Pool - carpooling app

SW Engineering CSC648-848-05 Fall 2023

Milestone 4 | 11/30/2023

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History Table

Milestone	Date
M4V1	**11/30/23**
M3V2	**11/25/23**
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M1V2	**10/8/23**
M1V1	**9/21/23**

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1. Product Summary

Pool: carpoolwith.me

Pool is a carpooling website which provides a platform for drivers to post a “pool” and for passengers to join them.

Unlike other carpooling platforms, Pool helps drivers highlight their FasTrak account status. This ensures that prospective passengers know their driver will never have to avoid toll routes in their pool and can make use of time-saving fast lanes during peak traffic hours. Passengers looking for a guarantee that their pool is FasTrak equipped need only to check the driver’s FasTrak verification status on their profile.

What further sets Pool apart from its competitors is the unique ability for drivers and passengers who have “pooled” together in the past to form a crew. Drivers may choose to post a pool publicly – available for anyone to join – or privately, only available to members of their crew. This feature allows users to pool together with familiar faces, adding stability and predictability to their commute, wherever it takes them.

Prioritized Functional Requirements

Priority 1

1. User

1.1 A user shall create an account
1.2 A user shall register as a driver
1.3 A user shall register as a passenger
1.4 A user shall sign in
1.5 A user shall log out

2. Profile

2.1 A profile shall belong to a passenger
2.2 A profile shall belong to a driver
2.3 A profile shall contain user details
2.4 A profile shall be viewed by the user it is associated with

3. Driver

- 3.1 A driver shall be Fastrak verified
- 3.2 A driver shall create zero or many pools
- 3.3 A driver shall have zero or many crews
- 3.4 A driver shall have a driver's license
- 3.5 A driver shall view the pools they posted
- 3.6 A driver shall view the crews they are a member of
- 3.7 A driver shall leave the crews they are a member of

4. Passenger

- 4.1 A passenger shall join many pools
- 4.2 A passenger shall have many crews
- 4.3 A passenger shall view the pools they have joined
- 4.4 A passenger shall view the crews they are a member of
- 4.5 A passenger shall leave the crews they are a member of
- 4.6 A passenger shall leave the pools they are a member of

5. Crew

- 5.1 A crew shall be created by one user
- 5.2 A crew shall have a description
- 5.3 A crew shall have members

6. Pool

- 6.1 A pool shall have a description
- 6.2 A pool shall have a start time.
- 6.3 A pool shall have passengers.
- 6.4 A pool shall have one driver
- 6.5 A pool shall have a start location
- 6.6 A pool shall have an end location
- 6.7 A pool shall be deleted by its driver

2. Usability Test Plan

Superior Feature: Ride with your crew

Usability Test Results

Test use case	Environment	Task	Effectiveness (% Completed)	Errors	Comments	Efficiency (Time)	Recording (screen capture only)
5	Mobile web (Chrome), iOS	Create a crew	100%	0		1 min 56 seconds	Click to watch session
6	Mobile web (Chrome), iOS	Post a private pool to your crew	100%	3 inline errors hit	Defect encountered: submit button inaccessible at bottom of screen when all dropdowns are open	3 min 17 seconds	Click to watch session
12	Mobile web (Chrome), iOS	Join a pool posted privately to your crew	90%	1 blocking defect (pool posted to crew did not display under “Available pools”)	User got all the way to “My Pools”, which is where the pool should have shown, and is where the	59 seconds	Click to watch session

					final action would have been taken.		
12	Mobile web (Chrome), iOS	View your crews	100%	0	User vocalized that they remembered where to navigate to from the hamburger menu.	11 seconds	Click to watch session
11	Mobile web (Chrome), iOS	Leave a crew	100%	0	Same as above, user knew right to go. User got a glimpse of the task and almost left the crew during the previous test.	8 seconds	Click to watch session

Function 1: Create a crew

Objective

A “crew” is a group of familiar people who choose to pool (or carpool) together. After a user has ridden in a pool, they may create a crew composed of the members of that pool, including themselves. Crew creation is the first step Pool users can take to regularize their commute with familiar faces to shared destinations.

It is imperative that users can easily navigate to where they may create a crew – from a past pool. If a user can not accomplish this, or if it takes a user a long time to accomplish this, that would indicate that a better/different UX is required to assist in navigation and wayfinding.

Test Description

System Setup

This test requires logging into an existing Pool account using credentials belonging to a user with *past pools* in their account. The test monitor will assist in this process since it is not a part of the test. This test may be conducted on any device in any browser.

Starting Point

User will start on the logged in state of the home page: carpoolwith.me, and will be explained what a crew is. Then, user will be instructed to “create a crew with members of a past pool you rode with.”

Intended Users

Creating a crew is a feature which may be utilized by Pool users looking to regularize their commute with familiar faces commuting to a shared destination.

URL of the system or start screen to be tested

carpoolwith.me/my-pools

What is to be measured

This test measures:

- Whether or not the user is able to complete the task
- What percentage of the task the user is able to complete
- How long it takes the user to complete the task
- Whether or not creating a crew is a feature the user would utilize

Problem Statement & Task Descriptions

Problem Statement	User wants to pool with familiar faces.
Objectives	Ensure user can easily navigate the authenticated experience to create a crew.
User Profile	Carlos: Carpool curious, likes driving (current commuting method), middle aged, male identifying
Method	Qualitative: live observation with minimal intervention
Test Environment	In-person: user is in their home with live observation
Test Monitor Role	Test monitor sets up user on carpoolwith.me, provides test prompt, provides *minimal* assistance as needed, asks questions at end of session.
Evaluation Method	Observation of completion criteria checked against benchmark, Likert Questionnaire.

Task	**Description**
Task	Create a crew
Default State	Homepage, logged in
Successful completion criteria	New crew displays under “My crews”
Benchmark	Completed in under three minutes

Likert Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Creating a crew is easy.					✅
I like the look and feel of the user interface for creating a crew.			✅		
I would create a crew if I was a Pool user.					✅

Function 2: Post a private pool to your crew

Objective

Drivers may post a pool either publicly (so that it is returned in search results by all users and available for anyone to join) or privately (so that it is only surfaced to members of a crew the driver belongs to). In order for drivers to maintain control of who they share their vehicles with through the Pool platform, they must understand how to post a pool privately to a crew they are a member of, should they choose to.

Test Description

System Setup

This test will be conducted immediately after Test 1, so that the user is already logged into the account they may use for the test – and may utilize the crew they created in the previous test.

Starting Point

The test monitor will direct the user to return to the home page once Test 1 is complete, where they will begin Test 2 from.

Intended Users

Posting a pool privately to a crew is a feature which may be utilized by Pool users who have registered as a driver looking to maintain better control and predictability over their carpooling experience – particularly as it pertains to passengers of their shared vehicle.

URL of the system or start screen to be tested

carpoolwith.me/create-pool

What is to be measured

This test measures:

- Whether or not the user is able to complete the task

- What percentage of the task the user is able to complete
- How long it takes the user to complete the task
- Whether or not posting a private pool is a feature the user would utilize

Problem Statement & Task Descriptions

Problem Statement	User wants to share their vehicle with familiar faces.
Objectives	Ensure user can easily navigate the authenticated experience to post a pool privately to a crew they just created.
User Profile	Carlos: Carpool curious, likes driving (current commuting method), middle aged, male identifying
Method	Qualitative: live observation with minimal intervention
Test Environment	In-person: user is in their home with live observation
Test Monitor Role	Test monitor sets up user on carpoolwith.me, provides test prompt, provides *minimal* assistance as needed, asks questions at end of session.
Evaluation Method	Observation of completion criteria checked against benchmark, Likert Questionnaire.

Task	**Description**
Task	Post a private pool to your crew
Default State	Homepage, logged in
Successful completion criteria	Pool displays under “My pools” with Crew name that it was posted to
Benchmark	Completed in under five minutes

Likert Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Posting a private pool to my crew was easy.					✅
I like the look and feel of the user interface for posting a private pool to my crew.		✅			
I would post a private pool to my crew if I was a Pool user.					✅

Function 3: Join a pool posted privately to your crew

Objective

Members of a crew are in a specialized user group – they get access to private pools only they can join. In order for this exclusive feature to be utilized, it must be tested to ensure that crew members understand it is available to them, and where and how to access it.

Test Description

System Setup

This test will require logging out of the account used for Test 1 and Test 2 and logging into a new account. (This will help get the user into the mindset of transitioning from being a driver to a passenger.) This account must belong to a member of the crew the pool was posted privately to in the prior test. If required, the test moderator will assist with login since it is not a part of the test.

Starting Point

The test monitor will explain that the user has now logged into the account belong to a member of the crew they just posted a pool privately to. The monitor will then instruct the user to find and join that pool.

Intended Users

Any member of a crew may join pools posted privately to them. This feature targets recurring users with multiple carpooling destinations who have different crews they commute to different places with.

URL of the system or start screen to be tested

carpoolwith.me/my-pools

What is to be measured

This test measures:

- Whether or not the user is able to complete the task

- What percentage of the task the user is able to complete
- How long it takes the user to complete the task
- Whether or not joining a private pool is a feature the user would utilize

Problem Statement & Task Descriptions

Problem Statement	User wants an alternative commuting method that is consistent and familiar.
Objectives	Ensure user can easily navigate the authenticated experience to create a crew.
User Profile	Carla: Currently commutes on Bart and Muni, dislikes driving, student, female identifying
Method	Qualitative: live observation with minimal intervention
Test Environment	In-person: user is in their home with live observation
Test Monitor Role	Test monitor sets up user on carpoolwith.me, provides test prompt, provides *minimal* assistance as needed, asks questions at end of session.
Evaluation Method	Observation of completion criteria checked against benchmark, Likert Questionnaire.

Task	**Description**
Task	Join a pool posted privately to your crew
Default State	Homepage, logged in
Successful completion criteria	Joined pool now displays under “My pools”
Benchmark	Completed in under three minutes

Likert Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Joining a pool posted privately to my crew was easy.	✅				
I like the look and feel of the user interface for joining a pool posted privately to my crew.		✅			
I would join a pool posted privately to my crew if I was a Pool user.					✅

Function 4: View your crews

Objective

For Pool users that are members of many crews, crew management is essential. It is important for Pool users to feel in control of their commuting experience, and to understand the tools available for doing so. This test evaluates whether or not users understand where they may manage the crews they are a member of, and how to navigate to this area of the site.

Test Description

System Setup

This test will utilize the same account credentials as the previous test, so the user may remain logged in.

Starting Point

The test monitor will direct the user back to the home page, and ask them to navigate to where they may view all of the crews they are a member of.

Intended Users

This feature is particularly useful for recurring users belonging to multiple crews they commute to different places with.

URL of the system or start screen to be tested

carpoolwith.me/my-crews

What is to be measured

This test measures:

- Whether or not the user is able to complete the task
- What percentage of the task the user is able to complete
- How long it takes the user to complete the task
- Whether or not viewing crews is a feature the user would utilize

Problem Statement & Task Descriptions

Problem Statement	User wants to view information about the crews they are a member of.
Objectives	Ensure user can easily navigate the authenticated experience to view the crews they are a member of.
User Profile	Carla: Currently commutes on Bart and Muni, dislikes driving, student, female identifying
Method	Qualitative: live observation with minimal intervention
Test Environment	In-person: user is in their home with live observation
Test Monitor Role	Test monitor sets up user on carpoolwith.me, provides test prompt, provides *minimal* assistance as needed, asks questions at end of session.
Evaluation Method	Observation of completion criteria checked against benchmark, Likert Questionnaire.

Task	**Description**
Task	View your crews
Default State	Homepage, logged in
Successful completion criteria	Crew(s) display under “My crews”
Benchmark	Completed in under two minutes

Likert Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Viewing my crews was easy.					✅
I like the look and feel of the user interface for viewing my crews.		✅			
I would view my crews if I was a Pool user.					✅

Function 5: Leave a crew

Objective

A user's commute changing may require finding a new crew to join. Leaving a crew signals to other members that the user no longer shares their commute, and requires another crew to commute with. If the time does come to leave a crew, knowing how to do this within the UI is essential.

Test Description

System Setup

This test will utilize the same account credentials as the previous test, so the user may remain logged in.

Starting Point

The test monitor will direct the user back to the home page, and ask them to navigate back to where they may view all of the crews they are a member of. Once there, the user will be asked to leave a crew.

Intended Users

This feature is particularly useful for users with a changing commute who no longer require membership to a crew they are currently a member of.

URL of the system or start screen to be tested

carpoolwith.me/my-crews

What is to be measured

This test measures:

- Whether or not the user is able to complete the task
- What percentage of the task the user is able to complete
- How long it takes the user to complete the task
- Whether or not leaving a crew is a feature the user would utilize

Problem Statement & Task Descriptions

Problem Statement	User wants to leave a crew they are a member of.
Objectives	Ensure user can easily navigate the authenticated experience to view and leave a crew they are a member of.
User Profile	Carla: Currently commutes on Bart and Muni, dislikes driving, student, female identifying
Method	Qualitative: live observation with minimal intervention
Test Environment	In-person: user is in their home with live observation
Test Monitor Role	Test monitor sets up user on carpoolwith.me, provides test prompt, provides *minimal* assistance as needed, asks questions at end of session.
Evaluation Method	Observation of completion criteria checked against benchmark, Likert Questionnaire.

Task	**Description**
Task	Leave a crew
Default State	Homepage, logged in
Successful completion criteria	Crew which has been left no longer displays under “My crews”
Benchmark	Completed in under three minutes

Likert Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Leaving a crew was easy.					✅
I like the look and feel of the user interface for leaving a crew.				✅(with feedback that this part of the UI was better due to the responsive color change of the “leave crew” button and the change state)	
I would leave a crew if I was a Pool user.			✅(with feedback “why would I leave a crew?... I would use it I guess if I needed it.”		

3. QA Test Plan

Nonfunctional Requirement 2.2: Pool shall use user input validation to ensure the integrity of data stored and retrieved.

Objective

This QA test puts a special focus on frontend validations to ensure that users are:

- Hitting a validation error when an invalid input is entered
- Seeing the validation in the right place
- Being presented with the correct inline error message

Backend validations are the final safeguard against bad or malicious data, but it should not function as the only protection against this – which is why it's important that the app's first line of protection, the frontend, is effectively catching bad data and preventing it from being sent in request bodies to the backend.

Setup

URLs of the system (or start screen) to be tested

carpoolwith.me/signup

carpoolwith.me/signin

carpoolwith.me/create-pool

System Setup

Test 1.

Navigate to carpoolwith.me/signup.

Test 2.

Navigate to carpoolwith.me/signin.

Test 3.

Navigate to: carpoolwith.me/signin and enter the following credentials:

- Email: JJonthetrack@gmail.com
- Password: manapool

Click on “Post a Pool” in the header menu (or from the hamburger menu, on mobile).

Test Environment

This will be tested live in production on carpoolwith.me on desktop web in all supported browsers.

Feature to be tested

This tests the inline error messaging on required fields of the “Sign Up”, “Sign In”, and “Post a Pool” screens.

