

# **VANIER COLLEGE**

## **Faculty of Science and Technology**

### **APPLICATION DEVELOPMENT 1**

**420-942-VA sect. 01222**

#### **Deliverable 3**

#### **Final Project Report**

#### **Car Rental Management System**

**2023/11/10**

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We certify that this assignment is our own work.

I, Shaojun Jiang, student ID# 2395049, certify that I have contributed to this deliverable,  
S.J.

I, Li Fan, student ID# 2395027, certify that I have contributed to this deliverable,  
L.F.

# Project Title

Car Rental Management System

## Project Scope

The Car Rental Management System is a versatile desktop application designed to assist car rental service companies in efficiently managing customers, services, and business operations across various service locations nationwide. It functions as a centralized repository for organizing and tracking critical business data.

The application caters to two distinct user groups:

1. Car Rental Company Management Team:

This user group comprises the management team of car rental companies. They use the application for administrative purposes, overseeing and managing various aspects of the car rental business. This may include monitoring inventory, managing bookings, and accessing analytical reports.

2. Customers:

Customers are individuals seeking to rent cars through the online platform. They interact with the application to browse available vehicles, make reservations, and complete transactions. Their primary focus is on the user-friendly interface and seamless rental process offered by the application.

The project can benefit from collaboration with the following third-party companies:

1. Payment Processors:

Payment processors can enhance the project by delivering secure payment processing services. This is particularly valuable for online transactions within the car rental management system.

2. Cloud Providers:

Cloud providers are essential partners, providing crucial cloud infrastructure and services. They contribute to hosting and deploying the project, ensuring

scalability and reliability. Hosting the database server on the cloud is a specific requirement for our project.

Target clients for the project are major car rental companies, including but not limited to:

1. Hertz:

*Description:* Hertz is a renowned global car rental company with a broad customer base. Integrating the project into Hertz's operations can enhance their online reservation system, providing customers with a seamless booking experience.

2. Avis:

*Description:* Avis is a leading car rental brand with a focus on customer satisfaction. Implementing the project within Avis can contribute to the efficiency of their rental processes and elevate the overall customer experience.

3. National Car Rental:

*Description:* National Car Rental is known for its extensive fleet and quality service. Our project can benefit National Car Rental by streamlining reservation management and providing valuable insights through analytics.

4. Enterprise:

*Description:* Enterprise is a major player in the car rental industry. Integrating the project can help Enterprise automate and optimize various aspects of their business, leading to improved operational efficiency.

These companies are identified as potential clients due to their prominence in the car rental sector, and the project aims to offer them enhanced functionalities and efficiency in their operations.

## Project Functionalities

- **Functionalities demonstration**

## Home Page

MainWindow

### Car Rental System


☒ Customer ☐ Admin

User Name

Password

Login

Creat new account



## User Case One:

**A customer wants to register an account and reserve a car.**

### 1. User Registration

Signup

#### Login Infor

User Name  
Max

Password  
••••••••

#### Personal Infor

First Name  
Max

Last Name  
Mercier

Phone Number  
514-233-1988

Email  
max@gmail.com

Sign Up

Login

Signup

**Login Infor**

User Name  
Max

Password  
••••••••

**Personal Infor**

First Name  
Max

Last Name  
Mercier

Phone Number  
514-233-1988

Email  
max@gmail.com

Sign Up

Login

Register Successful

OK

## 2. User Login

User will provide credential to login. If incorrect credential provided, the system would display “Login failed” message.

MainWindow

**Car Rental System**

☒ Customer ☐ Admin

User Name  
Max

Password  
••••••••

Login

Creat new account

Login failed.

OK

## Car Rental System

☒ Customer
 ☐ Admin

User Name

Password

Login

Creat new account



### 3. Car search

On this page customer can search cars by fuel type, search cars by body type, search cars by combination of filters.

Max checks available cars from 20 November to 21 November.

