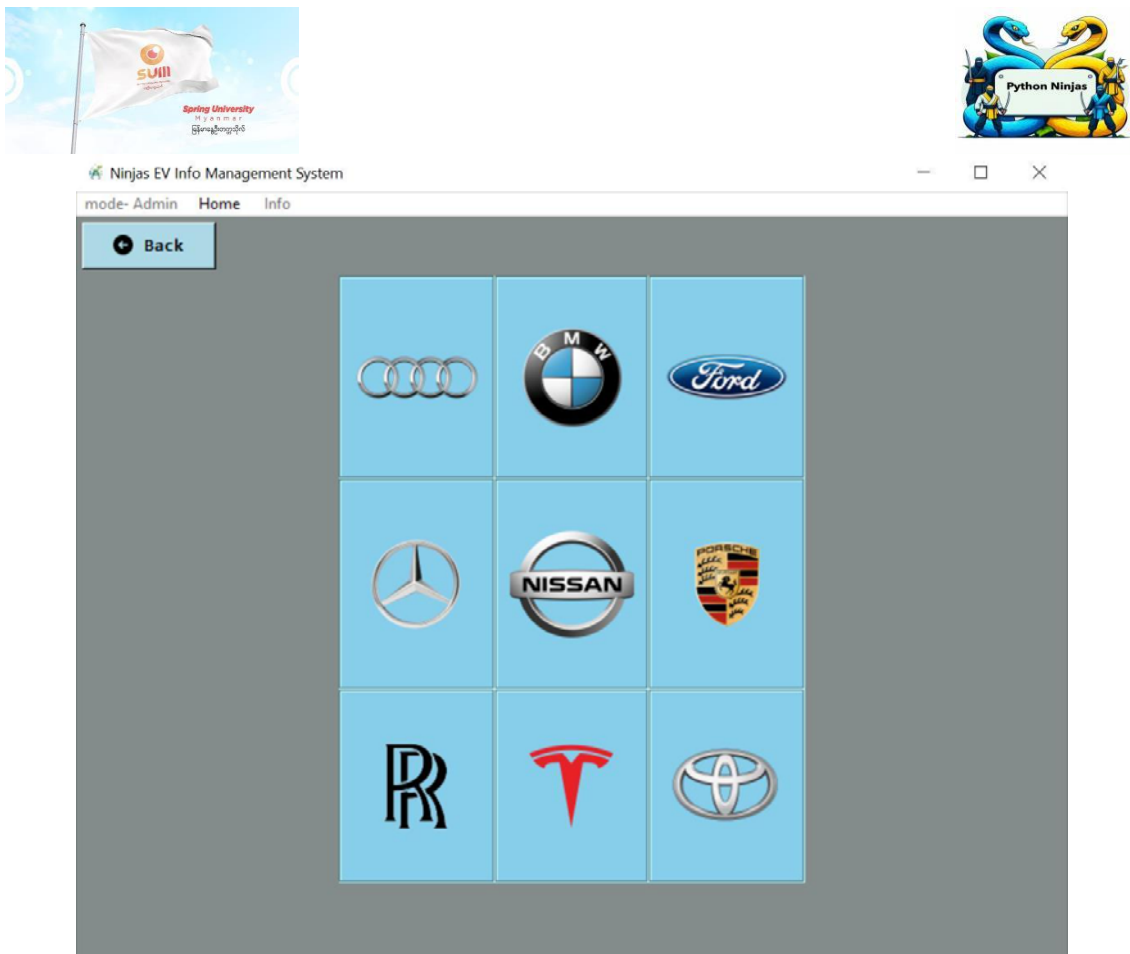


Figure: Show Car brand

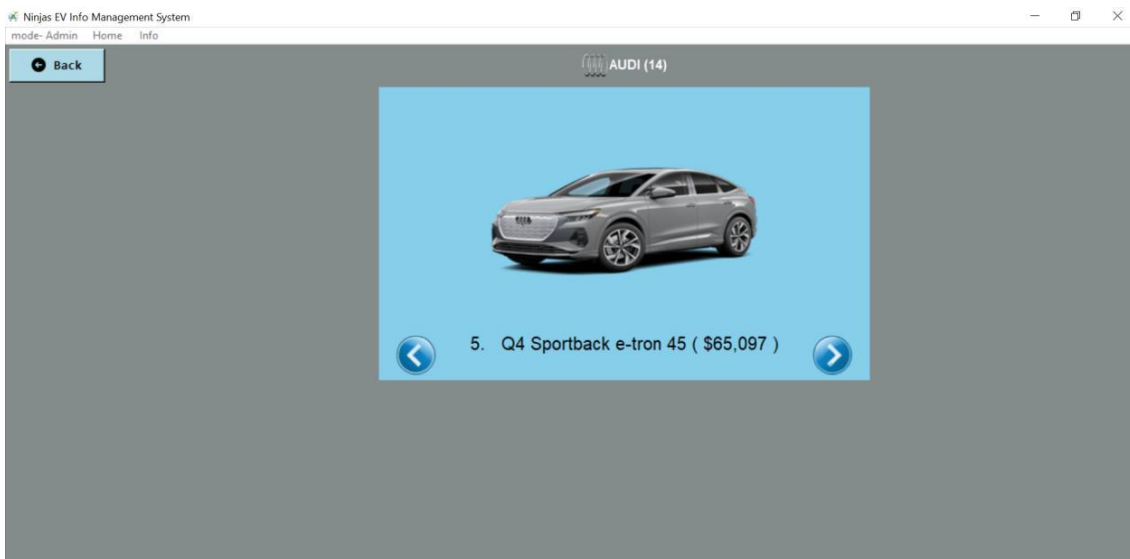


Figure: Show selected car brand

When click the individual car image, the detail specifications will be displayed.