Test Number	Setup	Description	Test Input	Expected Output	P/F: Chrome	P/F: Safari	P/F: Firefox	P/F: Duck Duck Go
1	Navigate to carpoolwith.me/signup	Required validation should trigger when fields are left blank on Sign Up	Click “Sign Up” without entering any inputs.	“Required” inline error messaging shows beneath every input other than the driver registration checkbox.	Pass	Pass	Pass	Pass
2	Navigate to carpoolwith.me/signin	Required validation should trigger when fields are left blank on Sign In	Click “Sign In” without entering any inputs.	“Required” inline error messaging shows beneath every input.	Pass	Pass	Pass	Pass
3	Navigate to carpoo	Required validation should	Click “Subm it”	“Required” error messagin	Pass	Pass	Pass	Pass

	lwith.me, sign in with the credentials: JJonthetrack@gmail.com (password: manapool), and click “Post a Pool” in the header menu	trigger when fields are left blank on Post a Pool	without entering any inputs.	g shows alongside every missing input.				

Nonfunctional Requirement 17.1: Application will have an average response time of 2 seconds or less.

Objective

The objective of testing this nonfunctional requirement is to ensure that users may take actions on Pool in an expectantly quick fashion, without encountering slow load times. To achieve this, this series of QA tests focuses on different user driven actions critical to the key functionality of Pool, i.e. sign up, log in, crew creation, etc. The tests put a special focus on time between triggering an action on the frontend and the end result, or output. It is important for users to have an experience on Pool which matches their expectations for highly functioning web services, and fast load time is a big part of this evaluation.

Setup

URLs of the system (or start screen) to be tested

carpoolwith.me

System Setup

Navigate to carpoolwith.me.

For Test 3, the following credentials will be required:

Email: JJonthetrack@gmail.com

Password: manapool

Test Environment

This will be tested live in production on carpoolwith.me on desktop web in all supported browsers.

Feature to be tested

This tests the application response time to ensure that the system can handle requests in two seconds or less.

Test Number	Setup	Description	Test Input	Expected Output	P/F: Chrome	P/F: Safari	P/F: Firefox	P/F: Duck Duck Go

1	Go to: https://carpoolwith.me/	Test that the search pools by starting zipcode returns results within 2 seconds using a stopwatch application.	On the Pool homepage, select the starting zip code in the dropdown, enter a zip code and press enter or search.	Display pools near the starting zip code within 2 seconds of searching.	Pass	Pass	Pass	Pass
2	Go to: https://carpoolwith.me/	Test to see if the response to redirect users to the signup page from the “login” takes 2 seconds or less.	In the homepage, first click on “Login” in the top right, once there, click on “Don't have an account ? Sign Up”.	The user is redirected to the signup page within 2 seconds.	Pass	Pass	Pass	Pass
3	Go to: https://carpoolwith.me/	Test to see if the response for signing in is 2 seconds or less	In the homepage, select the “login” option on the	Once the user enters their information, and clicks on “sign in”	Pass	Pass	Pass	Pass

			top right corner and enter email and password (JJonthetrack@gmail.com, manapool) before clicking to sign in	button, it will take 2 seconds or less to get redirected to the home page				

Nonfunctional Requirement 19.2: Data shall be sent over https protocol.

Objective

The objective of testing this nonfunctional requirement is to ensure that https protocol is always being used for the transmission of data. This is important for data security and to protect user assets. This also verifies that carpoolwith.me has an active SSL certificate recognized at the browser and network level.

Setup

URLs of the system (or start screen) to be tested

carpoolwith.me

System Setup

Navigate to carpoolwith.me on desktop web in the browser being tested.

Test Environment

This will be tested live in production on carpoolwith.me on desktop web in all supported browsers.

Feature to be tested

This test confirms that all data and requests are being transmitted using https protocol.

Test Number	Setup	Description	Test Input	Expected Output	P/F: Chrome	P/F: Safari	P/F: Firefox	P/F: Duck Duck

								Go
1	Go to https://www.carpoolwith.me	When you get to the homepage click on the padlock and view the valid ssl certificate	Click the padlock and view ssl certificate.	A valid SSL certificate.	Pass	Pass	Pass	Pass
2	Go to: https://carpoolwith.me/	When on the homepage, click the link to check for the “https” that appears before the url to see that data is being sent over https.	Go to the site, click on the link, might have to click it twice, and it should reveal if the site has https.	“Https” should appear before the url when the url is clicked once or twice.	Pass	Pass	Pass	Pass
3	Go to: https://carpoolwith.me/	When on the homepage, right click on the page and select the security tab and then should validate that it is secure	On the link, right click the page the view the page source	Click on the security tab and it should validate that the page is secured	Pass	Pass	Pass	Pass

Nonfunctional Requirement 6.1: Web Application will have search functionality to assist users.

Objective

This test seeks to confirm that search functionality is currently operational and behaving as expected. Search is a core component of the site, and this feature not working would be considered a critical bug preventing users from utilizing its main service (for both drivers and passengers).

Setup

URLs of the system (or start screen) to be tested

carpoolwith.me

System Setup

Navigate to carpoolwith.me on desktop web in the browser being tested.

Test Environment

This will be tested live in production on carpoolwith.me on desktop web in all supported browsers.

Feature to be tested

This test confirms that searching for pools using the following filters works as expected:

- Search for pools by start zip code
- Search for pools by end zip code
- Search for pools by city

Test Numbe	Setup	Description	Test Input	Expect ed	P/F: Chrom	P/F: Safari	P/F: Firefox	P/F: Duck

r				Output	e			Duck Go
1	Navigate to carpoolwith.me	Tests functionality of searching for pools by start zip code.	Select “Starting Zipcode” from the pulldown and enter “94133” in the search bar. Click “Search”.	Pools are returned	Pass	Pass	Pass	Pass
2	Navigate to carpoolwith.me	Tests functionality of searching for pools by end zip code.	Select “Ending Zipcode” from the pulldown and enter “94103” in the search bar. Click “Search”.	Pools are returned	Pass	Pass	Pass	Pass
3	Navigate to	Tests functionality	Select	Pools are	Pass	Pass	Pass	Pass

	carpoolwith.me	of searching for pools by city.	“City” from the pulld own and enter “San Franc isco” in the searc h bar. Click “Sear ch”.	returne d				

Nonfunctional Requirement 8.1: Passwords shall be encrypted.

Objective

This test seeks to confirm that password encryption is functioning as expected to ensure the security of passwords stored at the database level.

Specifically, this set of tests manually replicates the BCrypt hashing algorithm to hash a password and ensure that the end result is the same as the one the system produces with the same password input (with exception to the salt, which is randomly generated for every unique password generated – confirming this random generation also functions is a core part of this test suite).

Setup

URLs of the system (or start screen) to be tested

carpoolwith.me/signup

System Setup

Navigate to carpoolwith.me on desktop web in the browser being tested.

Test Environment

This will be tested live in production on carpoolwith.me on desktop web in all supported browsers.

Feature to be tested

This test confirms that the following aspects of password encryption work as expected:

- Password hashing
- Secure password storage
- Random salt generation

Test #	Setup	Description	Test Input:	Expected Output	P/F:

1	Go to: https://www.carpoolwith.me/signup	When a user signs up as a Pool user, confirm that a hash is stored in the password table in the database and not the characters of the password.	Password entered: manapool	Password Hash: $2a$10$3QhEsBRh3f8LupWS0HqQkOclSy/DYJTgx6YKMoTLsPybqRDlwJEiq	Pass
2	Go to: https://www.carpoolwith.me/signup	Confirm that a user can sign in with their text password: so the password can be matched to the hash for user sign in.	Password entered: manapool	User is able to sign in with the correct password and is unable to sign in with the incorrect password.	Pass
3	Go to: https://www.carpoolwith.me/signup	Create two new accounts with the same password. Each password hash stored in the database should be different ,although the same password has been used, because we are using a different salt for the hash each time a password is encrypted.	Password entered: abc123	Hash #1: $2a$10$1LWorToGCqqmjGWQZlpuYuD7.BhB9XMdKt0Tj2GTVLaFL6pIB.Lpy Hash #2: $2a$10$ZCosaPzS7n4M/lsbcry8Xey9NEGW9tMyE8A.lqDkASggNlJ9Q1lzm	Pass

4. Code Review

Coding Style

We pair program very regularly as a team, it is how we share knowledge across different corners of our application. Our code base leverages a microservices architecture, with a separate backend and frontend app. The coding style is defined by the following patterns within each app and framework:

Backend Code

- Java / Spring
    - Camel case
    - Indent using spaces
    - Tab size = four spaces

Frontend Code

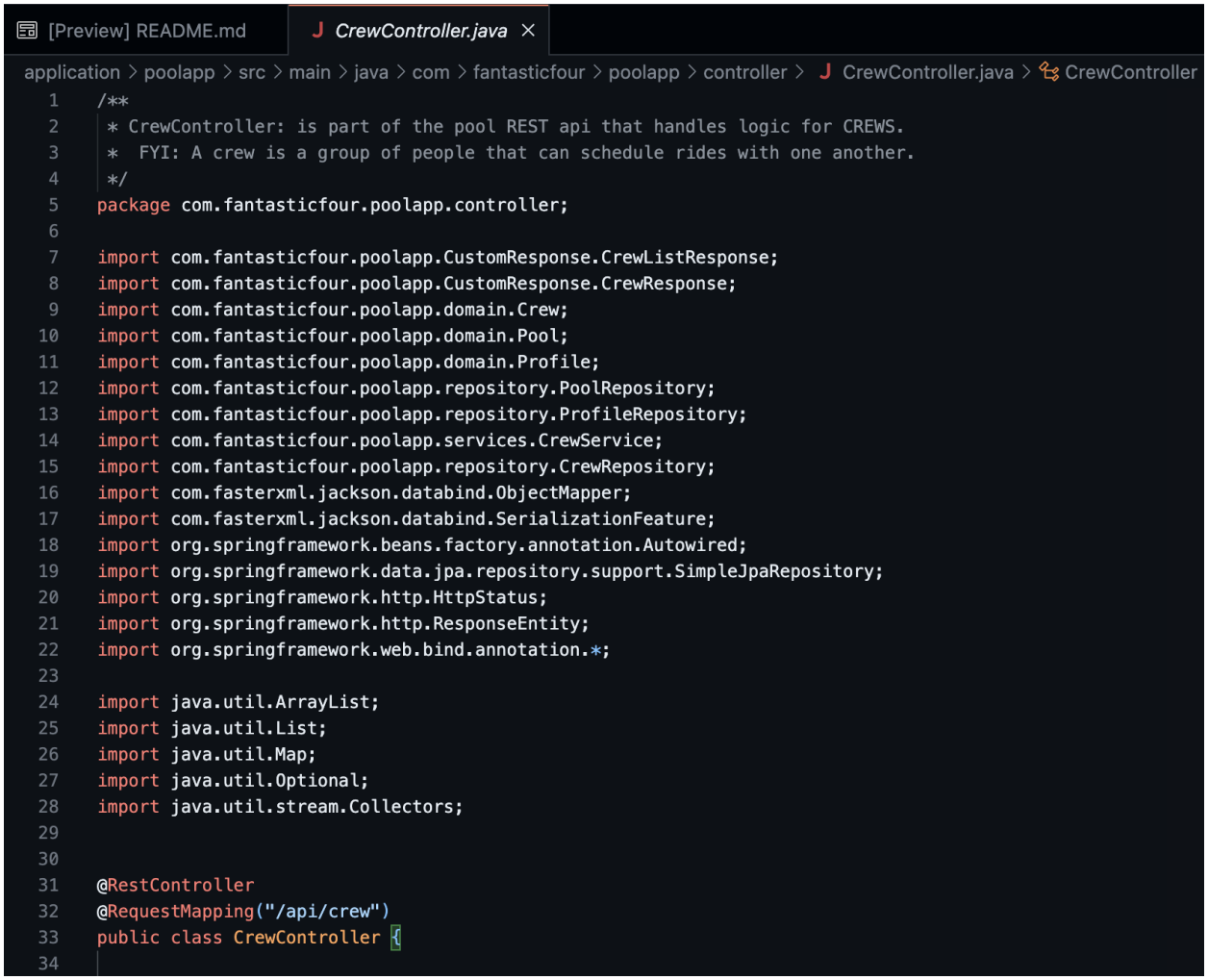
- React.js
    - Camel case
    - Indent using spaces
    - Tab size = two spaces

Database

- MySQL (JPA)