Reservation
Logout
Price:

Start time: 2023-11-20 15
End time: 2023-11-21 15
Transmission: any
Fuel Type: any
Body type: any
Apply

carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
1	Dodge	Durango	P91	2009	manual	gasoline	sedan	4	5	0
2	Land Rover	Defender 90	t9	1994	manual	electric	suv	4	5	0
3	Lamborghini	Murciélago	Lxauto	2009	auto	gasoline	sedan	2	2	0
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
5	Mazda	CX-5	AWD	2017	auto	gasoline	suv	5	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
9	Toyota	Heightlander	H6	2022	auto	gasoline	suv	7	5	0
8	Toyota	Heightlander	H6	2021	auto	gasoline	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0
12	Mazda	CX-5	AWD	2022	auto	gasoline	suv	5	5	0
13	Audi	Q7	Q7	2022	auto	gasoline	suv	5	5	0

Reserve

Max searches cars have transmission type as auto.

CarSelection

Reservation

Logout

Price:

Start time:

2023-11-20

15

End time:

2023-11-21

15

Transmission

auto

Fuel Type

electric

Body type

any

Apply

carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0

Reserve

Max selects MINI Cooper and see the rental price.

CarSelection

Reservation

Logout

Price : \$ 217.81

Start time:

2023-11-20

15

End time:

2023-11-21

15

Transmission

auto

Fuel Type

electric

Body type

any

Apply

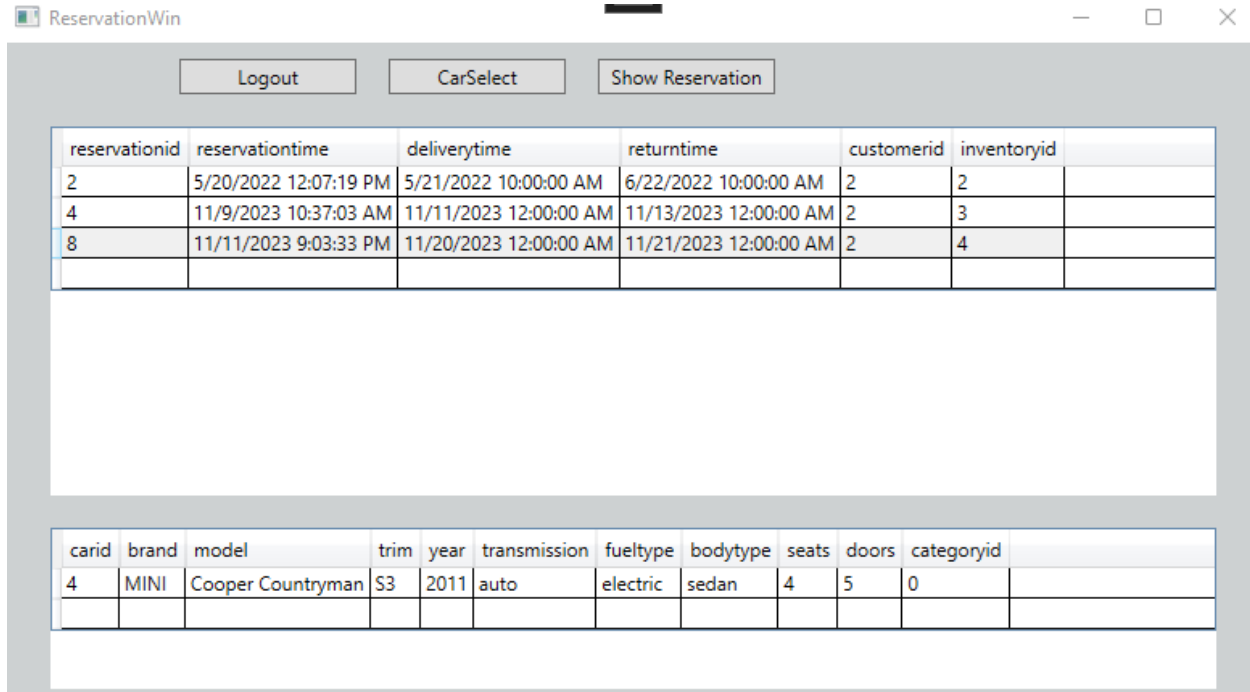
carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0

Reserve

#### 4. Car reservations

Max clicks the Reserve button to reserve MINI Cooper.