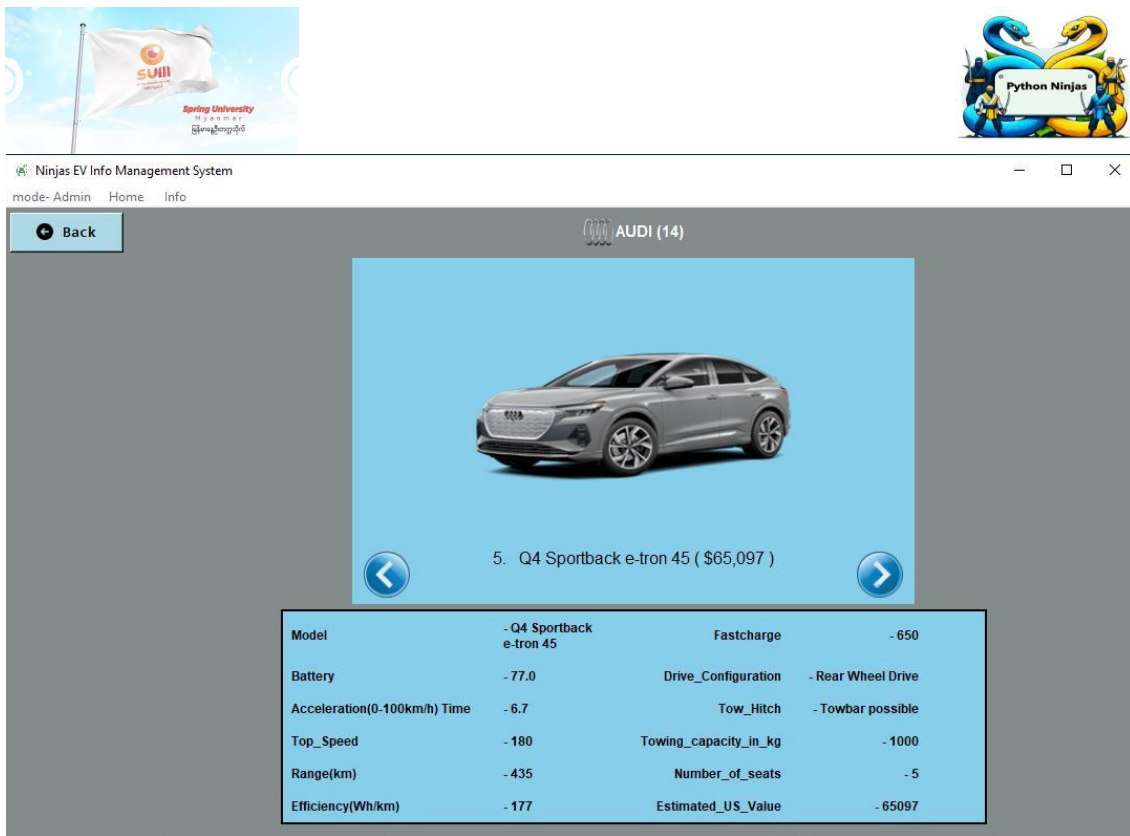
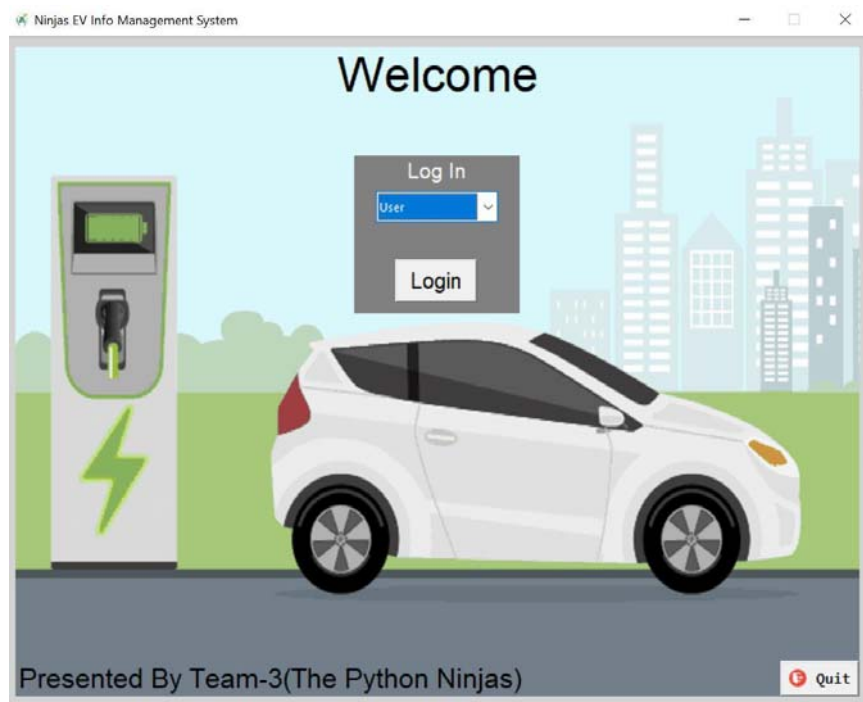


Figure: Show selected car brand detail

The normal user is not required to provide password to login and select 'User' and click 'Login' button from welcome form.





User Home form will have Show Cars Info, More and log out functions. Show cars Info and Log out will be same as Admin function.

Figure : User Home Form

When click 'More' function, user able to see Search function. Input data to search and click 'Search' button, then will display the information if it is existed in the system, otherwise will show the error message.

Figure: Search Form



Ninjas EV Info Management System

mode- User Home Info

Brand : Fastcharge :

Model : Drive_Configuration :

Battery : Tow_Hitch :

Acceleration(0-100km/h) : Towing_capacity_in_kg :

Time :

Top_Speed : Number_of_seats :

Range(km) : Estimated_US_Value :

Efficiency(Wh/km) :

20 results were found!