Choose the Code for Review

The crew controller was chosen for review because it plays an essential role in the crew feature, which is the focus of our usability test. From crew creation, posting a pool privately to a crew, to leaving a crew, the crew controller makes it all possible. The crew controller can be thought of as the glue between the database, backend, and frontend systems related to the crew entity and function.



```
34
35      @Autowired
36      private CrewService crewService;
37
38      @Autowired
39      private CrewRepository crewRepository;
40
41      @Autowired
42      private ProfileRepository profileRepository;
43
44      @Autowired
45      private PoolRepository poolRepository;
46
47      /**
48       * Create a crew entity.
49       * @param crew from json request body.
50       * @return ResponseEntity<Crew>
51       */
52      @PostMapping({"", "/"})
53      public ResponseEntity<Crew> addCrew(@RequestBody Crew crew) {
54          Crew newCrew = crewService.addCrew(crew);
55          return new ResponseEntity<>(newCrew, HttpStatus.CREATED);
56      }
57
58      /**
59       * Retrieves crews certain profiles are a member of.
60       * @param profileId
61       * @return a list of crew entities the user is a member of.
62       */
63      @GetMapping("/{id}")
64      public ResponseEntity<List<CrewResponse>> getCrewById(@PathVariable("id") int profileId) {
65
66          CrewListResponse crewListResponse = new CrewListResponse();
67          List<CrewResponse> crewResponselist = new ArrayList<>();
68
```

```
69          //get crews by profile id
70          List<Crew> crews = crewService.getCrewByProfileId(profileId).stream()
71                                        .filter(Optional::isPresent)
72                                        .map(Optional::get)
73                                        .collect(Collectors.toList());
74
75          //build a custom http response body
76          if(!crews.isEmpty()){
77              for (Crew crew: crews
78                   ) {
79                  CrewResponse crewResponse = new CrewResponse();
80                  crewResponse.setCrewId(crew.getCrewId());
81                  crewResponse.setDescription(crew.getDescription());
82                  if ((crew.getMember1() != null)) {
83                      crewResponse.setOneMember(crew.getMember1());
84                  } else {
85                      System.out.println("User does not Exist");
86                  }
87                  if ((crew.getMember2() != null)) {
88                      crewResponse.setOneMember(crew.getMember2());
89                  } else {
90                      System.out.println("User does not Exist");
91                  }
92                  if ((crew.getMember3() != null)) {
93                      crewResponse.setOneMember(crew.getMember3());
94                  } else {
95                      System.out.println("User does not Exist");
96                  }
97                  if((crew.getCreator() != null)) {
98                      crewResponse.setOneMember(crew.getCreator());
99                  } else {
100                     System.out.println("User does not Exist");
101                 }
102                 crewResponselist.add(crewResponse);
103             }
```

```
104             return new ResponseEntity<>(crewResponselist,HttpStatus.OK);
105         }
106         else{
107             return new ResponseEntity<>(null,HttpStatus.OK);
108         }
109     }
110 
111     /**
112      * Get all crews in the database
113      * @return A list of all the crews in the DB.
114      */
115     @GetMapping({"", "/"})
116     public ResponseEntity<List<Crew>> getAllCrews() {
117         List<Crew> crews = crewService.getAllCrews();
118         if (crews.isEmpty()) {
119             return new ResponseEntity<>(null, HttpStatus.OK);
120         }
121         return new ResponseEntity<>(crews, HttpStatus.OK);
122     }
123 
124     /**
125      * Updates members of an existing crew.
126      * @param id (crew id)
127      * @param crew
128      * @return A json response body of the updated crew.
129      */
130     @PutMapping("/{id}")
131     public ResponseEntity<Crew> updateCrew(@PathVariable("id") int id, @RequestBody Crew crew) {
132         Optional<Crew> currentCrew = crewService.getCrewById(id);
133         if (currentCrew.isPresent()) {
134             Crew updatedCrew = crewService.updateCrew(crew);
135             return new ResponseEntity<>(updatedCrew, HttpStatus.OK);
136         } else {
137             return new ResponseEntity<>(HttpStatus.NOT_FOUND);
138         }
```

```
139     }
140
141
142     /**
143      * Removes a single member of a crew, if the member of the crew removed is also the
144      * creator then the entire crew entity is deleted.
145      * @param jsonMap : json request body with profileID and crewID.
146      * @return String in json response body whether removal is successful or not.
147      */
148     @DeleteMapping("/remove/member")
149     public ResponseEntity<?> deleteUser(@RequestBody Map<String, Object> jsonMap) {
150         jsonMap.forEach((key, value) -> System.out.println("Key: " + key + ", Value: " + value));
151         System.out.println("we are in the remove member function");
152         if(jsonMap.isEmpty()){
153             return new ResponseEntity<>(HttpStatus.NO_CONTENT);
154         }
155
156         int profileId = (int)jsonMap.get("profileId");
157         int crewId = (int)jsonMap.get("crew_id");
158
159
160         Optional<Crew> optionalCrew = crewRepository.findById(crewId);
161
162         if(!optionalCrew.isPresent()){
163             return new ResponseEntity<>("Crew not found", HttpStatus.NOT_FOUND);
164         }
165
166         Crew crew = optionalCrew.get();
167
168         //if profileId called is the creator, delete the entire crew
169         //if not, remove profile from crew
170
171         boolean isDeleted = false;
172         if(crew.getCreator() != null && profileId == crew.getCreator().getProfileId()){
173             deleteCrew(crew.getCrewId());
```

```
175             //set pool created to 0 after creator is deleted. because crew is deleted when creator deletes a crew.
176             Optional<Pool> optionalPool = poolRepository.findById(crew.getOriginPoolId());
177             if (optionalPool.isPresent()) {
178                 Pool originalPool = optionalPool.get();
179                 originalPool.setCrewCreated(false);
180                 poolRepository.save(originalPool);
181             }else {
182                 System.out.println("origin pool id does not exist to toggle crew_created field");
183             }
184 
185             return new ResponseEntity<>("Crew deleted", HttpStatus.OK);
186         }
187 
188         /**
189          * Deleting crew members based on profile ID
190          */
191         if(crew.getMember1() != null && crew.getMember1().getProfileId() == profileId){
192             crew.setMember1(null);
193             isDeleted = true;
194         }
195         if(crew.getMember2() != null && crew.getMember2().getProfileId() == profileId){
196             crew.setMember2(null);
197             isDeleted = true;
198         }
199         if(crew.getMember3() != null && crew.getMember3().getProfileId() == profileId){
200             crew.setMember3(null);
201             isDeleted = true;
202         }
203         if(crew.getCreator() != null && crew.getCreator().getProfileId() == profileId){
204             crew.setCreator(null);
205             isDeleted = true;
206         }
207 
208         if(isDeleted){
209             crewRepository.save(crew);
```

```
213             return new ResponseEntity<>("Profile with id" + profileId + "not found", HttpStatus.NOT_FOUND);
214         }
215     }
216 
217     /**
218      * Delete a crew entity.
219      * @param id (Crew ID)
220      * @return no content returned on deletion.
221      */
222     @DeleteMapping("/{id:[\\d]+}") //"/{id}" regex to make pathing more specific, only accepts integers.
223     public ResponseEntity<Void> deleteCrew(@PathVariable("id") int id) {
224         crewService.deleteCrew(id);
225         return new ResponseEntity<>(HttpStatus.NO_CONTENT);
226     }
227 
228     /**
229      * Create a crew from from a previous pool id(carpoool id). Member of the pool will be the
230      * new members of the crew.
231      * @param jsonMap keys including the pool_id and creator of the crew.
232      * @return a json return body confirming if new crew is created or not.
233      */
234     @PostMapping("/createcrew")
235     public ResponseEntity<?> createCrew(@RequestBody Map<String,Object> jsonMap){
236         jsonMap.forEach((key, value) -> System.out.println("Key: " + key + ", Value: " + value));
237 
238         // Checking is request body is empty
239         if(jsonMap.isEmpty()){
240             return new ResponseEntity<>("Nothing in Json Body", HttpStatus.NO_CONTENT);
241         }
242         boolean profileExists = false;
243         Profile creator_id;
244         Profile member1_id;
245         Profile member2_id;
246         Profile member3_id;
247         int originPoolId;
```

```
249             Crew crew = new Crew();
250             Pool pool = new Pool();
251 
252             // Create crew from original pool
253             if(jsonMap.get("origin_pool_id") != null){
254                 originPoolId = (int)jsonMap.get("origin_pool_id");
255                 Optional<Pool> optionalPool = poolRepository.findPoolByPoolId(originPoolId);
256                 if(optionalPool.isPresent()){
257                     pool = optionalPool.get();
258                     pool.setCrewCreated(true);
259                     poolRepository.save(pool);
260                     crew.setOriginPoolId((int)jsonMap.get("origin_pool_id"));
261                 }
262             }
263 
264             //checks for existing profileId
265             if(jsonMap.get("creator_id") != null){
266                 int creatorid = (int)jsonMap.get("creator_id");
267                 Optional<Profile> creator = profileRepository.findProfileByProfileId(creatorid);
268                 if(creator.isPresent()){
269                     creator_id = creator.get();
270                     crew.setCreator(creator_id);
271                     profileExists = true;
272                 }
273             }
274 
275             // Setting members in a crew
276             if(pool.getMember1() != null){
277                 member1_id = pool.getMember1();
278                 crew.setMember1(member1_id);
279                 profileExists = true;
280             }
281             if(pool.getMember2() != null){
282                 member2_id = pool.getMember1();
283                 crew.setMember2(member2_id);
```

```
284                 profileExists = true;
285             }
286             if(pool.getMember3() != null){
287                 member3_id = pool.getMember1();
288                 crew.setMember3(member3_id);
289                 profileExists = true;
290             }
291             crew.setDescription(pool.getDescription());
292 
293 
294             if(profileExists){
295                 crewRepository.save(crew);
296                 return new ResponseEntity<>("Crew created", HttpStatus.OK);
297             }
298 
299             else{
300                 return new ResponseEntity<>("Profile(s) do not exist, crew cannot be created", HttpStatus.NOT_FOUND);
301             }
302 
303     }
304 }
```

Internal Code Review

- Removing unused imports, such as those on lines 16, 17, and 19, would be good practice.
- The controller correctly uses field injection with @Autowired annotations (lines 36-45), but we should consider using constructor injection for better testability to follow Spring's framework practices.
- addCrew (lines 48-56) properly uses an HTTP status of 'CREATED' upon successfully adding a new crew (line 55).
- getCrewById (lines 58-109) is well-structured, but it should be able to handle potential 'null' values better. Instead of printing to the console (lines 85, 90, 95, 100), we could use a logger and return meaningful response to the client.
- getAllCrews (lines 115-121) correctly handles cases where no crews are found by returning an empty list rather than a 'null.'
- updateCrew (lines 130-139) properly checks if the crew exists before attempting an update, if the crew is not found, it correctly responds with an HTTP status of 'NOT_FOUND.'
- deleteUser (lines 142-214) provides logic for removing a crew member or an entire crew, depending on the request. However, lines 152 and 183 show that there are direct console outputs that are used for debugging purposes, which should be replaced with a proper logger to return actual response to the client.
- deleteCrew (lines 222-226) uses the correct HTTP status response of 'NO_CONTENT' when a deletion is successful (line 225).
- createCrew (lines 234-303) checks if the request body is empty and returns early if it is (lines 238-241), this is good in practice.
- On lines 282 and 287, there seems to be a bug where member2_id and member3_id are set to pool.getMember1() instead of pool.getMember2() and pool.getMember3() respectively.
- On line 296, consider using HTTP status 'CREATED' instead of 'OK' to state that a new resource is being created.

External Code Review *Conducted by Jeremy Tran's team*

"CrewController" class looks to be well-organized and does well at setting up endpoints for managing crews. I thought that all the methods are clear and well-commented. Overall, it was very easy to follow along and understand what was going on. There are a few areas that I think could be improved on.

- The error handling I think could be better such as on updateCrew where it assume the requested resource exists. It should handle cases where the resource isn't there.
- Response from the server has a very general type 'ResponseEntity<?>'. I think it could be more clear what kind of data type you're handling.
- There's repeated code in createCrew, maybe make it into a function so it's not duplicated.
- API paths are mostly consistent but ones like '/remove/member' moves away from your pattern.
- There are use of 'System.out.println' which shouldn't be there but I assume these will be removed during final submission.

5. Self Check on Best Practices for Security

Major Protected Assets

Pool secures major protected assets such as user information including but not limited to emails, phone numbers and email addresses using several methods:

- HTTPS (SSL/TLS) provided by “Let's Encrypt” is used to encrypt data transmitted by the client and server.
- Spring Security Module in conjunction with JSON Web Tokens (JWT) is used to secure Pool application API’s from being accessed without proper authentication.
- User input is validated on the front-end and back-end to avoid injection attacks.
- Pool does not log sensitive user data in application error logs or return user information in error messages.

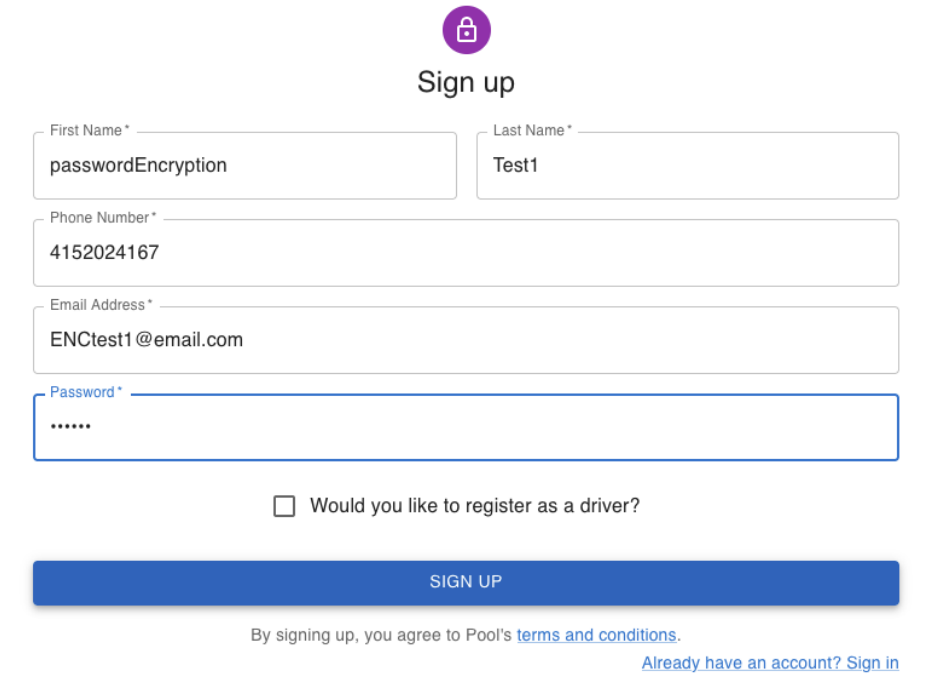
Password Encryption

The Pool application uses the BCrypt hashing algorithm provided by the Spring Security Cryptography Module to secure user passwords by hashing plain text passwords and only storing the resulting hash in the password table in the database. BCrypt generates a random salt each time a password is hashed so even two identical passwords should have different hashes stored in the database.

Example of user signing up and the resulting database entry:

Password: abc123

See next page for screenshots:




```
10  SELECT
11      u.user_id, u.email,
12      p.password
13  FROM
14      account a
15      JOIN user u ON a.user_id = u.user_id
16      JOIN password p ON a.password_id = p.password_id;
```

0% 25:11

Result Grid Filter Rows: Search Export:

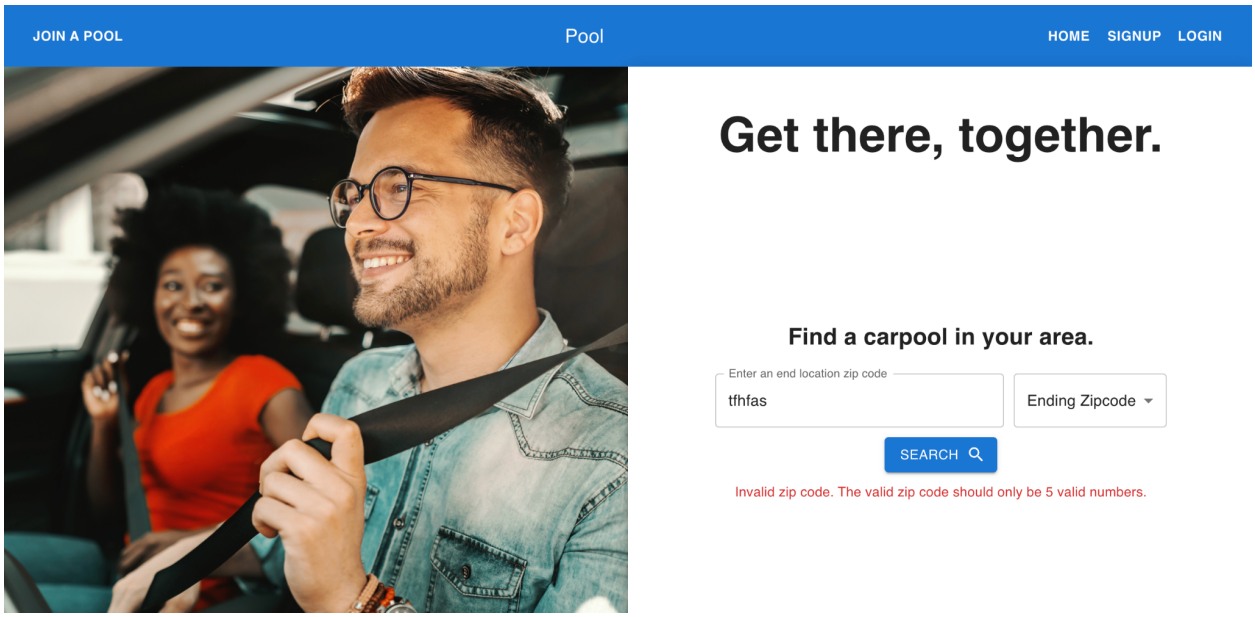
user_id	email	password
718	duyanh120115tm@gmail.com	$2a$10$2HiisGvhVFB8/oU8mgyXz.RfZksqbJXFeig9L/fKA40ELcRzojKpe
719	lyla@yopmail.com	$2a$10$lzD1LknnO.6oP4KTejmAjucbfAmcJ62gOn.US3.gw0PoLuXdADLDS
721	ENCtest1@email.com	$2a$10$1LWorToGCqqmjGWQZlpuYuD7.BhB9XMdKt0Tj2GTVLaFL6plB.Lpy