On reservation details page, Max sees all his reservation records.



The screenshot shows a web application window titled "ReservationWin". At the top, there are three buttons: "Logout", "CarSelect", and "Show Reservation". Below the buttons, there are two tables. The first table displays reservation records with columns: reservationid, reservationtime, deliverytime, returntime, customerid, and inventoryid. The second table displays car details with columns: carid, brand, model, trim, year, transmission, fueltype, bodytype, seats, doors, and categoryid.

reservationid	reservationtime	deliverytime	returntime	customerid	inventoryid
2	5/20/2022 12:07:19 PM	5/21/2022 10:00:00 AM	6/22/2022 10:00:00 AM	2	2
4	11/9/2023 10:37:03 AM	11/11/2023 12:00:00 AM	11/13/2023 12:00:00 AM	2	3
8	11/11/2023 9:03:33 PM	11/20/2023 12:00:00 AM	11/21/2023 12:00:00 AM	2	4

carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0

#### 5. User Logout

Max finished his reservation and click Logout button to log out his account.

### User Case Two:

**An authorized staff wants to login to admin account and manage the cars and inventory.**

#### 1. User Login



—    □    ×

☐ Customer ☒ Admin

User Name

Password

Login



Admin chooses Car section from the top left banner and clicks in Show button to check all the cars.

**Admin**

Car Inventory

car id  brand  model  trim  year  transmission  fuel type

body type  seats  doors

Add Show Modify Delete Logout

carid	brand	model	trim	year	transmission	fueltype	bodysize	seats	doors	categoryid
1	Dodge	Durango	P91	2009	manual	gasoline	sedan	4	5	0
2	Land Rover	Defender 90	t9	1994	manual	electric	suv	4	5	0
3	Lamborghini	Murciélago	Lxauto	2009	auto	gasoline	sedan	2	2	0
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
5	Mazda	CX-5	AWD	2017	auto	gasoline	suv	5	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
9	Toyota	Heightlander	H6	2022	auto	gasoline	suv	7	5	0
8	Toyota	Heightlander	H6	2021	auto	gasoline	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0
12	Mazda	CX-5	AWD	2022	auto	gasoline	suv	5	5	0
13	Audi	Q7	Q7	2022	auto	gasoline	suv	5	5	0

Admin modifies model information for the car with the car id as 13.

Admin

Car Inventory

car id  brand  model  trim  year  transmission  fuel type

body type  seats  doors

carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
1	Dodge	Durango	P91	2009	manual	gasoline	sedan	4	5	0
2	Land Rover	Defender 90	t9	1994	manual	electric	suv	4	5	0
3	Lamborghini	Murciélago	Lxauto	2009	auto	gasoline	sedan	2	2	0
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
5	Mazda	CX-5	AWD	2017	auto	gasoline	suv	5	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
9	Toyota	Heightlander	H6	2022	auto	gasoline	suv	7	5	0
8	Toyota	Heightlander	H6	2021	auto	gasoline	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0
12	Mazda	CX-5	AWD	2022	auto	gasoline	suv	5	5	0
13	Audi	Q7	Q7	2022	auto	gasoline	suv	5	5	0

Admin clicks on Modify button and the system display “Update Car Successfully”.