Brand	Model	Battery	Acceler	Top_Spe	Range(km)	Efficie	Fastch	Drive_C	Tow_Hi	Towing	Number	Estimat
BMW	i4 eDrive	80.7	5.7	190	515	157	800	Rear Wh	Towbar	1600	5	72130
BMW	iX xDrive	71.0	6.1	200	360	197	480	All Whee	Towbar	2500	5	87101
BMW	iX3	74.0	6.8	180	385	192	520	Rear Wh	Towbar	750	5	79949
BMW	iX1 xDrive	64.7	5.6	180	380	170	510	All Whee	Towbar	1200	5	59141
BMW	i4 M50	80.7	3.9	225	450	179	700	All Whee	Towbar	1600	5	88571
BMW	i7 xDrive	101.7	4.7	240	510	199	760	All Whee	Towbar	2000	5	142006
BMW	i4 eDrive	67.0	6.8	190	430	156	580	Rear Wh	Towbar	1600	5	62293
BMW	iX xDrive	105.2	4.6	200	505	208	680	All Whee	Towbar	2500	5	128032

Figure : Display search result

Ninjas EV Info Management System

mode- User Home Info

Brand : Fastcharge :

Model : Drive_Configuration :

Battery : Tow_Hitch :

Acceleration(0-100km/h) : Towing_capacity_in_kg :

Time :

Top_Speed : Number_of_seats :

Range(km) : Estimated_US_Value :

Efficiency(Wh/km) :

0 results were found!

Brand	Model	Battery	Acceler	Top_Spe	Range(km)	Efficie	Fastch	Drive_C	Tow_Hi	Towing	Number	Estimat
-------	-------	---------	---------	---------	-----------	---------	--------	---------	--------	--------	--------	---------

Figure : Display No data result



Info menu is same function as Admin, able to see car brand icon and click respective icon to see each brand car list and detail specification.

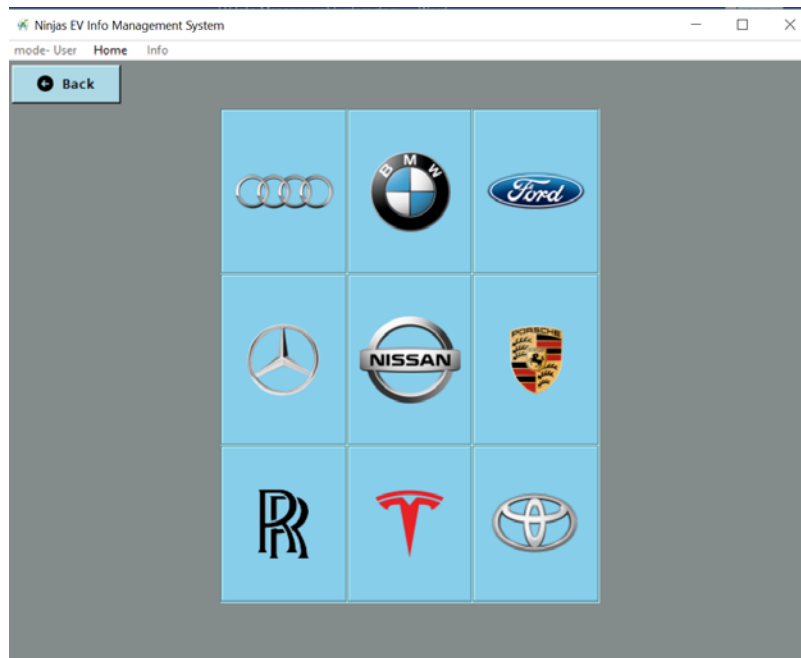


Figure : Info menu

To logout from the system, admin or user click 'Log Out' from home page. Then the welcome form will be displayed to leave from the system. Click 'Quit' button to stop using the system.