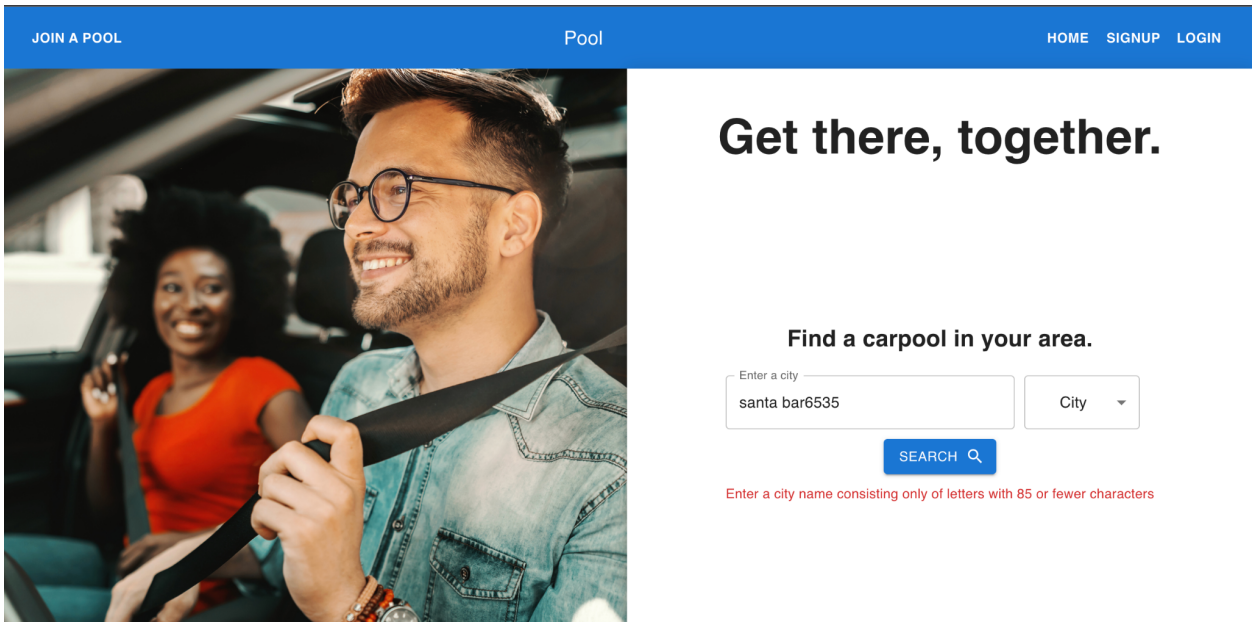
Result 6

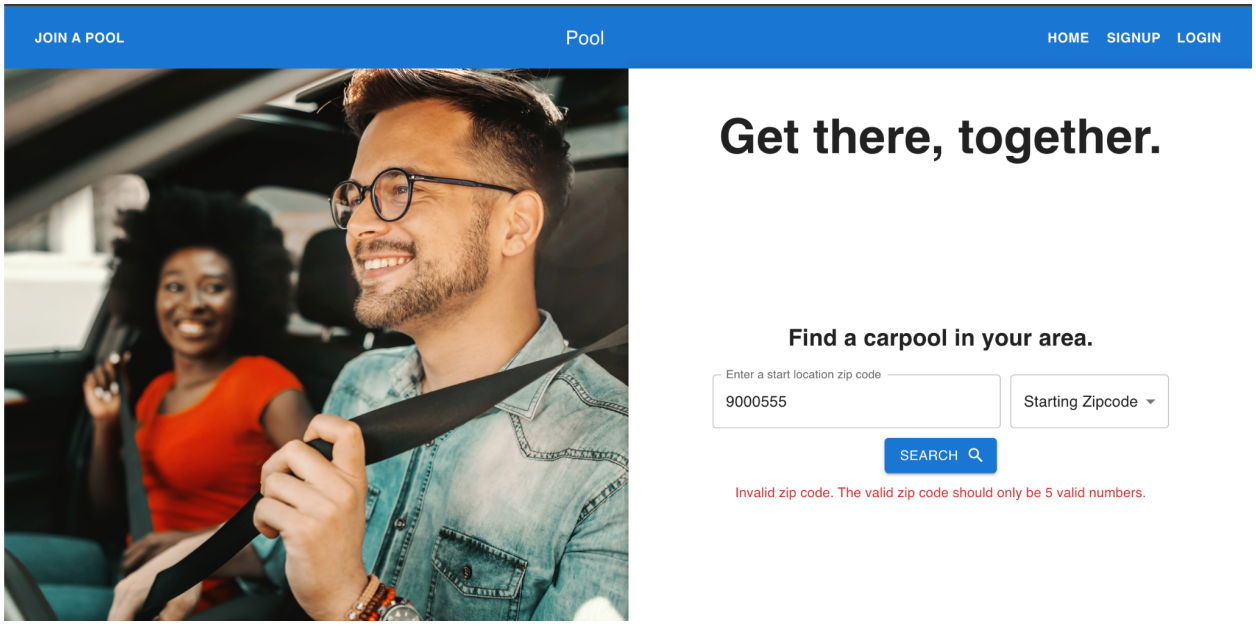
Input Validation

Home (carpoolwith.me)

Frontend Home screen - search bar input validation for zip code and city:








```
Nguyen Xuan Duy Anh, last week | 2 authors (Nguyen Xuan Duy Anh and others)
export function isZipCodeValid(input) {
  const regex =
    /^(?!0{5}|1{5}|2{5}|3{5}|4{5}|5{5}|6{5}|7{5}|8{5}|9{5})\d{5}(-\d{4})?$/;

  if (input.length !== 5) {
    return false;
  }

  return regex.test(input);
}
```

```
export function isCityNameValid(input) {
  var regex = /^[A-Za-z ]+$/;

  if (input.length > 85) {
    return false;
  }

  return regex.test(input);
}
```

```
const handleKeyDown = (event) => {
  if (event.key === "Enter") {
    if (!filterOption) {
      setError(true);
      return;
    }
    setError(false);

    let hasError = false;

    if (
      (filterOption === "startZip" || filterOption === "endZip") &&
      !isZipCodeValid(searchQuery)
    ) {
      setZipCodeError(true);
      hasError = true;
    } else {
      setZipCodeError(false);
    }

    if (filterOption === "city" && !isCityNameValid(searchQuery)) {
      setCityNameError(true);
      hasError = true;
    } else {
      setCityNameError(false);
    }

    if (!hasError) {
      setHasSearched(true);
      onSearch({ searchQuery, filterOption });
    }
  }
};
```

```
const handleClick = () => {
  if (!filterOption) {
    setError(true);
    return;
  }
  setError(false);

  let hasError = false;

  if (
    (filterOption === "startZip" || filterOption === "endZip") &&
    !isZipCodeValid(searchQuery)
  ) {
    setZipCodeError(true);
    hasError = true;
  } else {
    setZipCodeError(false);
  }

  if (filterOption === "city" && !isCityNameValid(searchQuery)) {
    setCityNameError(true);
    hasError = true;
  } else {
    setCityNameError(false);
  }

  if (!hasError) {
    setHasSearched(true);
    onSearch({ searchQuery, filterOption });
  }
};
```

```
        <MenuItem value="" disabled>
          Select
        </MenuItem>
        <MenuItem value="startZip">Starting Zipcode</MenuItem>
        <MenuItem value="endZip">Ending Zipcode</MenuItem>
        <MenuItem value="city">City</MenuItem>
      </Select>
    </div>
    <Button
      variant="contained"
      color="primary"
      endIcon={<SearchIcon />}
      onClick={handleClick}
      style={{ marginTop: "10px", marginBottom: "10px" }}
    >
      Search
    </Button>
    {(error || zipCodeError || cityNameError) && (
      <Typography color="error" variant="body2">
        {error && "Please select an option before searching."}
        {zipCodeError &&
          "Invalid zip code. The valid zip code should only be 5 valid numbers."}
        {cityNameError &&
          "Enter a city name consisting only of letters with 85 or fewer characters"}
      </Typography>
    )}
  </div>
);
```

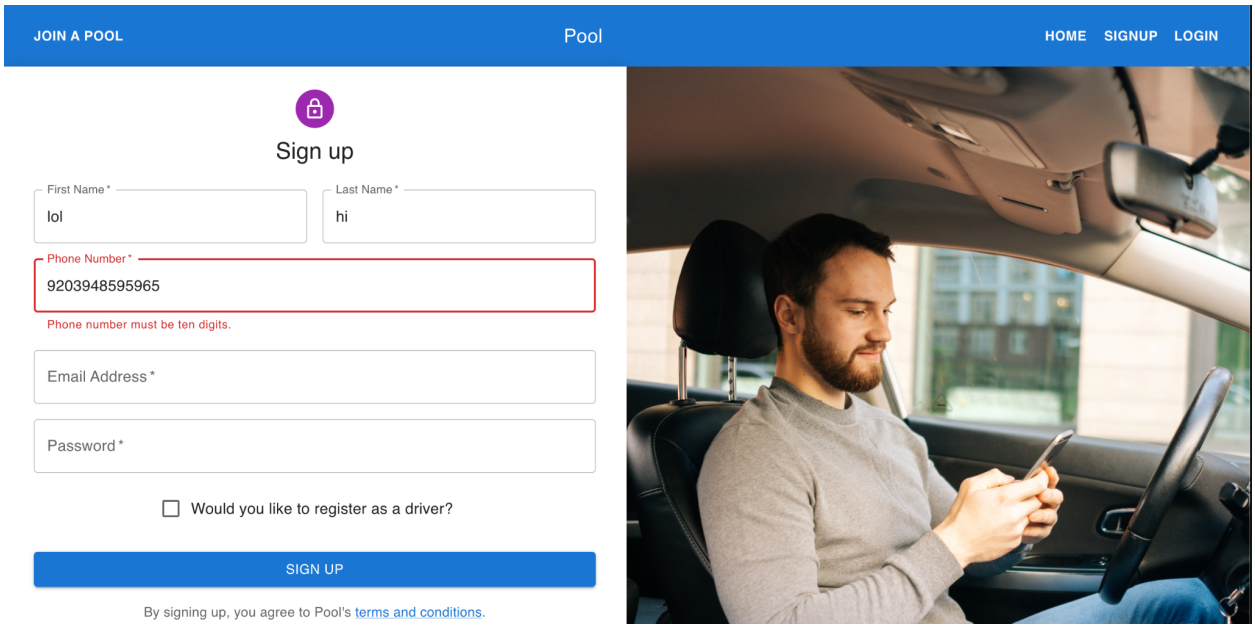
Backend Home screen - search bar input validations for zip code and city:

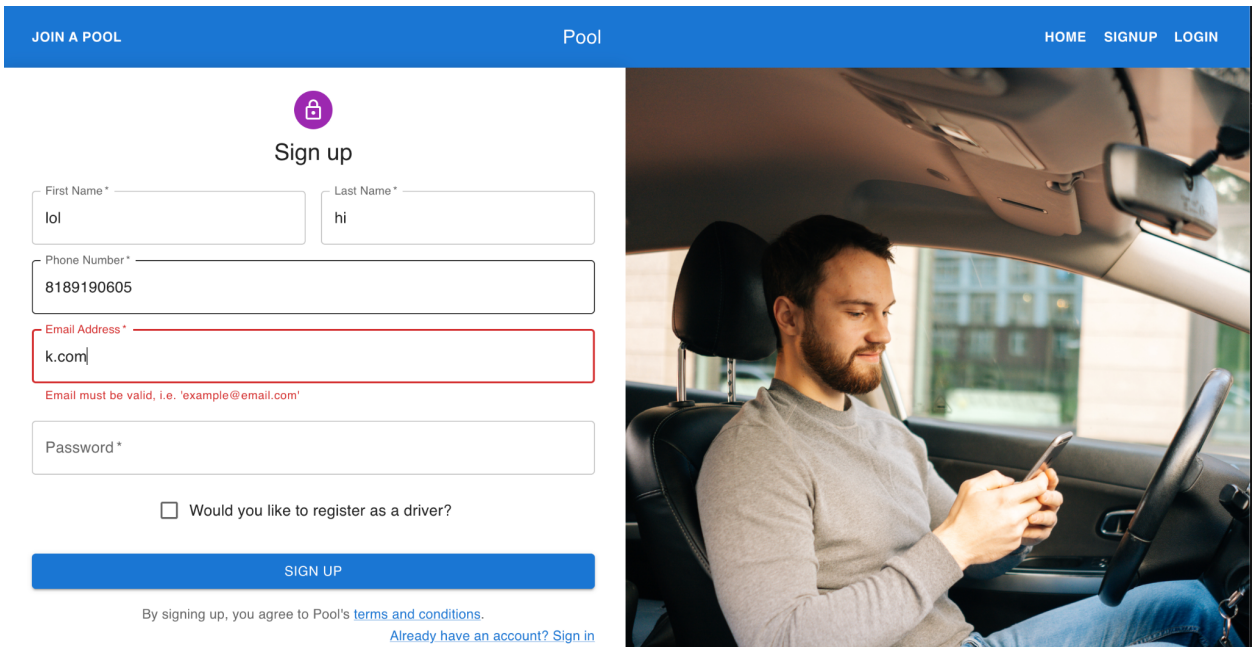
```
1 usage   kkrstchn +1
public CityValidationEnum cityInputValidation(String city) {
    if(city == null || city.isBlank()) {
        return CityValidationEnum.CITY_HAS_BLANK_NAME;
    } else if (!city.matches( regex: "^[a-zA-Z\\- ]+$")) { // Allows alphabetic chars, hyphens, and spaces
        return CityValidationEnum.CITY_NAME_CONTAINS_NON_ALPHA_CHARS;
    } else if (city.length() > 85) {
        return CityValidationEnum.CITY_NAME_TOO_LONG;
    }
    return CityValidationEnum.CITY_IS_VALID;
}
```

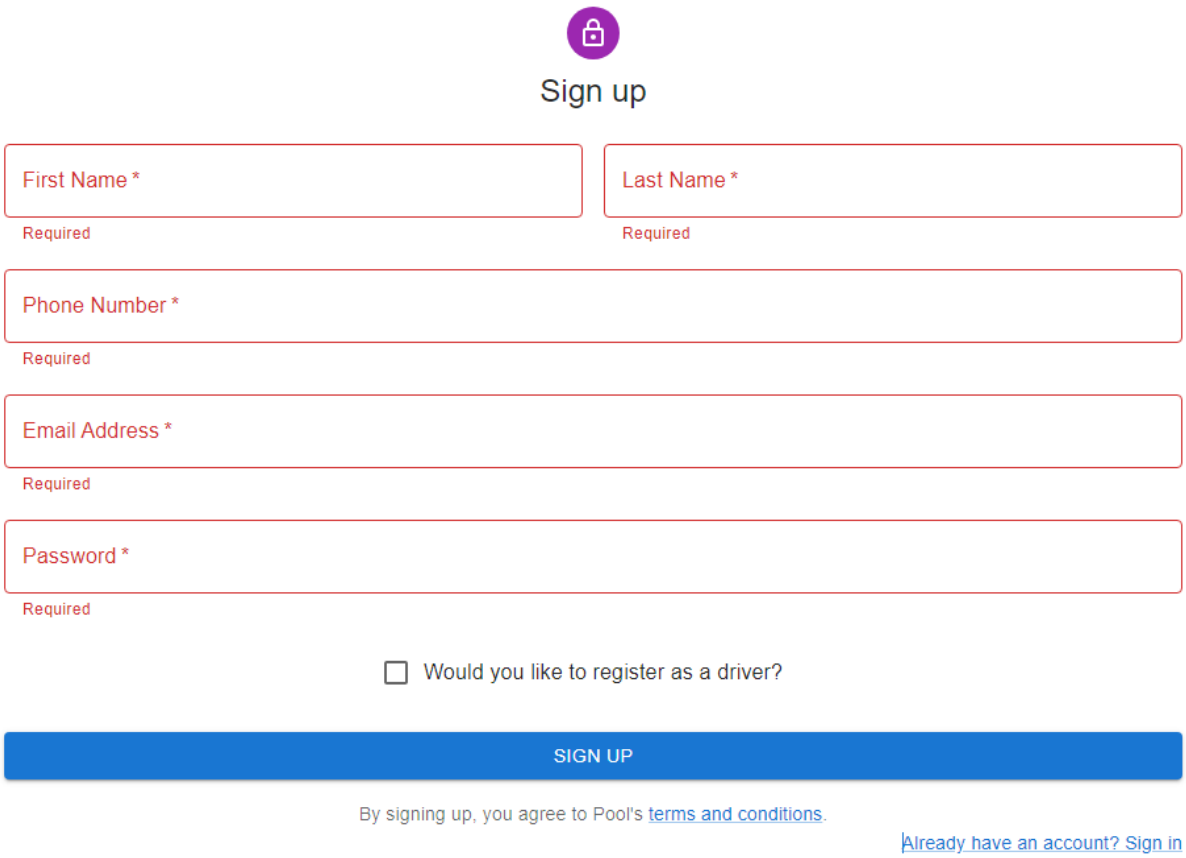
```
2 usages   kkrstchn
public ZipCodeValidationEnum zipcodeValidation (String zipcode) {
    System.out.println("zip validaztion, in zip service: " + zipcode);
    if (zipcode == null || zipcode.isBlank()) {
        return ZipCodeValidationEnum.BLANK_ZIP;
    }else if (!zipcode.matches( regex: "^[0-9]+$")) {
        return ZipCodeValidationEnum.HAS_NON_NUMERIC_CHAR;
    } else if (zipcode.length() != 5) {
        return ZipCodeValidationEnum.ZIP_DOES_NOT_HAVE_CORRECT_LENGTH;
    }

    return ZipCodeValidationEnum.VALID_ZIP;
}
```

