SC2006 FDAE TEAM 2 LAB 1

PROJECT PROPOSAL

Streamline the parking experience at HDB carpark Website

This website aims to improve the parking experience at HDB car parks in Singapore by allowing users to view real-time availability of parking lots and access detailed information about each car park, such as location, operating hours, gantry height, rates, night parking option and payment types. To cater to a broad user base, the website must be compatible across widely used browsers to ensure a seamless user experience.

Additionally, the app will include user account management functionalities such as sign-up, login, and password changes, complete with security measures to protect user data. This enhancement is designed to increase convenience and accessibility for drivers looking for preferred parking at Singapore's HDB car parks.

FUNCTIONAL REQUIREMENTS

1. Account Creation

    1.1 Users must pass in a new username.

    1.2 Users must pass in a new password with at least 8 characters long and combination of upper letters, lower letters, numbers and symbols.

    1.3 Users must pass in a new email address.

    1.4 Users must pass in a vehicle number plate.

    1.5 Their details must be saved in the User authentication system.

2. Login and User Authentication

    2.1 Users must enter their email address.

    2.2 Users must enter their password.

    2.3 To login, the entered details must match those stored in the User authentication system.

    2.4 Users must be able to reset their password.

3. Homepage and Accessibility

    3.1 Users entering the correct account details must see the home page.

    3.2 On the homepage, users must be able to access different functionalities.

4. Parking Lot Information and Management

    4.1 Users must be able to view the real-time availability of HDB carpark lots in Singapore, updated to the minute.

    4.2 Users must be able to view parking rates of car parks based on the selected date and time.

    4.3 Users must be able to view the nearest available HDB car park from a specified destination.

    4.4 Users must be able to access essential information about HDB car parks, including operating hours, carpark location and address, gantry height restrictions, parking payment type, and type of car park.

5. Feedback and Support

    5.1 Users must be able to provide feedback or report issues through the app.

    5.2 A support section should include FAQs and options to contact customer service.

6. Dynamic Pricing and Suggestions

    6.1 The app must display dynamic pricing for parking and suggest cheaper parking times based on analytics.

7. Community Engagement

    7.1 A community forum for users to discuss parking strategies and share experiences.

8. Multi-Language Support

8.1 The app must support multiple languages to cater to all users.

9. Advanced Search and Filters

9.1 Enhanced search capabilities with filters for types of parking, payment options, and amenities like electric vehicle charging stations.

NON-FUNCTIONAL REQUIREMENTS

1. **Usability**

- **1.1 User Interface** The interface must be easy to navigate, featuring clear instructions, well-labeled elements, and visible error messages that guide users through recovery steps.
    1.1.1 The account creation and login processes must not exceed three steps each.
    1.1.2 Each form field must have clear labels and placeholder text where applicable.
    1.1.3 Error messages must be specific and appear immediately upon invalid input.

- **1.2 Consistent Navigation**: The navigation bar should be visible across all pages, granting easy access to core functionalities like HomePage, Parking Reservation, Forum, and Profile.

- **1.3 Efficiency**: At least 80% of first-time users should be able to find car park information within one minute of their query.

- **1.4 High Capacity**: The system must efficiently handle up to 1,000 requests per hour.

- **1.5 Quick Response**: Information on car park availability must be retrieved and displayed within two seconds of user request.

2. **Maintainability**

- **2.1 Modular Design:** The system must employ a modular architecture, such as MVC, to ensure components like login, profile management, and navigation can be independently updated without system-wide disruptions.

- **2.2 Reusable Components:** The application must develop reusable components for frequently used functionalities and UI elements to simplify future updates and ensure consistency.

3. **Reliability**

- **3.1 Data Integrity**: Ensure real-time data, including parking availability and user accounts, is consistently accurate and promptly updated.

- **3.2 Robust Data Handling**: Implement mechanisms to handle unexpected system failures, ensuring minimal data loss and quick recovery.

4. **Security**
- **4.1 Data Security**: User data must be securely stored, including authentication details and

personal information, in encrypted formats within secure databases.

- **4.2 Vulnerability Management**: Protect against SQL injection, XSS, CSRF, and brute-force attacks. Regularly update security protocols and perform vulnerability scans.

- **4.3 Secure Transactions**: All data exchanges, particularly those involving sensitive or personal information, must be encrypted using HTTPS.