Admin

Car Inventory

car id  brand  model  trim  year  transmission  fuel type

body type  seats  doors

carid	brand	model	trim	year	transmission	fueltype	bodytype	seats	doors	categoryid
1	Dodge	Durango	P91	2009	manual	gasoline	sedan	4	5	0
2	Land Rover	Defender 90	t9	1994	manual	electric	suv	4	5	0
3	Lamborghini	Murciélago	Lxauto	2009	auto	gasoline	sedan	2	2	0
4	MINI	Cooper Countryman	S3	2011	auto	electric	sedan	4	5	0
5	Mazda	CX-5	AWD	2017	auto	gasoline	suv	5	5	0
7	Tesla	Y	d5	2022	auto	electric	suv	5	5	0
9	Toyota	Heightlander	H6	2022	auto	gasoline	suv	7	5	0
8	Toyota	Heightlander	H6	2021	auto	gasoline	suv	5	5	0
6	Tesla	Y	d5	2021	auto	electric	suv	5	5	0
12	Mazda	CX-5	AWD	2022	auto	gasoline	suv	5	5	0
13	Audi	Q7	Q7	2022	auto	gasoline	suv	5	5	0

Update Car successful

OK

### 3. Inventory Management

Admin clicks on Inventory button on top left banner to browser inventory page.

Admin

Car Inventory

Inventory ID  VIN  Color  Rent  Deposit  cost  Car ID

Find Add Update Show All Delete Logout

inventoryid	vin	color	rentprice	deposit	cost	carid
1	JN8AZ2KR1AT007853	Black	162.48	1.0	71718.19	1
2	WVCAV3AX1DW506090	Sliver	536.59	1.0	42731.88	2
3	WVGAV3AX1DW506020	Sliver	536.59	1.0	42731.88	3
4	1FTEW1CW4AF425095	Green	217.81	1.0	36951.5	4
6	MA8AZ2KR1AT007853	Brown	192.98	2.0	51718.19	5
7	TE8AZ2KR1AT007853	White	152.98	2.0	60018.19	7
8	TS8AZ2KR1AT007853	Black	152.98	2.0	60018.19	6
9	TOCAV3AX1DW506090	Black	436.19	3.0	62731.88	9
18	TOCAV8AX1DW506090	Silver	436.19	3.0	62731.88	8
44	MA8ZZ2KR1AT007853	Red	192.98	2.0	51718.19	12
45	AD8ZZ2KR1AT007853	Black	262.98	3.0	751718.19	13

Admin can search, add, update and delete cars from inventory. He/She can see more details information of cars from this page, like the cost, the VIN number which will not disclosed to customers.

- **Integration of REST API**

REST API was integrated in the entire project.