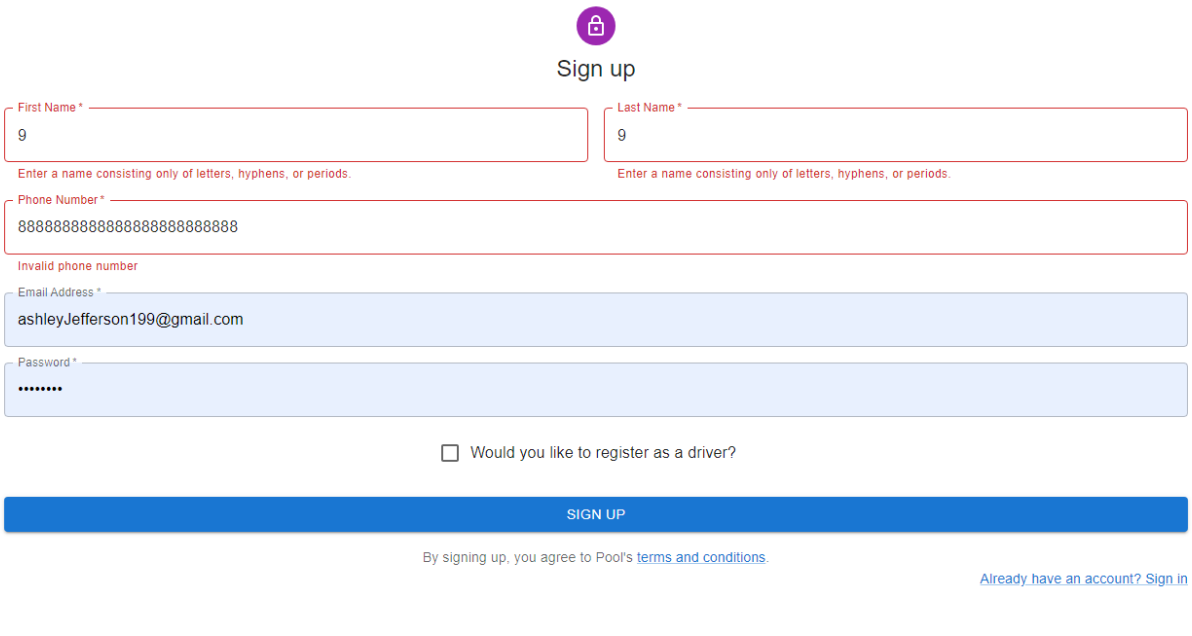
Sign up screen (carpoolwith.me/signup)

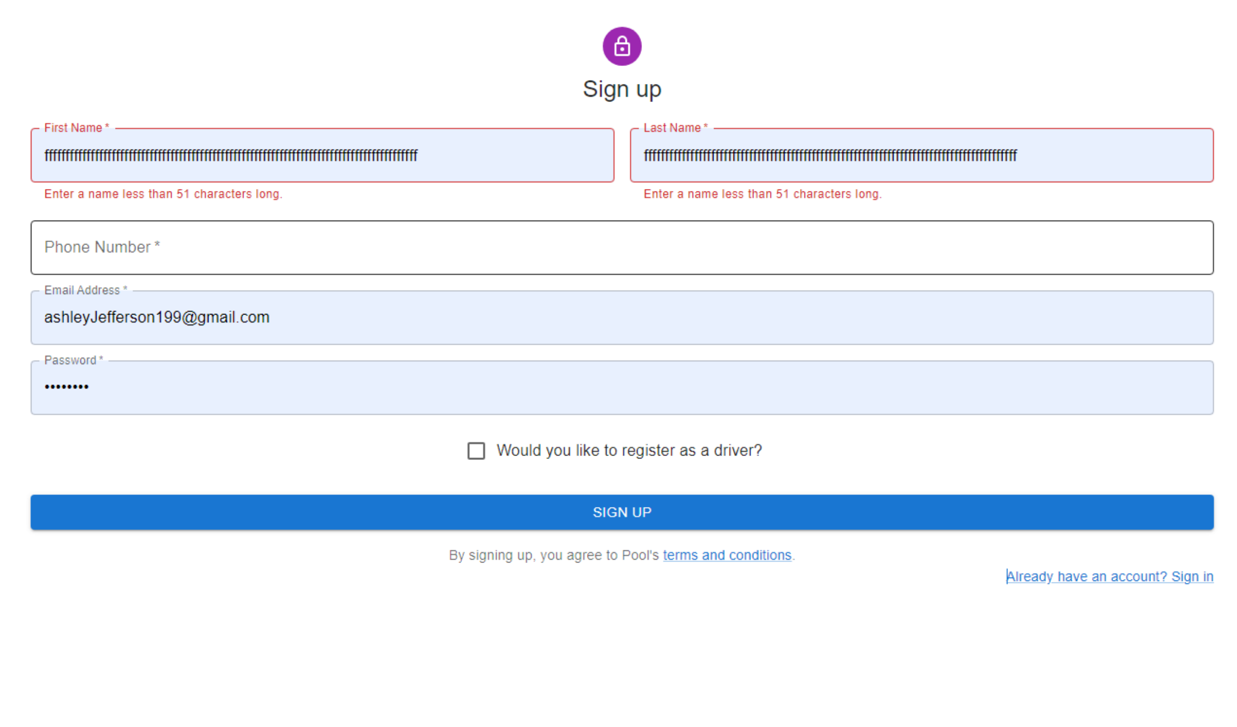
Frontend validations (first name, last name, phone number, email, password):






Sign up
First Name *
Required
Last Name *
Required
Phone Number *
Required
Email Address *
Required
Password *
Required
Would you like to register as a driver?
SIGN UP
By signing up, you agree to Pool's terms and conditions.
Already have an account? Sign in


Sign up
First Name *
9
Enter a name consisting only of letters, hyphens, or periods.
Last Name *
9
Enter a name consisting only of letters, hyphens, or periods.
Phone Number *
88888888888888888888888
Invalid phone number
Email Address *
ashleyJefferson199@gmail.com
Password *
••••••••
Would you like to register as a driver?
SIGN UP
By signing up, you agree to Pool's terms and conditions.
Already have an account? Sign in


Sign up
First Name *
Last Name *
Enter a name less than 51 characters long.
Enter a name less than 51 characters long.
Phone Number *
Email Address *
ashleyJefferson199@gmail.com
Password *
Would you like to register as a driver?
SIGN UP
By signing up, you agree to Pool's terms and conditions.
Already have an account? Sign in

```
if (firstName.length > 50) {
  setFirstNameError("Enter a name less than 51 characters long.");
  return;
} else {
  setFirstNameError(null);
}
if (lastName.length > 50) {
  setLastNameError("Enter a name less than 51 characters long.");
  return;
} else {
  setLastNameError(null);
}
const firstNameRegex = /^[a-zA-Z.-]+$/;
if (!firstNameRegex.test(firstName)) {
  setFirstNameCharError("Enter a name consisting only of letters, hyphens, or periods.");
  return;
} else {
  setFirstNameCharError(null);
}
const lastNameRegex = /^[a-zA-Z.-]+$/;
if (!lastNameRegex.test(lastName)) {
  setLastNameCharError("Enter a name consisting only of letters, hyphens, or periods.");
  return;
} else {
  setLastNameCharError(null);
}
const requestBody = {
  firstName,
  lastName,
  phoneNumber,
  email,
  password,
  fasTrakVerification,
  driversLicense,
  role: driversLicense ? "driver" : "passenger",
};
```

```
if (!isPhoneNumberValid(phoneNumber)) {
  setPhoneError("Invalid phone number");
  return;
} else {
  setPhoneError(false);
}

if (driversLicense) {
  if (!licenseRegex.test(driversLicense)) {
    setLicenseError("Invalid license");
    return;
  } else {
    setLicenseError(false);
  }
}

if (!email || !emailRegex.test(email)) {
  setEmailError("Invalid email");
  return;
} else {
  setEmailError(false);
}

if (!agreeTerms) {
  setAgreeTermsError(
    "You must agree to the Terms and Conditions to continue."
  );
  return;
} else {
  setAgreeTermsError(null);
}
```

```
export function isPhoneNumberValid(input) {
  //check if it has 10 characters
  console.log("aaaa", !/^\d{10}$/.test(input));
  if (!/^\d{10}$/.test(input)) {
    return "Phone number must be ten digits.";
  }

  //check if input isnt null
  if (input === null) {
    return;
  }
      You, yesterday • Uncommitted changes

  //checking for list validation
  if (input === "1234567890") {
    return "Phone number can't be 1234567890";
  }

  //checking for repeated characters
  if (/^(\d)\1{9}$/.test(input)) {
    return "Phone number can not consist of ten identical numbers.";
  }

  //first or 4th cant be 0 or 1
  if (
    input[0] === "0" ||
    input[0] === "1" ||
    input[3] === "0" ||
    input[3] === "1"
  ) {
    return "First or fourth digit can not be 0 or 1";
  }
  return;
}

```

```
if (isPhoneNumberValid(phoneNumber)) {
  setPhoneError(isPhoneNumberValid(phoneNumber));
  return;
} else {
  setPhoneError(false);
}
```

```
const emailRegex = /^[\w-\.]+@([\w-]+\.)+[\w-]{2,4}$/;
if (!emailRegex.test(email)) {
  setEmailError("Email must be valid, i.e. 'example@email.com'");
  return;
} else {
  setEmailError(null);
}
```

Backend validation for signup api:

```
1 usage  kkrstchn
public SignUpValidationEnum signUpValidation (String signUpKey, String signUpValue) {
    if (signUpValue == null || signUpValue.isBlank()) {
        return SignUpValidationEnum.IS_EMPTY;
    }
    if (signUpKey.equals("firstName") || signUpKey.equals("lastName")) {
        SignUpValidationEnum signUpValidationEnum = validateUserName(signUpValue);
        if (signUpValidationEnum != SignUpValidationEnum.IS_VALID) {
            return signUpValidationEnum;
        }
    }
    if (signUpKey.equals("phoneNumber")) {
        SignUpValidationEnum signUpValidationEnum = validatePhoneNumber(signUpValue);
        if (signUpValidationEnum != SignUpValidationEnum.IS_VALID) {
            return signUpValidationEnum;
        }
    }
    return SignUpValidationEnum.IS_VALID;
}
```

```
1 usage  kkrstchn
private SignUpValidationEnum validateUserName  (String name) {
    if (name == null || name.isBlank()) {
        return SignUpValidationEnum.IS_EMPTY;
    } else if (name.length() > 50) {
        return SignUpValidationEnum.IS_LONGER_THAN_50_CHAR;
    } else if (!name.matches( regex: "^[a-zA-Z-.]+$")) { //matches letters, hyphens and periods in names
        return SignUpValidationEnum.INVALID_CHARACTERS_OTHER_THAN_HYPHEN_OR_PERIOD;
    }
    return SignUpValidationEnum.IS_VALID;
}
```

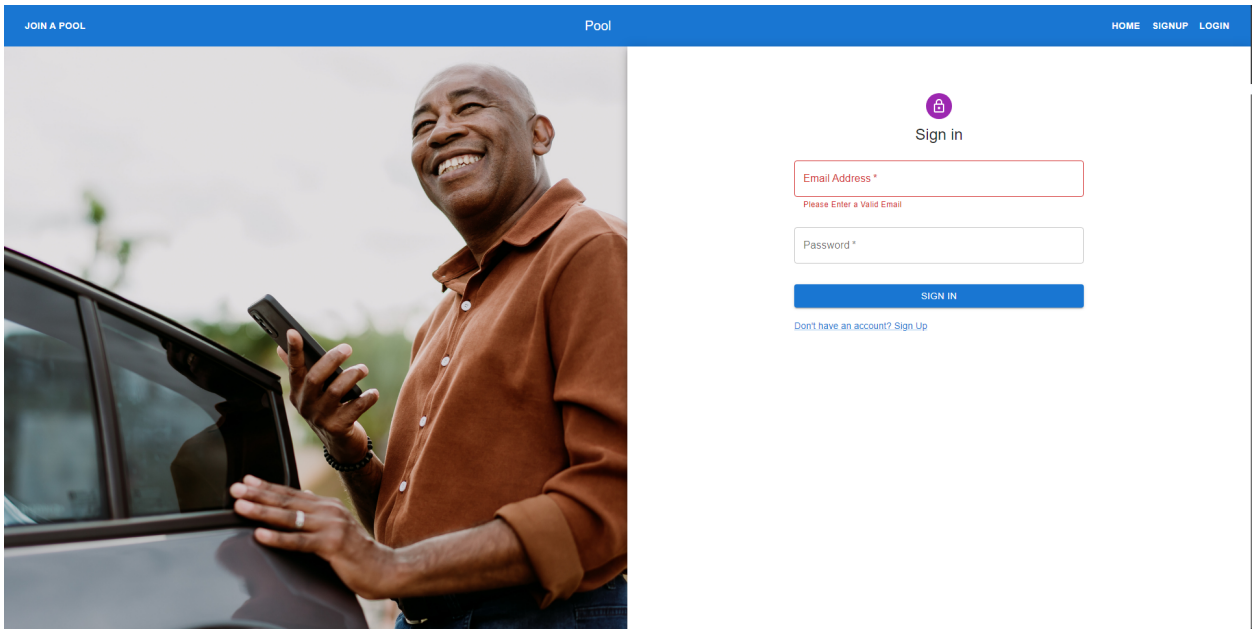
```
1 usage   kkrstchn *
private SignUpValidationEnum validatePhoneNumber(String phoneNumber) {
    if (phoneNumber == null || phoneNumber.isBlank()) {
        return SignUpValidationEnum.IS_EMPTY;
    } else if (phoneNumber.length() != 10) {
        return SignUpValidationEnum.PHONE_NUMBER_MUST_BE_LENGTH_0F_10_CHARACTERS;
    } else if (!phoneNumber.matches( regex: "^[0-9]+$")) {
        return SignUpValidationEnum.PHONE_NUMBER_MUST_CONSIST_OF_ONLY_NUMBERS;
    } else if (phoneNumber.matches( regex: "^(.)\\1+$")) {
        //phone number is one duplicate character repeating
        return SignUpValidationEnum.PHONE_NUMBER_COMPOSED_OF_DUPLICATE_CHARACTERS;
    } else if (isSequential(phoneNumber)) {
        return SignUpValidationEnum.NON_SEQUENTIAL_PHONE_NUMBER_REQUIRED;
    } else if (phoneNumber.matches( regex: "^(?:[01].{2}.|...[01]).*$")) {
        //area code validation 1st and 4th digit are 0 or 1 is invalid
        return SignUpValidationEnum.AREA_CODE_INVALID;
    }
    return SignUpValidationEnum.IS_VALID;
}
```