- **4.4 Access Control**: Strictly enforce access controls and permissions to ensure users can only access information pertinent to their account and privilege.
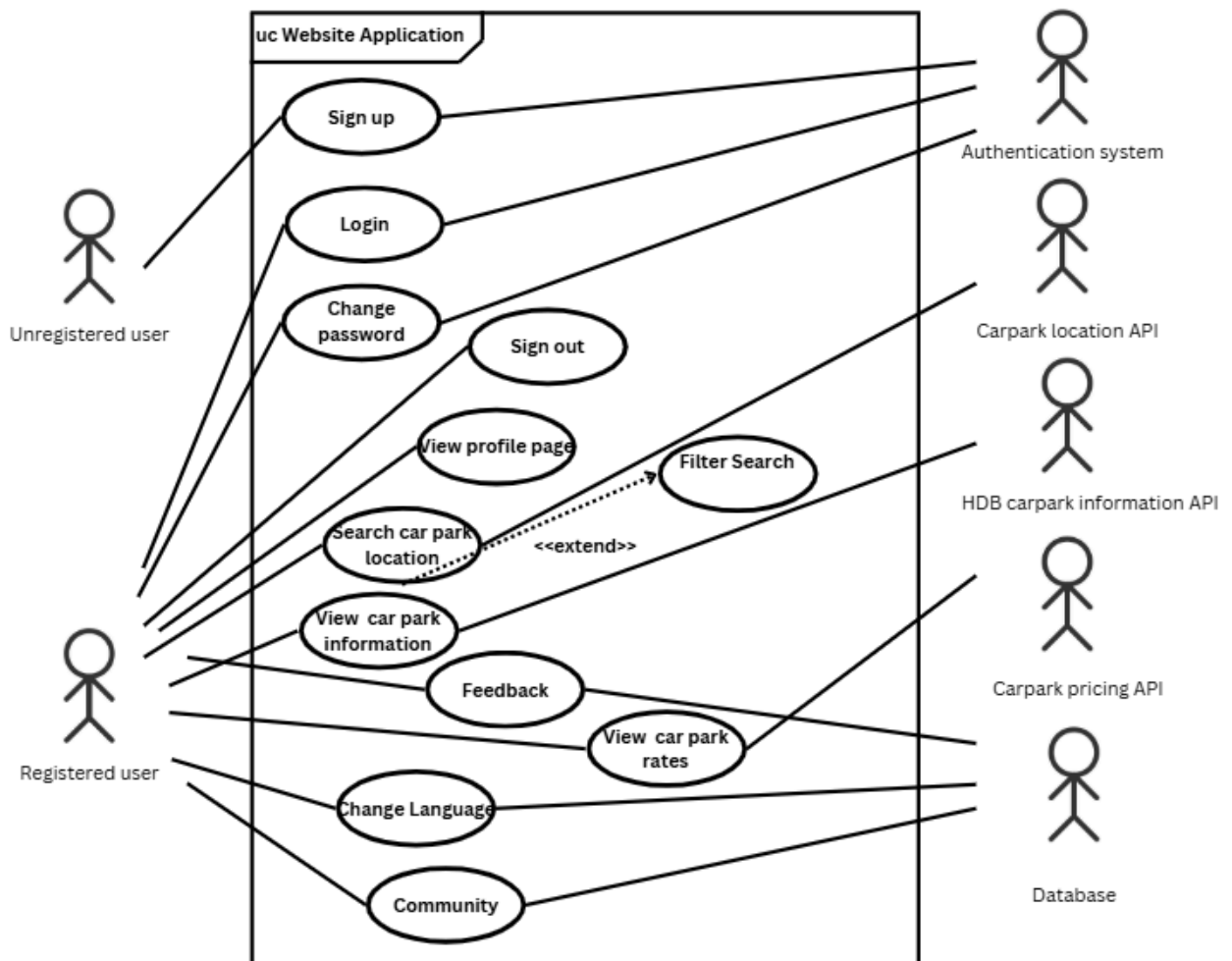
5. **Error Handling**
- **5.1 User Guidance and Feedback:** The application should provide actionable and specific error messages to guide users effectively when errors occur. For example, if an error happens during login, such as entering a wrong password, the system should display, "Incorrect password. Please try again or reset your password." If the username is not found, the message should read, "No account found with that username. Please try again or create a new account."