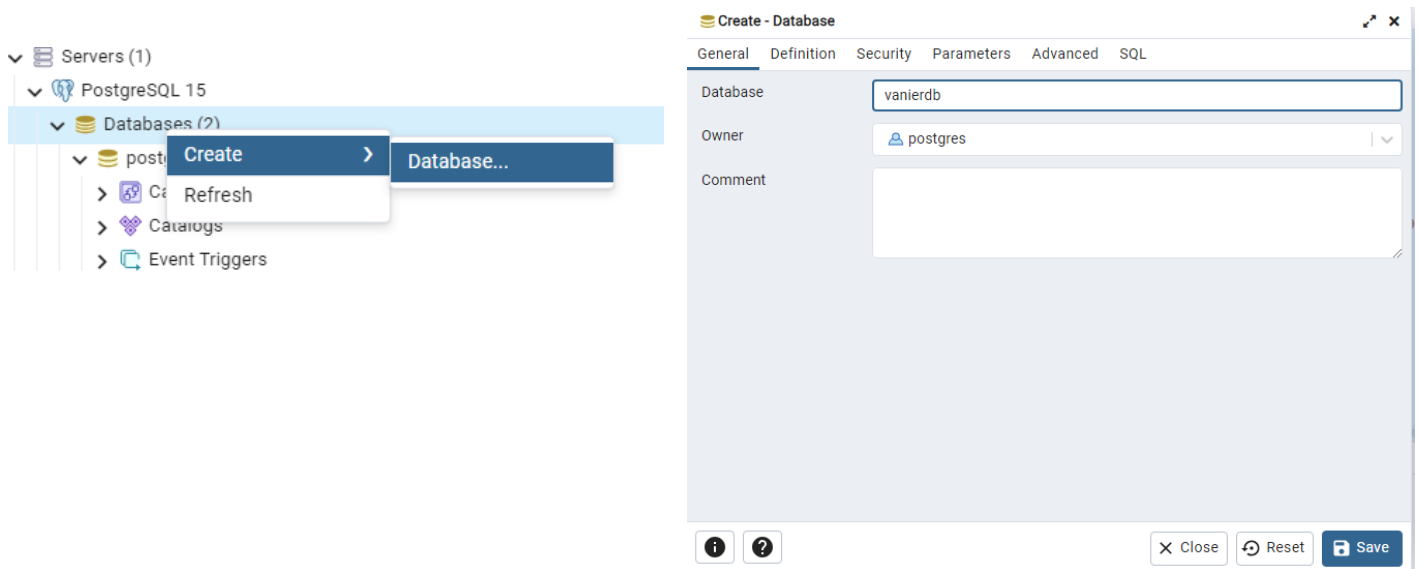
- **The content added after mid-term project evaluation.**

1. User Logout
2. Car Management (check car, add car, modify car, delete car)
3. Inventory Management (show product add product, update product, delete product)
4. Car reservation (check available cars, search cars by transmission type, search cars by fuel type, search cars by body type, search cars by combination of filters, reserve car, check car reservation records)

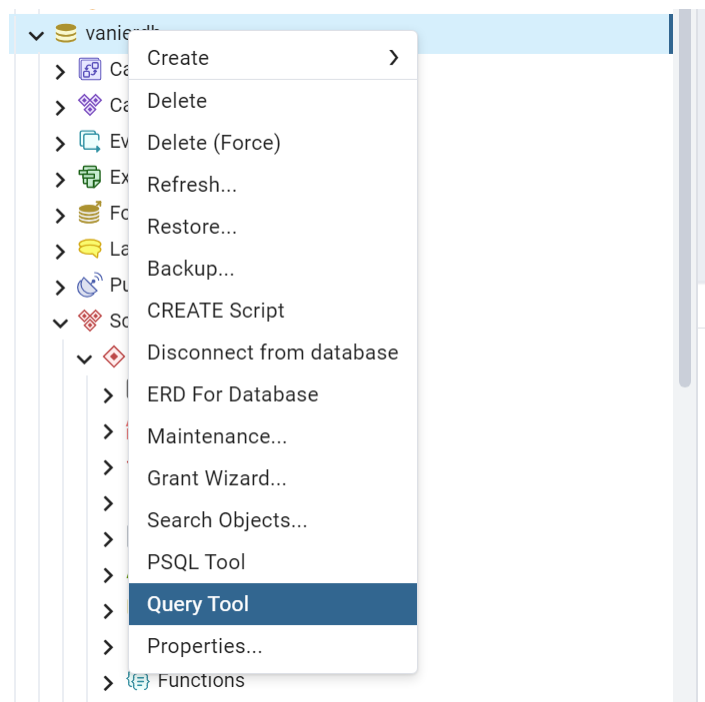
## Project Setup

- Database: PostgreSQL 15
  - Install: Download PostgreSQL version 15 from website: <https://www.postgresql.org/>, Then follow the instructions to install.