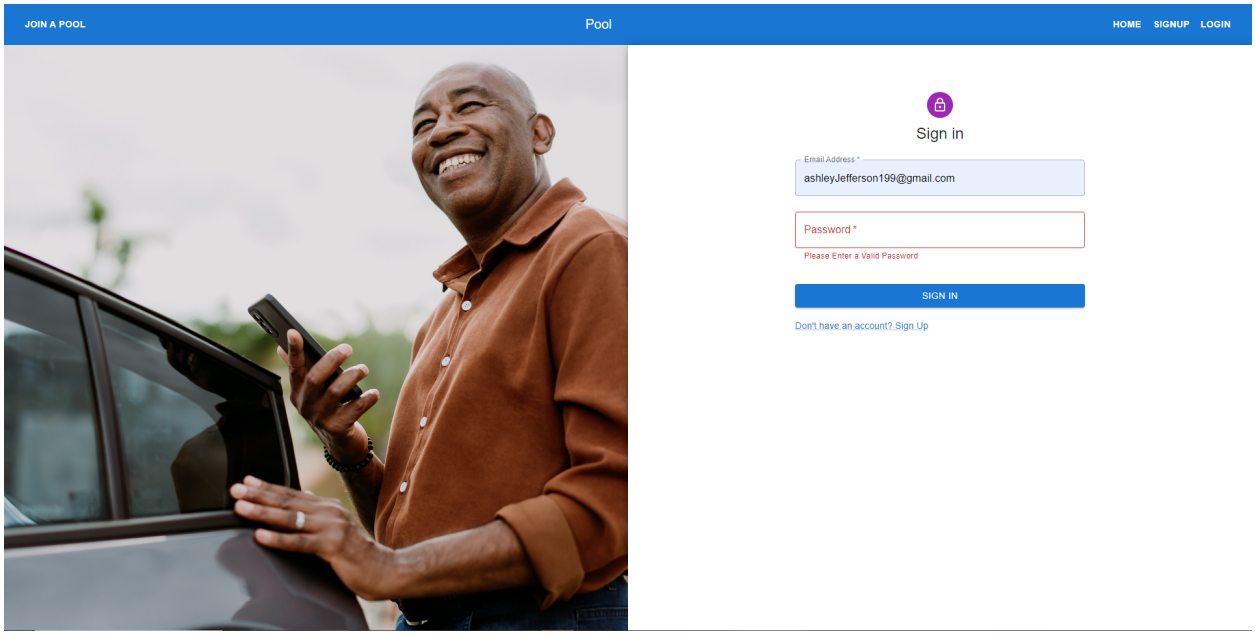
Sign in screen (carpoolwith.me/signin)

Backend validations - sign in (check if user exists)

```
        //check if user exists by email
        User user;
        if (optionalUser.isPresent()){
            user = optionalUser.get();
        } else {
            return new ResponseEntity<>( body: "Incorrect username or password", HttpStatus.UNAUTHORIZED);
        }

        Optional<Account> optionalAccount = accountRepository.findAccountByUserId(user.getUserId());

        //Check if account exists for the user
        Account account;
        if (optionalAccount.isPresent()) {
            account = optionalAccount.get();
        } else {
            return new ResponseEntity<>( body: "Could not find account", HttpStatus.UNAUTHORIZED);
        }

        //check if password matches
        boolean validPassword = isPasswordNull(jsonMap.get("password"));
        if(!validPassword){
            return new ResponseEntity<>( body: "Password is empty or null", HttpStatus.UNAUTHORIZED);
        }

        String inputPassword = jsonMap.get("password");
        String storedPassword = account.getPassword().getPassword(); //hashed password
        boolean isPasswordMatching = passwordEncoder.matches(inputPassword, storedPassword);

        if (isPasswordMatching) {
            // Check if user is a driver
            boolean isDriver = driverRepository.findByUser_UserId(user.getUserId()).isPresent();
            user.setIsDriver(isDriver);

           Profile profile= profileRepository.findByUserId(user);
```

Frontend Validations - Sign in (validate email and password)





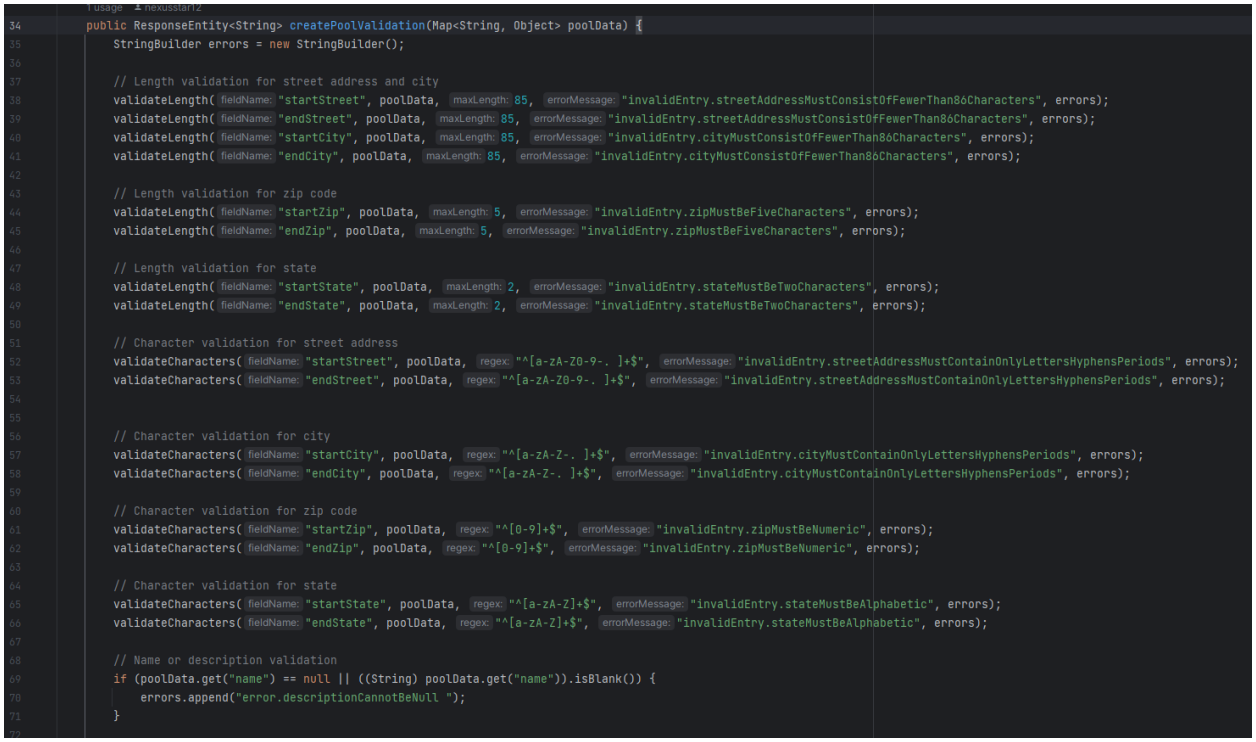
appfrontend > src > components > JS SignIn.js > SignIn

```
const defaultTheme = createTheme();

export default function SignIn() {
  const history = useNavigate();
  const [error, setError] = useState(null);
  const [emailError, setEmailError] = useState(null);
  const [passwordError, setPasswordError] = useState(null);
  const userContext = useContext(UserContext);
  const emailRegex = /^[\w-\.]+@([\w-]+\.)+[\w-]{2,4}$/;

  const handleSubmit = async (event) => {
    event.preventDefault();
    const data = new FormData(event.currentTarget);
    const email = data.get("email");
    const password = data.get("password");

    const requestBody = { email, password };


    if (!email || !emailRegex.test(email)) {
      setEmailError("Please Enter a Valid Email");
      return;
    } else {
      setEmailError(false);
    }
    if(!password){
      setPasswordError("Please Enter a Valid Password");
      return;
    }
    else{
      setPasswordError(false);
    }
    try {
      const response = await axiosInstance.post("/signin", requestBody);
      if (response.status === 200) {
        localStorage.setItem("userInfo", JSON.stringify(response.data));
        userContext.setUserInfo(response.data);
        history("/", { replace: true });
      }
    } catch (error) {
      setError(error.response.data);
    }
  };

```

```
<Box
  component="form"
  noValidate
  onSubmit={handleSubmit}
  sx={{ mt: 1 }}
>
  <TextField
    margin="normal"
    required
    fullWidth
    id="email"
    label="Email Address"
    name="email"
    autoComplete="email"
    autoFocus
    error = {!!emailError}
    helperText={emailError}
  />
  <TextField
    margin="normal"
    required
    fullWidth
    name="password"
    label="Password"
    type="password"
    id="password"
    autoComplete="current-password"
    error = {!!passwordError}
    helperText={passwordError}
  />
  <Typography color="error" variant="body2">
    {error}
  </Typography>
```

Post a Pool (carpoowith.me/create-pool)

Backend validations for pool description, address, and privacy settings



```
1 usage  1 nexusstar12
public ResponseEntity<String> createPoolValidation(Map<String, Object> poolData) {
    StringBuilder errors = new StringBuilder();

    // Length validation for street address and city
    validateLength( fieldName: "startStreet", poolData,  maxLength: 85,  errorMessage: "invalidEntry.streetAddressMustConsistOfFewerThan86Characters", errors);
    validateLength( fieldName: "endStreet", poolData,  maxLength: 85,  errorMessage: "invalidEntry.streetAddressMustConsistOfFewerThan86Characters", errors);
    validateLength( fieldName: "startCity", poolData,  maxLength: 85,  errorMessage: "invalidEntry.cityMustConsistOfFewerThan86Characters", errors);
    validateLength( fieldName: "endCity", poolData,  maxLength: 85,  errorMessage: "invalidEntry.cityMustConsistOfFewerThan86Characters", errors);

    // Length validation for zip code
    validateLength( fieldName: "startZip", poolData,  maxLength: 5,  errorMessage: "invalidEntry.zipMustBeFiveCharacters", errors);
    validateLength( fieldName: "endZip", poolData,  maxLength: 5,  errorMessage: "invalidEntry.zipMustBeFiveCharacters", errors);

    // Length validation for state
    validateLength( fieldName: "startState", poolData,  maxLength: 2,  errorMessage: "invalidEntry.stateMustBeTwoCharacters", errors);
    validateLength( fieldName: "endState", poolData,  maxLength: 2,  errorMessage: "invalidEntry.stateMustBeTwoCharacters", errors);

    // Character validation for street address
    validateCharacters( fieldName: "startStreet", poolData,  regex: "^[a-zA-Z0-9-. ]+$",  errorMessage: "invalidEntry.streetAddressMustContainOnlyLettersHyphensPeriods", errors);
    validateCharacters( fieldName: "endStreet", poolData,  regex: "^[a-zA-Z0-9-. ]+$",  errorMessage: "invalidEntry.streetAddressMustContainOnlyLettersHyphensPeriods", errors);


    // Character validation for city
    validateCharacters( fieldName: "startCity", poolData,  regex: "^[a-zA-Z-. ]+$",  errorMessage: "invalidEntry.cityMustContainOnlyLettersHyphensPeriods", errors);
    validateCharacters( fieldName: "endCity", poolData,  regex: "^[a-zA-Z-. ]+$",  errorMessage: "invalidEntry.cityMustContainOnlyLettersHyphensPeriods", errors);

    // Character validation for zip code
    validateCharacters( fieldName: "startZip", poolData,  regex: "^[0-9]+$",  errorMessage: "invalidEntry.zipMustBeNumeric", errors);
    validateCharacters( fieldName: "endZip", poolData,  regex: "^[0-9]+$",  errorMessage: "invalidEntry.zipMustBeNumeric", errors);

    // Character validation for state
    validateCharacters( fieldName: "startState", poolData,  regex: "^[a-zA-Z]+$",  errorMessage: "invalidEntry.stateMustBeAlphabetic", errors);
    validateCharacters( fieldName: "endState", poolData,  regex: "^[a-zA-Z]+$",  errorMessage: "invalidEntry.stateMustBeAlphabetic", errors);

    // Name or description validation
    if (poolData.get("name") == null || ((String) poolData.get("name")).isBlank()) {
        errors.append("error.descriptionCannotBeNull ");
    }
```