DATA DICTIONARY

Term	Definition
User	A person using the application to check availability or reserve parking
Car Park	An area where vehicles may be parked.
Lot	A single parking spot.
Query	A user-entered search term used to locate HDB carparks based on name, location, or other attributes.
Rate	The cost of parking in an HDB carpark, which varies based on time of day and duration.
Car Park Type	The structural type of the HDB carpark.
Payment Type	The payment system used for the car park.
Gantry Height	Maximum vehicle height allowed at the carpark entrance.
Availability	The number of unoccupied parking lots in a car park at a given time.

USE CASE DIAGRAM

uc Website Application

- Sign up
- Login
- Change password
- Sign out
- View profile page
- Filter Search
- Search car park location
- <<extend>>
- View car park information
- Feedback
- View car park rates
- Change Language
- Community

Unregistered user

Registered user

Authentication system

Carpark location API

HDB carpark information API

Carpark pricing API

Database

USE CASE DESCRIPTIONS

Use Case Name	Sign up
Actor:	Unregistered User, Authentication System
Description:	Allow new user to create account
Preconditions:	User does not have an existing account
Postconditions:	New user account created
Flow of Events:	S1: User opens app for the first time S2: User is brought to login page S3: User clicks on "Sign up" button and redirected to sign up page S4: User enters relevant details (full name, email, userID, phone number, car plate number) S5: Authentication System stores new user information in database S6: User enters main page

Alternative Flows:	AF-S4-1: Email/Phone Number is in wrong format
	
	    1. App displays "Please ensure Email/Phone Number is in correct format." message
	    2. App remains at step S4 until requirements are met
	
	AF-S4-2: Password and Confirm Password doesn't Match

	1. App displays "Please ensure passwords match." message 2. App remains at step S4 until requirements are met AF-S5: Email already registered 1. App displays "Email already in use. Please use a different email or log in." message 2. App returns to step S2
Exceptions:	EX1: Authentication System/ Database is inaccessible EX2: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name	Login
Actor:	Registered User, Authentication System
Description:	Allow user to log in
Preconditions:	User has an existing account User has not logged in on device before
Postconditions:	User is logged in and authenticated
Flow of Events:	S1: User opens app S2: User is brought to login page S3: User enters email/password S4: Authentication System verifies login details with database S5: User is logged in successfully

	S6: User enters main page
Alternative Flows:	AF-S4-1: Login password is invalid 1. App displays "Wrong Password. Please try again." message 2. App returns to step S2 AF-S4-2: Login email is invalid 1. App displays "User does not exist. Please create a new account." message 2. App returns to step S2
Exceptions:	EX1: Password is entered wrongly 3 times and user exists 1. App displays "You have entered an invalid password 3 times. Please change your password. " 2. Initiate "Change Password" use case EX2: Authentication System/ Database is inaccessible EX3: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name	Change Password
Actor:	Registered User, Authentication System
Description:	Allow user to change password
Preconditions:	User has an existing account
Postconditions:	User password is changed

Flow of Events:	S1: User clicks on "Change Password" S2: User enters email, phone number, car plate number S3. Authentication System verifies details with database S4: App requests user to enter existing password and new password twice S5: Password is changed S6: Authentication System updates the database
Alternative Flows:	AF-S1: User forgot password and failed to login thrice and was redirected to change password 1. Authentication system sends an OTP to user through mobile/email 2. App requests user to enter OTP 3. User enters OTP 4. App verifies OTP with authentication system 5. Skip to step S4 when OTP is correct, else display 'Please enter the correct OTP." AF-S3: Details are invalid/wrong or no match in database 1. App displays "Please ensure all relevant details are correct." message 2. App returns to step S2 AF-S4: Password and Confirm Password doesn't Match 1. App displays "Please ensure passwords match." message 2. App remains at step S4 until requirements are met
Exceptions:	EX1: Authentication System/ Database is inaccessible EX2: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name:	Sign Out
Actor:	Registered User
Description:	Allow user to log out of the app
Preconditions:	User is logged in and authenticated User is on the main page
Postconditions:	User is logged out and return to the login page
Flow of Events:	S1: User taps the "Sign Out" button S2: App prompts user with a confirmation message "Are you sure you want to sign out?" S3: User confirms the sign-out action S4: App clears user session data S5: User is signed out and redirected to the login page
Alternative Flows:	AF-S3: User cancels sign-out 1. App returns to the main page without logging out
Exceptions:	EX1: Sign-out fails due to a system error 1. App displays "There was an error signing you out. Please try again later." message