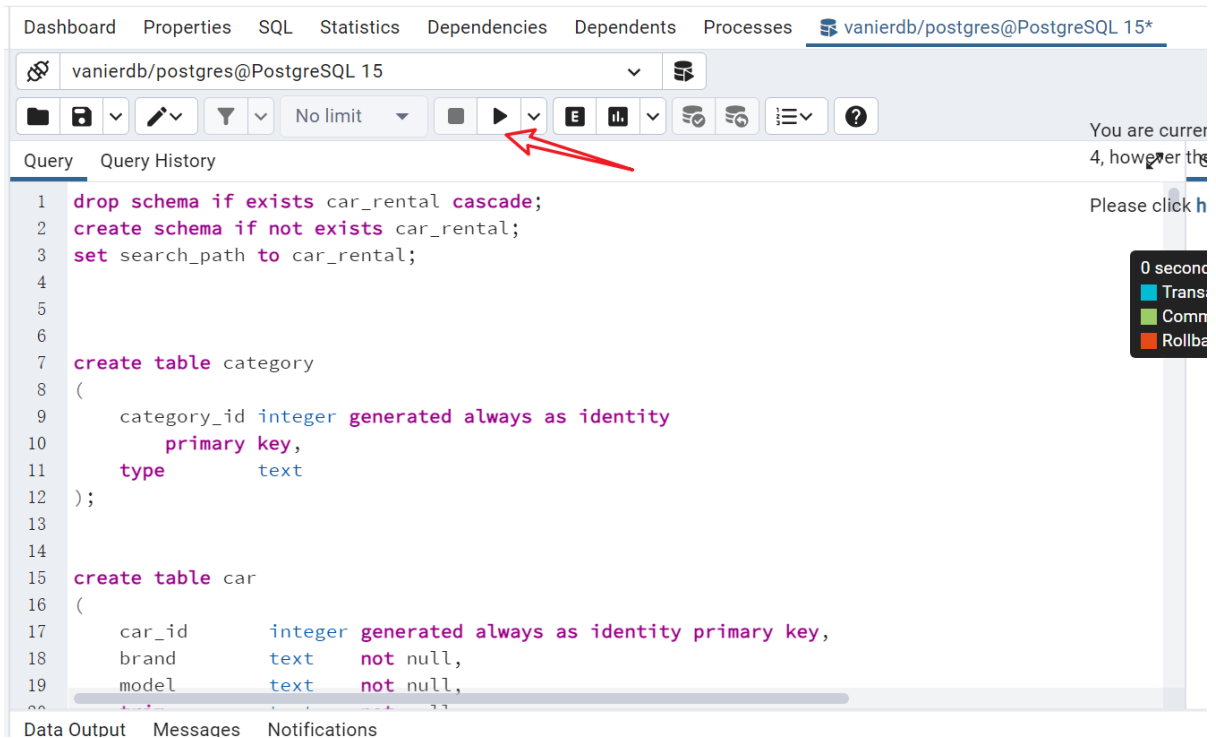
- Create Database: Open pgAdmin 4, then create a database named vanierdb as shown below.



- Create Schema and tables:  
Right click vanierdb, then select Query Tool to open a query window.



- Copy and paste all content from create\_2395027\_2395049.sql file to the Query window, then run it.