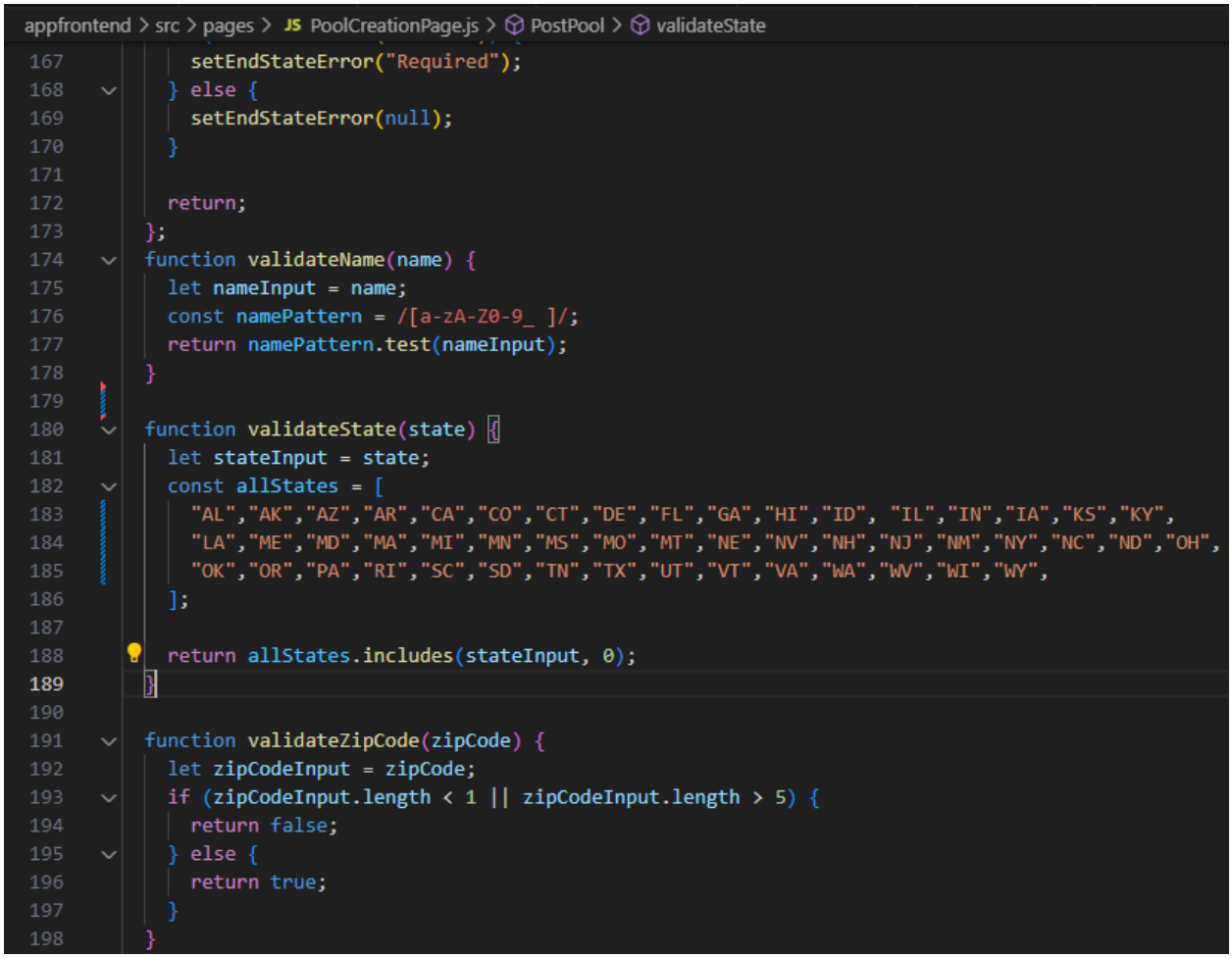
```
        // startStreet validation
        if (poolData.get("startStreet") == null || ((String) poolData.get("startStreet")).isBlank()) {
            errors.append("error.startStreetCannotBeNull ");
        }

        // startCity validation
        if (poolData.get("startCity") == null || ((String) poolData.get("startCity")).isBlank()) {
            errors.append("error.startCityCannotBeNull ");
        }

        // startZip validation
        if (poolData.get("startZip") == null || ((String) poolData.get("startZip")).isBlank()) {
            errors.append("error.startZipCannotBeNull ");
        }

        // startState validation
        if (poolData.get("startState") == null || ((String) poolData.get("startState")).isBlank()) {
            errors.append("error.startStateCannotBeNull ");
        }

        // endStreet validation
        if (poolData.get("endStreet") == null || ((String) poolData.get("endStreet")).isBlank()) {
            errors.append("error.endStreetCannotBeNull ");
        }

        // endCity validation
        if (poolData.get("endCity") == null || ((String) poolData.get("endCity")).isBlank()) {
            errors.append("error.endCityCannotBeNull ");
        }

        // endZip validation
        if (poolData.get("endZip") == null || ((String) poolData.get("endZip")).isBlank()) {
            errors.append("error.endZipCannotBeNull ");
        }

        // endState validation
        if (poolData.get("endState") == null || ((String) poolData.get("endState")).isBlank()) {
            errors.append("error.endStateCannotBeNull ");
        }

        // Privacy validation
        if (poolData.get("privacy") == null) {
            errors.append("error.privacyCannotBeNull ");
        }
```

```
        // Character validation for street address to contain at least one letter
        if (poolData.get("startStreet") != null && !containsLetter((String) poolData.get("startStreet"))) {
            errors.append("error.startStreetMustContainAtLeastOneLetter ");
        }
        if (poolData.get("endStreet") != null && !containsLetter((String) poolData.get("endStreet"))) {
            errors.append("error.endStreetMustContainAtLeastOneLetter ");
        }

        // Character validation for city to contain at least one letter
        if (poolData.get("startCity") != null && !containsLetter((String) poolData.get("startCity"))) {
            errors.append("error.startCityMustContainAtLeastOneLetter ");
        }
        if (poolData.get("endCity") != null && !containsLetter((String) poolData.get("endCity"))) {
            errors.append("error.endCityMustContainAtLeastOneLetter ");
        }

        // Check for startDateTime and validate it's in the future
        String startDateTimeStr = (String) poolData.get("startTime");
        if (startDateTimeStr != null && !startDateTimeStr.isBlank()) {
            try {
                LocalDateTime startDateTime = LocalDateTime.parse(startDateTimeStr);
                if (startDateTime.isBefore(LocalDateTime.now())) {
                    errors.append("invalidEntry.dateTimeMustBeInTheFuture ");
                }
            } catch (DateTimeParseException e) {
                errors.append("invalid.startTimeFormat ");
            }
        }

        // Return any errors here
        if (!errors.isEmpty()) {
            return ResponseEntity.badRequest().body(errors.toString().trim());
        }

        // If all fields are valid
        return ResponseEntity.ok( body: "All fields are valid");
    }
```

```
    // Check if a string contains at least one letter
    4 usages  nexusstar12
    private boolean containsLetter(String input) { return input.matches( regex: ".*[a-zA-Z]+.*"); }

    8 usages  nexusstar12
    private void validateLength(String fieldName, Map<String, Object> poolData, int maxLength, String errorMessage, StringBuilder errors) {
        String fieldValue = (String) poolData.get(fieldName);
        if (fieldValue != null && fieldValue.length() > maxLength) {
            errors.append(errorMessage).append(" ");
        }
    }

    8 usages  nexusstar12
    private void validateCharacters(String fieldName, Map<String, Object> poolData, String regex, String errorMessage, StringBuilder errors) {
        String fieldValue = (String) poolData.get(fieldName);
        if (fieldValue != null && !fieldValue.matches(regex)) {
            errors.append(errorMessage).append(" ");
        }
    }
```

Frontend Validations: Pool Description, address, and privacy settings

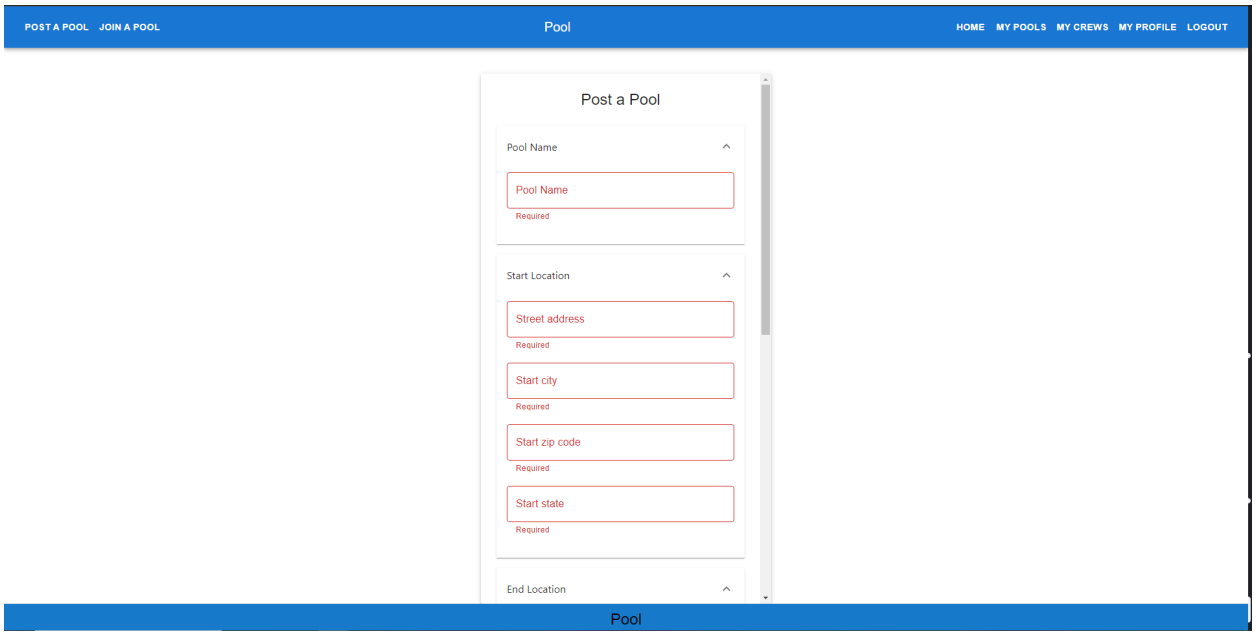
```
//field validations
if (!validateName(name)) {
  setNameError("Required");
} else {
  setNameError(null);
}
if (!startStreet) {
  setStartStreetError("Required");
} else {
  setStartStreetError(null);
}
if (!startCity) {
  setStartCityError("Required");
} else {
  setStartCityError(null);
}
if (!validateZipCode(startZip)) {
  setStartZipError("Required");
} else {
  setStartZipError(null);
}
if (!validateState(startState)) {
  setStartStateError("Required");
} else {
  setStartStateError(null);
}

if (!endStreet) {
  setEndStreetError("Required");
} else {
  setEndStreetError(null);
}
if (!endCity) {
  setEndCityError("Required");
} else {
  setEndCityError(null);
}
if (!validateZipCode(endZip)) {
  setEndZipError("Required");
} else {
  setEndZipError(null);
}
```

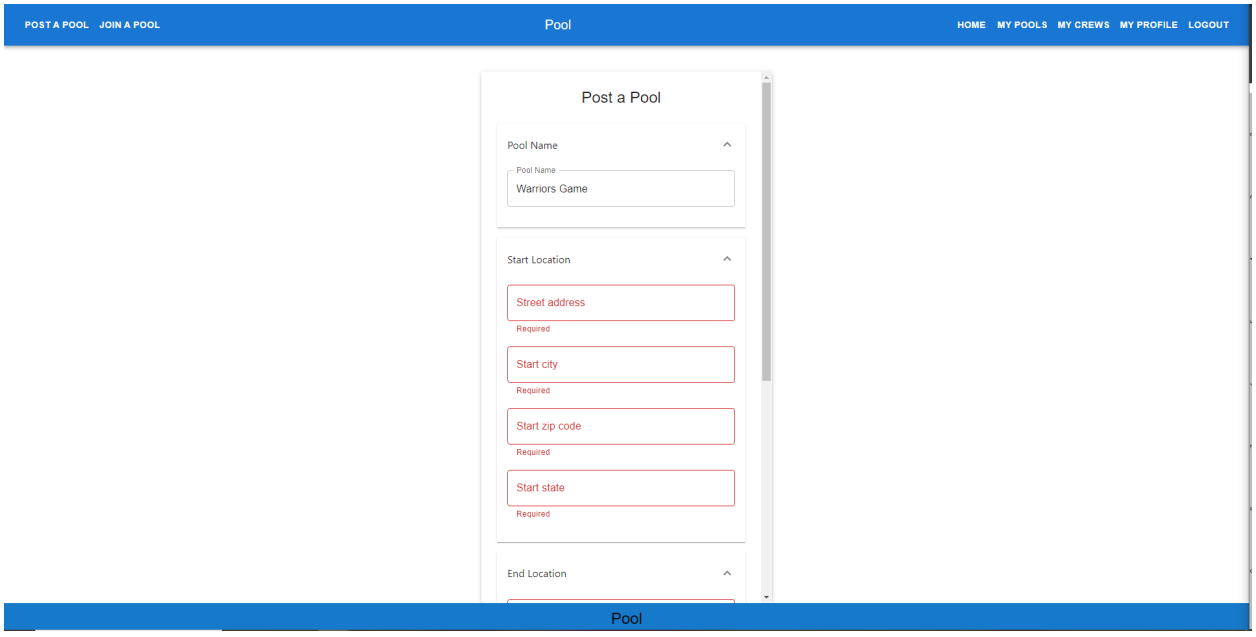

appfrontend > src > pages > JS PoolCreationPage.js > PostPool > validateState
setEndStateError("Required");
} else {
setEndStateError(null);
}
return;
};
function validateName(name) {
let nameInput = name;
const namePattern = /[a-zA-Z0-9_]/;
return namePattern.test(nameInput);
}
function validateState(state) {
let stateInput = state;
const allStates = [
"AL","AK","AZ","AR","CA","CO","CT","DE","FL","GA","HI","ID", "IL","IN","IA","KS","KY",
"LA","ME","MD","MA","MI","MN","MS","MO","MT","NE","NV","NH","NJ","NM","NY","NC","ND","OH",
"OK","OR","PA","RI","SC","SD","TN","TX","UT","VT","VA","WA","WV","WI","WY",
];
return allStates.includes(stateInput, 0);
}
function validateZipCode(zipCode) {
let zipCodeInput = zipCode;
if (zipCodeInput.length < 1 || zipCodeInput.length > 5) {
return false;
} else {
return true;
}
}

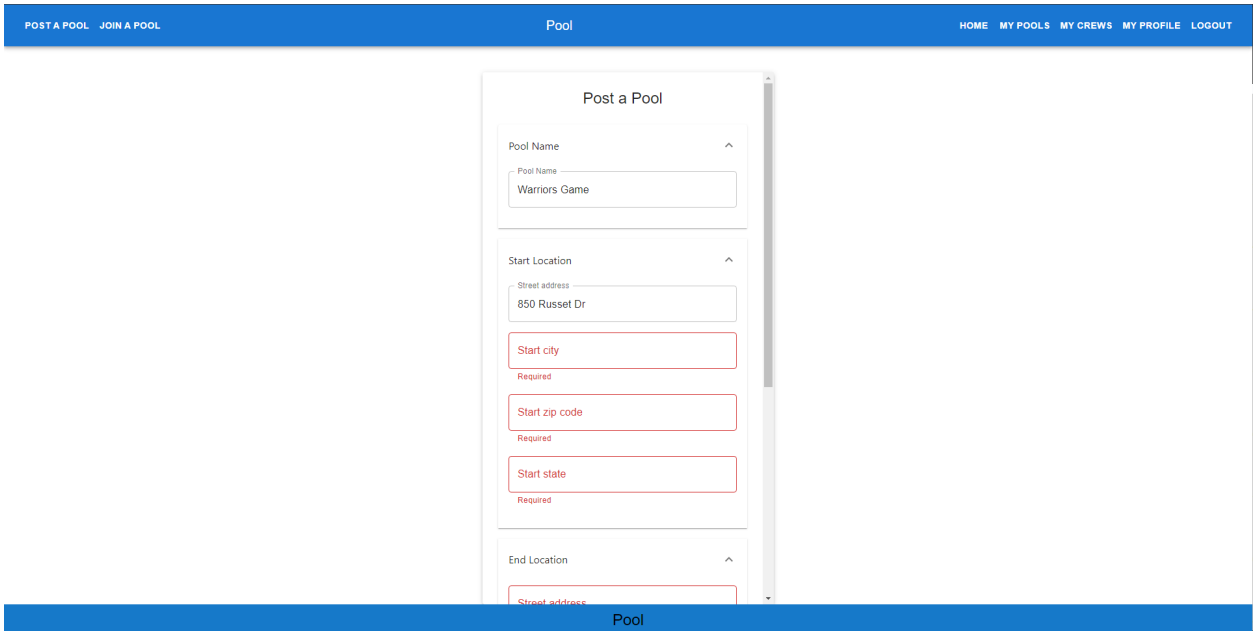

appfrontend > src > pages > JS PoolCreationPage.js > PostPool > validateState
225
226 return (
227 <Box
228 component="form"
229 noValidate
230 onSubmit={handleSubmit}
231 sx={{
232 mt: 5,
233 display: "flex",
234 flexDirection: "column",
235 alignItems: "center",
236 }}
237 >
238 <Paper
239 elevation={3}
240 sx={{
241 p: 3,
242 width: "80%",
243 maxWidth: 400,
244 overflowY: "auto",
245 maxHeight: "80vh",
246 }}
247 >
248 <Typography variant="h5" align="center" mb={3}>
249 Post a Pool
250 </Typography>
251 <Accordion>
252 <AccordionSummary expandIcon={<ExpandMoreIcon />}>
253 Pool Name
254 </AccordionSummary>
255 <AccordionDetails>
256 <TextField
257 fullWidth
258 name="name"
259 label="Pool Name"
260 sx={{ mb: 2 }}
261 error={!!nameError}
262 helperText={nameError}
263 />
264 </AccordionDetails>
265 </Accordion>