Use Case Name	View Profile Page
Actor:	Registered User

Description:	Allow users to view and update their profile information
Preconditions:	User is logged in and on the homepage
Postconditions:	User can view and update their profile information
Flow of Events:	S1: User selects the "Profile" option from the navigation bar S2: App retrieves the user's profile data from the User Authentication System S3: App displays the user's profile information including email, username, vehicle number plate, and other relevant details S4: User can edit their details such as email, password, or vehicle number plate S5: User confirms changes and updates are saved to the User Authentication System S6: App confirms changes have been successfully updated
Alternative Flows:	AF-S4: User cancels profile updates 1. App returns to the homepage without saving any changes
Exceptions:	EX1: Profile update fails due to system error 1. App displays "There was an error updating your profile. Please try again later."

Use Case Name	Search car park location
Actor:	Registered User, Carpark Location API

Description:	Allow users to search for specific car park locations
Preconditions:	User is logged in and on the homepage
Postconditions:	User is presented with search results for car park locations
Flow of Events:	S1: User enters a location or address into the search bar S2: App processes the input and retrieves matching car park locations from the Car Park Information System S3: App displays a list of car parks that match the search query, including their names and general location information S4: User can click on any car park in the list for more detailed information
Alternative Flows:	AF-S2-1: No matching car parks found 1. App displays "No car parks found matching your search. Please try again with different keywords." 2. Return to step S1
Exceptions:	EX1: Search query fails due to system error. 1. App displays "There was an error processing your search. Please try again later." EX2: API rate limit exceeded. 1. App displays "There was an overload of requests. Please try again later." EX3: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name	Filter Search
Actor:	Registered User, Carpark Location API
Description:	Extends search by allowing users to filter by types of parking, payment options, and amenities like electric vehicle charging stations
Preconditions:	User is logged in and on the homepage
Postconditions:	User is presented with filtered search results for car parks
Flow of Events:	S1: User enters a location or address into the search bar S2: User chooses from a list of filters to filter the search result by S3: App displays a list of car parks that match the search query and filters, including their names and general location information S4: User can click on any car park in the list for more detailed information
Alternative Flows:	AF-S3: No matching car parks found 1. App displays "No car parks found matching your search. Please try again with different keywords."
Exceptions:	EX1: Search query fails due to system error 1. App displays "There was an error processing your search. Please try again later." EX2: API rate limit exceeded. 1. App displays "There was an overload of requests. Please try again later."

	EX3: Network error
	App displays "Error. Not connected to the internet."

Use Case Name	View car park information
Actor:	Registered User, HDB Carpark Information API
Description:	Allow users to view real-time availability and information about HDB car parks
Preconditions:	User is logged in and on the homepage
Postconditions:	User views the real-time availability and information of parking lots
Flow of Events:	S1: User selects a car park from the list or searches for a specific car park S2: App retrieves real-time parking availability for the selected car park S3: App displays the parking lot details including rates, operating hours, gantry height, and payment methods
Alternative Flows:	AF-S2: No parking lots available 1. App displays "No available parking lots at the moment. Please try again later."
Exceptions:	EX1: Real-time data retrieval fails 1. App displays "Unable to retrieve parking availability. Please try again later." EX2: Network error App displays "Error. Not connected to the internet."

Use Case Name	View car park rates
Actor:	Registered User, Carpark Pricing API
Description:	Allow users to view the parking rates for selected car parks based on the date and time
Preconditions:	User is logged in and has selected a specific car park
Postconditions:	User views the parking rates for the selected car park
Flow of Events:	S1: User selects a car park to view details S2: App displays the car park details, including the available parking rates S3: User selects a date and time for parking to see specific rates for that period S4: App displays the relevant rates based on the user's selection S5: User can choose to reserve a parking spot based on the displayed rates
Alternative Flows:	AF-S3: No rates available for selected date and time 1. App displays "No available parking rates for the selected time. Please try a different time."
Exceptions:	EX1: Rates retrieval fails due to system error 1. App displays "There was an error retrieving parking rates. Please try again later."