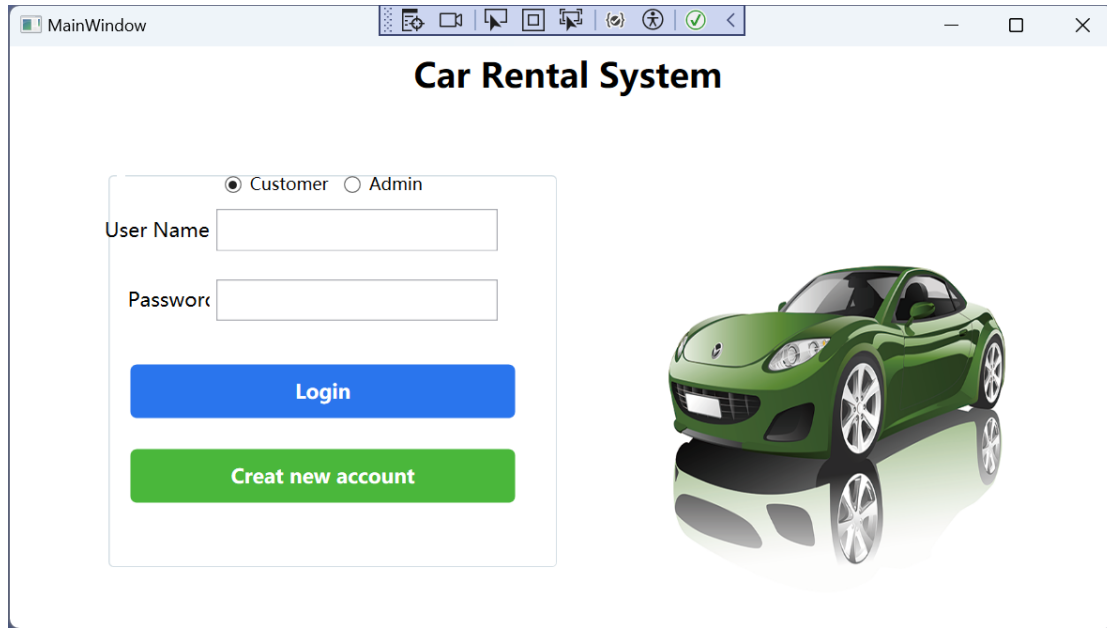


- Visual Studio Version: 2022
  - Installation: Download Visual Studio Version 2022 from website: <https://visualstudio.microsoft.com/>, Then follow the instructions to install for .Net desktop development.
- REST API
  - Use Visual Studio to open REST Api solution, then run it.

localhost7122/swagger/index.html

CarRental		^
GET	/CarRental/GetAllCustomer	▼
GET	/CarRental/GetCustomerByUsername/{username}	▼
POST	/CarRental/AddCustomer	▼
POST	/CarRental/AddStaff	▼
POST	/CarRental/CheckAuthority	▼
POST	/CarRental/StaffLogin	▼
POST	/CarRental/AddCar	▼
DELETE	/CarRental/DeleteCarbyId/{id}	▼
POST	/CarRental/UpdateCar	▼
POST	/CarRental/GetCarbyFilter	▼
POST	/CarRental/GetCarbyId	▼
POST	/CarRental/AddInventory	▼
DELETE	/CarRental/DeleteInventorybyId/{id}	▼
POST	/CarRental/UpdateInventory	▼
POST	/CarRental/GetInventorybyCarId	▼
POST	/CarRental/GetInventorybyId	▼
POST	/CarRental/GetInventory	▼
POST	/CarRental/AddReservation	▼
DELETE	/CarRental/DeleteReservationbyId/{id}	▼
PUT	/CarRental/UpdateReservation	▼
POST	/CarRental/GetReservationbyId	▼
POST	/CarRental/GetReservationbyCustomerId	▼
POST	/CarRental/GetReservationbyInventoryId	▼

- CarRental
  - Use Visual Studio to open CarRental solution, then run it.



## Work Progress in Future

In our future endeavors, we aspire to elevate the project by seamlessly integrating a payment functionality, ensuring the completion of the entire project workflow. This will entail the implementation of a robust payment API. Furthermore, we are committed to refining the project's user interface, aiming for a more sophisticated and visually appealing frontend.

## Contributions:

Team member: Li Fan 2395027 (50%); Shaojun Jiang 2395049 (50%)

Task Team member	<i>UI Design</i>	<i>database refactor</i>	<i>registration page</i>	<i>login page</i>	<i>car search page</i>	<i>reservation page</i>	<i>admin page</i>	<i>integrate REST API</i>	<i>unit test</i>	<i>testing</i>	<i>doc/ report</i>
Li Fan	√		√			√		√		√	√
Shaojun Jiang		√		√	√		√	√	√	√	