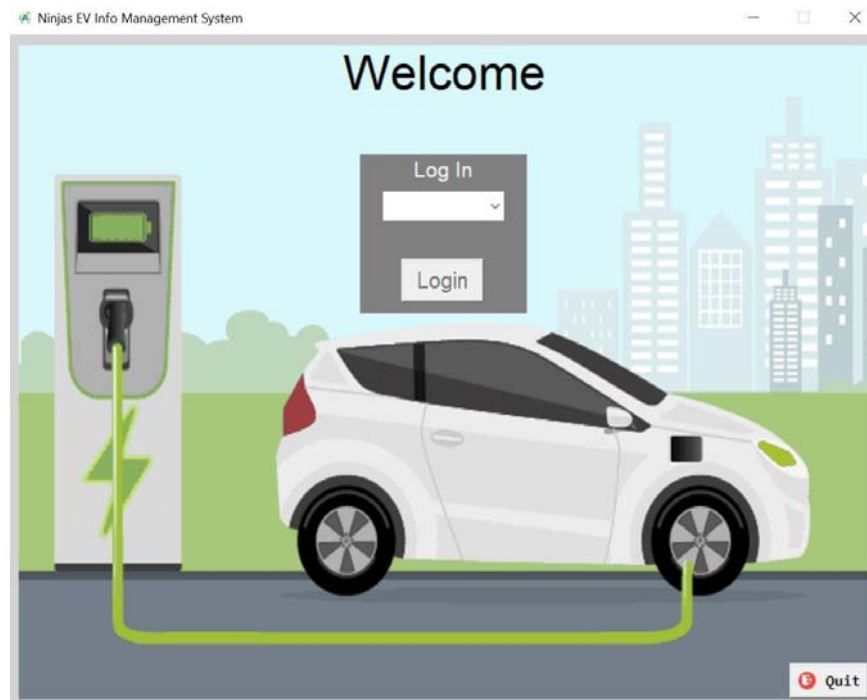


Figure : Quit form



Chapter (4)

Conclusion

EV Info Management System is easy to use for end user. The admin user who is required to login by providing valid password has full access, and normal user has limited to use few features in the system. Admin user is able to input vehicle information by loading csv file, add the new record for the car information, able to manipulate the existing record, remove from the system, search and view all the information that are existing in the system. In the meanwhile, normal user is not allowed to modify the records, but have accessible to search and view the vehicle information in the system. By using the EV Info Management system, the user can reduce manual work and increase productivity on daily processing.

Limitation and Future work of the system

In the existing system, the vehicle data is required to load from CSV file so it has limitation of the records like adding new columns, handling many columns. In the future, we are planning to use database in place to store and manage large amounts of data, to support a wide range of activities, including data storage, data analysis, and data management. When the system is implemented by using database, it will be more convenient and accessible for the system users. The Ninjas EV Cars Info Management System is well on its way to becoming a versatile and user-friendly application.

We are also planning to do following updates:

1. Compatibility:

- Ensure that our code can handle various CSV files, not just the one(eg.ev cars_subset.csv) specific to this project.
- Make it adaptable to different car datasets and other datasets for images, etc.
- Manage charging station data (locations, availability, charging rates).

2. Compatibility:

- Ensure that our code can handle various CSV files, not just the one(eg.ev cars_subset.csv) specific to this project.



- Make it adaptable to different car datasets and other datasets for images, etc.
- Manage charging station data (locations, availability, charging rates).

3. User-Friendly Features:

- Implement features like data reverting (undo changes) for admin
- filtering based on conditions
- tracking charging station locations, showroom service centers
- managing maintenance schedules (service dates, reminders)
- downloading images
- add cars to their favorites
- Enhance the GUI by adding tooltips, progress bars

4. Image Display:

- Fine-tune the image display using PIL (Pillow). Optimize resizing, cropping, and handling transparent backgrounds just in application

5. Event Handling:

- Bind events effectively (using keyboard shortcuts or context menus) for better usability
- redirecting car brand main website by mouse actions

Reference



[1] <https://www.kaggle.com/datasets/vanillatyy1/electric-vehicle-dataset>

<https://electriccarstrade.com/index/evinfo>

<https://en.wikipedia.org/wiki/Flowchart>