Use Case Name	Change Language
Actor:	Registered User, Database
Description:	Allows user to change language of user interface
Preconditions:	User is logged in
Postconditions:	User interface language changed to preferred language
Flow of Events:	S1: User enters Profile Page S2: User navigates to the settings section of the Profile Page S3: User selects the "Language" option from the settings menu S4: App displays a list of available languages S5: User selects their preferred language from the list S6: App updates the interface language to the selected language by fetching the translations from the Database S7: App confirms the language change and displays a message "Language updated successfully."

Alternative Flows:	AF-S4: No available languages
	
	  1. If there are no available languages for the user to choose from, the app displays a message "No language options are available at the moment."
	  2. App returns to the Profile Page or settings section for the user to take further action.
	
	AF-S5: User cancels language change
	
	  1. User chooses to cancel the language change after selecting a language.

	2. App returns to the Profile Page without applying any language change.
Exceptions:	EX1: Language change fails due to system error 1. App displays "Unable to update language settings. Please try again later." 2. App returns to the Profile Page with no language change applied. EX2: Language preference not saved after session restart 1. App displays "Your language preference could not be saved. Please try again." 2. User is prompted to reselect their language or return to default settings. EX3: Database error 1. App displays "Unable to update language settings. Please try again later. 2. App returns to the Profile Page with no language change applied. EX4: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name	Community
Actor:	Registered User, Database
Description:	Allows user to access community forum to interact with other users and share experiences
Preconditions:	User is logged in
Postconditions:	User views posts from other users or successfully posts

Flow of Events:	S1: User enters Profile Page S2: User navigates to Community Page S3: App fetches forum data from the Database S4: User scrolls and reads posts S5: User posts about his thoughts and experiences if he wants to
Alternative Flows:	AF-S5: User does not post anything
Exceptions:	EX1: Database error 1. App displays "Unable to update language settings. Please try again later." 2. App returns to the Profile Page with no language change applied. EX2: Network error 1. App displays "Error. Not connected to the internet."

Use Case Name	Feedback
Actor:	Registered User, Feedback Database
Description:	Allows users to provide feedback on their experience with the app
Preconditions:	User is logged in User is on the homepage or any relevant page
Postconditions:	User's feedback is submitted and stored for review

Flow of Events:	S1: User selects the "Feedback" option from the navigation menu S2: App prompts the user to enter their feedback S3: User enters feedback in the provided text field S4: User submits the feedback S5: App confirms submission with a message "Thank you for your feedback" S6: Feedback is stored in the system for review
Alternative Flows:	AF-S2-1: User cancels feedback submission 1. App returns to the previous screen without submitting any feedback

Exceptions:	EX1: Feedback submission fails due to system error
	
	   1. App displays "There was an error submitting your feedback. Please try again later."
	
	EX2: Feedback text exceeds character limit
	
	   1. App displays "Your feedback is too long. Please shorten your message."
	
	EX3: Network error
	
	   1. App displays "Error. Not connected to the internet."

UI MOCKUPS

Signup Page

ParkSmart

Join Our Parking Community

Connect and have easy access to carparks in Singapore

Already have an account? Sign in

Create Account

Fill in your details to get started

Email address

Enter your email

Car Plate Number

Enter plate number

Format: ABC-1234

User ID

Choose a user ID

Password

Create a password

✓ At least 8 characters
✓ Mix of letters and numbers

☐ I agree to the **Terms of Service** and **Privacy Policy**

Create Account

Or continue with

G Google   Apple

Login Page

Home   About   Contact

Welcome back

Log in to access your account and continue your journey with us.

Log in

Enter your credentials to access your account

Email address

✉ Enter your email

Password

🔒 Enter your password   🚫

☐ Remember me   Forgot password?

Log in

Or continue with

G Google   🍎 Apple

Don't have an account? Sign up

Terms   Privacy   Help

Home Page

P **ParkSmart**

Dashboard   Services   Locations   Support

Welcome to ParkSmart

Manage your parking experience efficiently with our smart parking solutions.

Aditi

Quick Access

My Profile

View and manage your account settings and preferences

Access >

Carpark Location

Find and navigate to available parking spaces

Access >

Carpark Information

View real-time parking availability and rates

Access >

Provide Feedback

Share your experience and help us improve

Access >

Community Forum

Connect with other users and share insights

Access >

FAQs & Support

Get help and find answers to common questions

Access >

Car Park information

ParkSmart

Home   Find Parking   Rates   About   Contact   Login

🔍 Search for parking locations...   ⚙ Filters

All Parking   EV Charging   Covered Parking   Electronic Payment

Available Parking Locations

Central Plaza Parking
📍 123 Central Boulevard

↕ Height: 2.1m   💳 Electronic, Credit Card   🚗 Multi-storey

🔌 EV Charging   P Covered   **$2.40/hr**
                                                                           0.5km away

                                                                           View Details

Marina Bay Parking
📍 45 Marina Street

↕ Height: 2.0m   💳 Electronic, Cash   🚗 Underground

🔌 EV Charging   P Covered   **$3.20/hr**
                                                                           1.2km away

                                                                           View Details

Orchard Gateway
📍 290 Orchard Road

↕ Height: 2.2m   💳 Electronic   🚗 Multi-storey

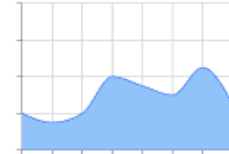🔌 EV Charging   P Covered   **$4.00/hr**
                                                                           2.1km away

                                                                           View Details

Dynamic Pricing

Current Rate:	**$3.50/hr**
Peak Hours:	18:00 - 20:00
Off-Peak:	22:00 - 06:00

Suggested Parking Times

Cheapest Time
Tomorrow, 3 AM - 6 AM

Peak Time
Today, 6 PM - 8 PM

Quick Filters

🔌 EV Charging   ⌄

💳 Payment Type   ⌄

↕ Height Restriction   ⌄

Feedback and Support

How can we help you?

🔍 Search for help articles...

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⑦

FAQs

Find quick answers to common questions about parking and our service.

✉

Email Support

Get in touch with our support team via email for detailed assistance.

🎧

Phone Support

Speak directly with our customer service representatives.

Frequently Asked Questions

How do I reserve a parking spot?   ⌄

Simply open the ParkSmart app, enter your destination, choose your preferred parking spot, and complete the booking with your payment method.

What payment methods do you accept?   ⌄

We accept all major credit cards, Apple Pay, Google Pay, and PayPal for your convenience.

Can I cancel my reservation?   ⌄

Yes, you can cancel your reservation up to 1 hour before your scheduled parking time for a full refund.

Quick Contact

📞 **Phone Support**
1-800-PARK-SMART
Mon-Fri, 9AM-6PM EST

✉ **Email Support**
support@parksmart.com
24/7 Response

💬 **Live Chat**
Available in App
24/7 Support

Community Engagement

ParkSmart Forum

Search discussions...

Popular   Latest   Members   Create Post

Community Stats

Members   12,458
Posts   45,789
Daily Active   2,345

Popular Categories

Tips & Tricks

Feature Requests

Success Stories

Help & Support

News & Updates

Welcome to ParkSmart Community

Join our community of smart parkers and share your experiences!

Get Started

Sarah Johnson
2 hours ago

Tips for finding parking spots during peak hours

I've discovered some great strategies for finding parking spots during rush hour...

Tips & Tricks   24   156

Michael Chen
4 hours ago

New ParkSmart feature suggestion: Real-time availability updates

It would be really helpful if we could see real-time updates for parking spot availability...

Feature Request   45   231

Emily Davis
6 hours ago

Success story: How ParkSmart saved me time and money

I wanted to share my experience using ParkSmart over the past month...

Success Stories   18   142

Top Contributors

David Wilson
234 posts • 4.8 rating

Lisa Anderson
189 posts • 4.7 rating

John Martinez
156 posts • 4.6 rating

Community Guidelines

- Be respectful and helpful to other members
- Share accurate and verified information
- Keep discussions relevant to parking

Profile Settings

John Smith

User ID: USR_7891234

Car Plate: ABC 1234

Last login: Today at 9:42 AM

Security Settings

Change Password
Update your password regularly

Change

Two-Factor Authentication
Add an extra layer of security

Enable

Account Actions

Logout

Delete Account