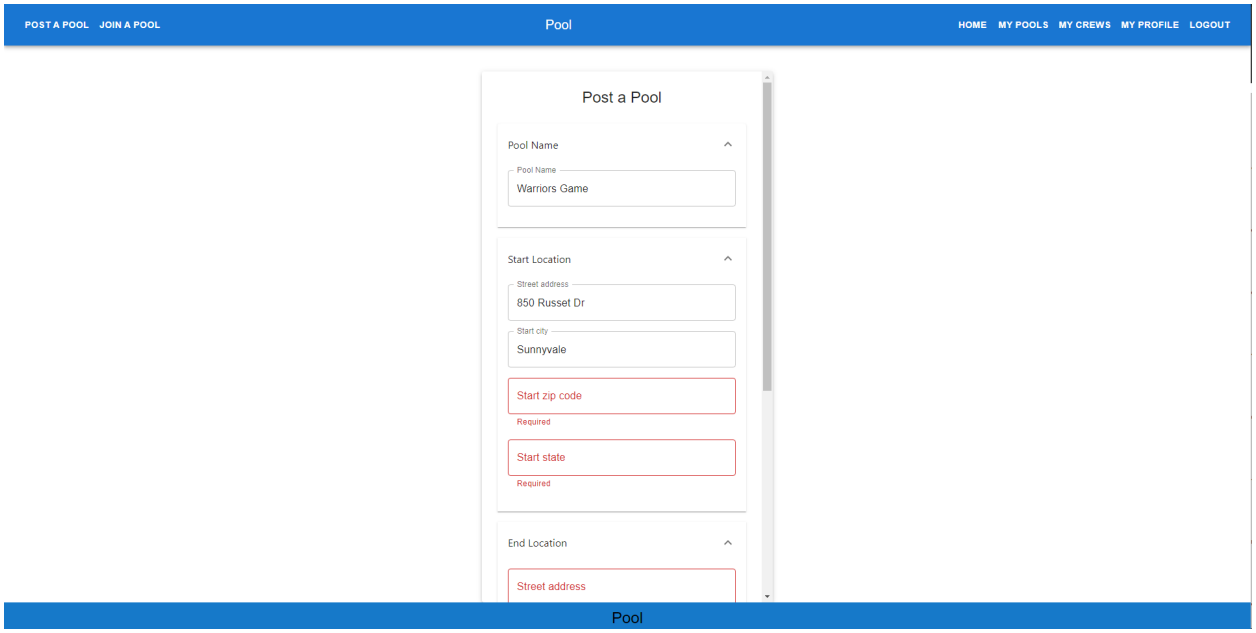
```
<Accordion>
  <AccordionSummary expandIcon={<ExpandMoreIcon />}>
    Start Location
  </AccordionSummary>
  <AccordionDetails>
    <TextField
      fullWidth
      name="startStreet"
      label="Street address"
      error={!!startStreetError}
      helperText={startStreetError}
      sx={{ mb: 2 }}
    />
    <TextField
      fullWidth
      name="startCity"
      label="Start city"
      error={!!startCityError}
      helperText={startCityError}
      sx={{ mb: 2 }}
    />
    <TextField
      fullWidth
      name="startZip"
      label="Start zip code"
      error={!!startZipError}
      helperText={startZipError}
      sx={{ mb: 2 }}
    />
    <TextField
      fullWidth
      name="startState"
      label="Start state"
      error={!!startStateError}
      helperText={startStateError}
      sx={{ mb: 2 }}
    />
  </AccordionDetails>
</Accordion>
```

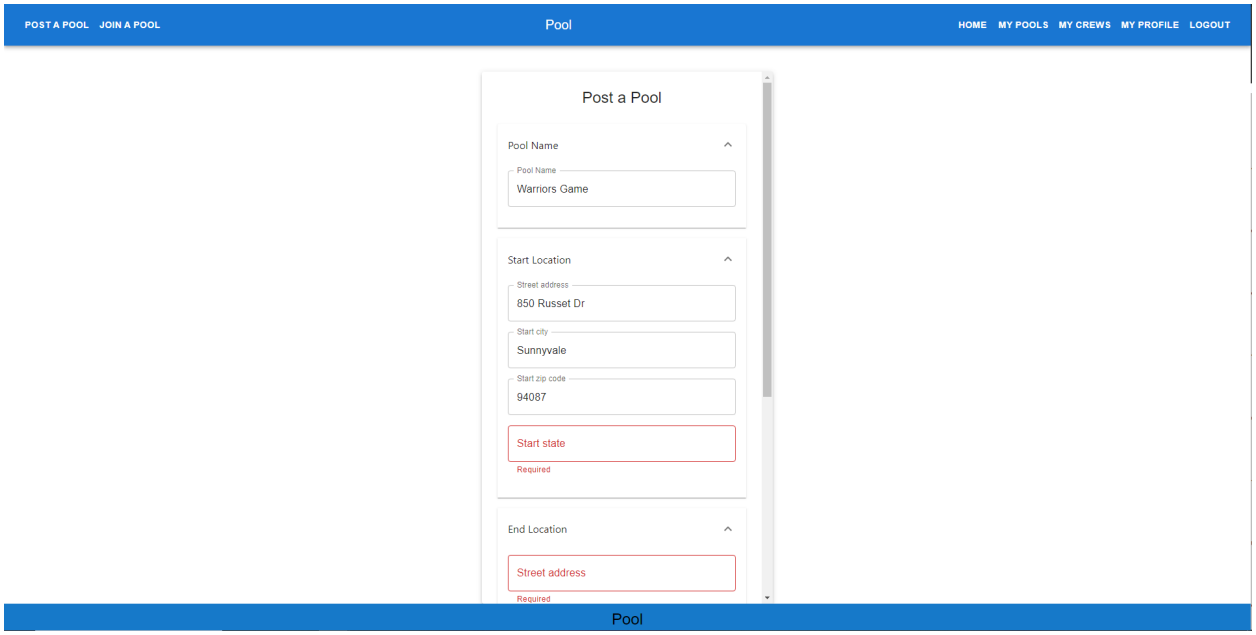
```jsx
{/* Enter end location section */}
<Accordion>
  <AccordionSummary expandIcon={<ExpandMoreIcon />}>
    End Location
  </AccordionSummary>
  <AccordionDetails>
    <TextField
      fullWidth
      name="endStreet"
      label="Street address"
      error={!!endStreetError}
      helperText={endStreetError}
      sx={{ mb: 2 }}
    />
    <TextField
      fullWidth
      name="endCity"
      label="End city"
      error={!!endCityError}
      helperText={endCityError}
      sx={{ mb: 2 }}
    />
    <TextField
      fullWidth
      name="endZip"
      label="End zip"
      sx={{ mb: 2 }}
      error={!!endZipError}
      helperText={endZipError}
    />
    <TextField
      fullWidth
      name="endState"
      label="End state"
      error={!!endStateError}
      helperText={endStateError}
      sx={{ mb: 2 }}
    />
  </AccordionDetails>
</Accordion>
```

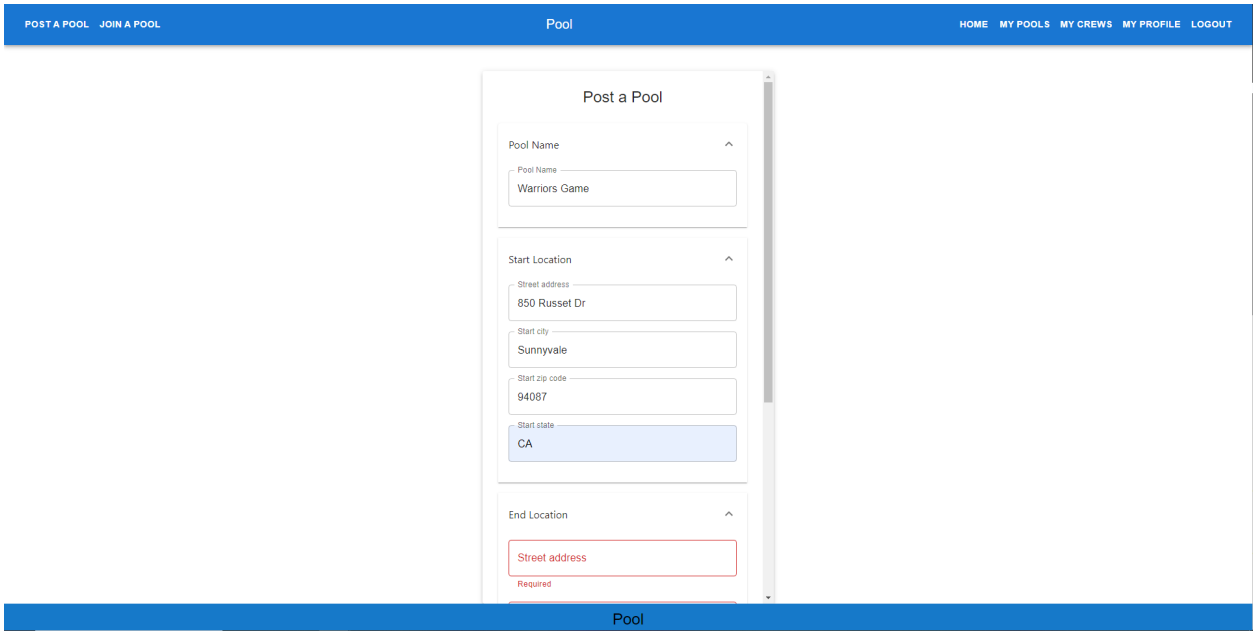

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Required
Start Location
Street address
Required
Start city
Required
Start zip code
Required
Start state
Required
End Location
Pool

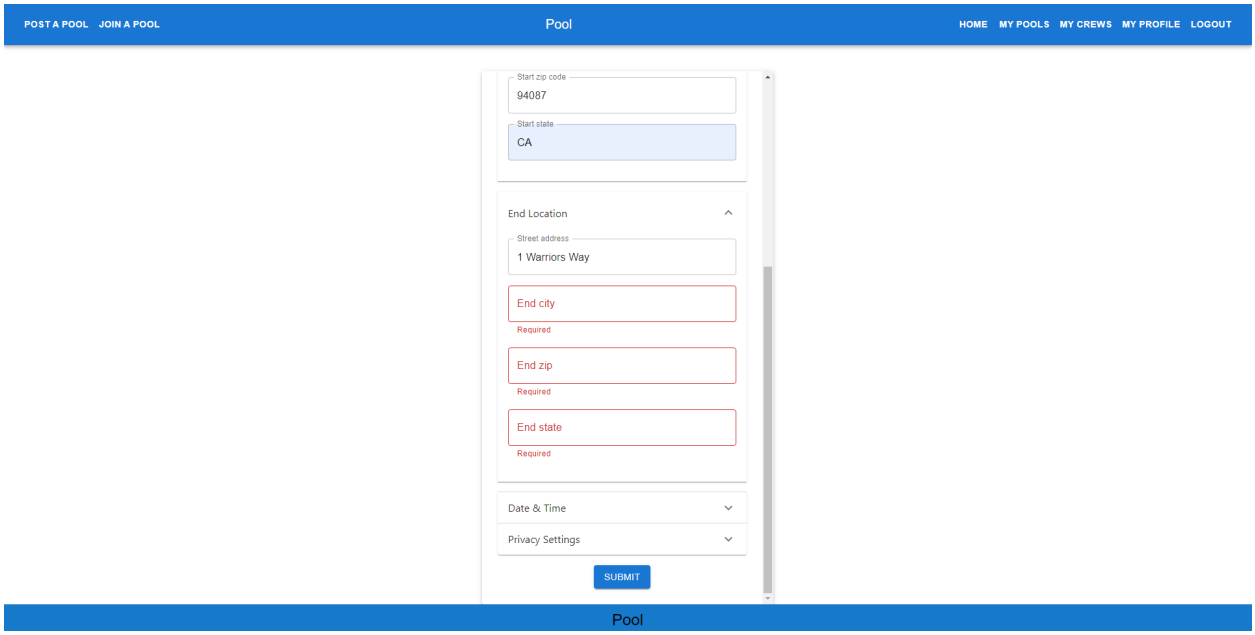

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Warriors Game
Start Location
Street address
Required
Start city
Required
Start zip code
Required
Start state
Required
End Location
Pool

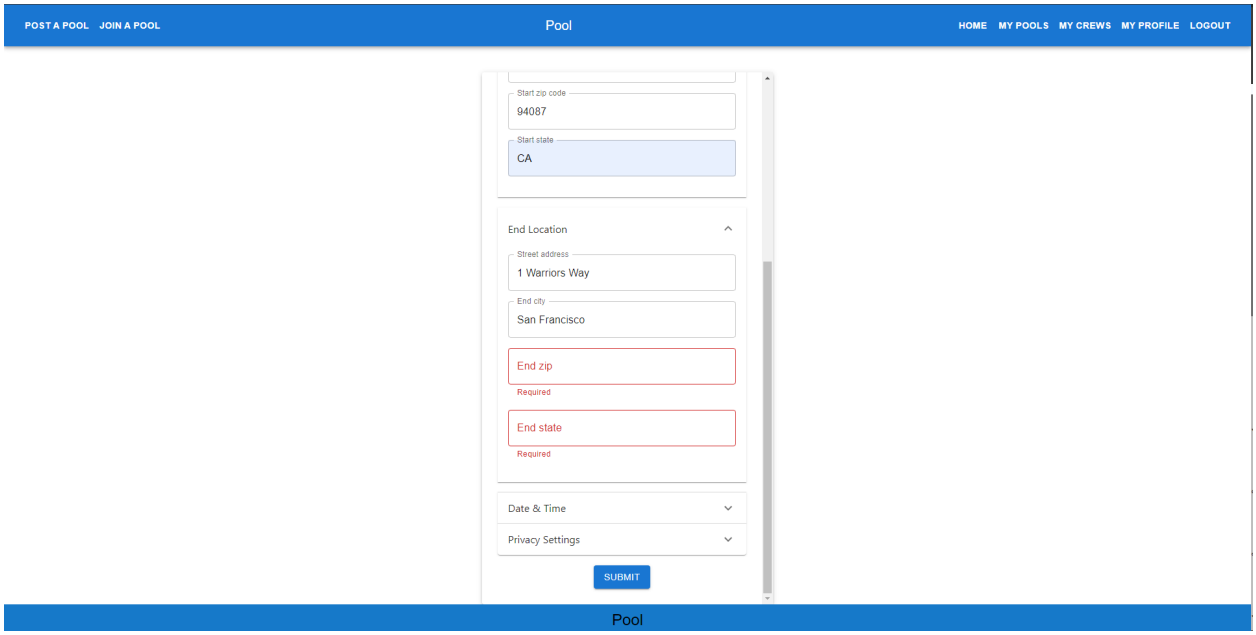

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Warriors Game
Start Location
Street address
850 Russet Dr
Start city
Required
Start zip code
Required
Start state
Required
End Location
Pool

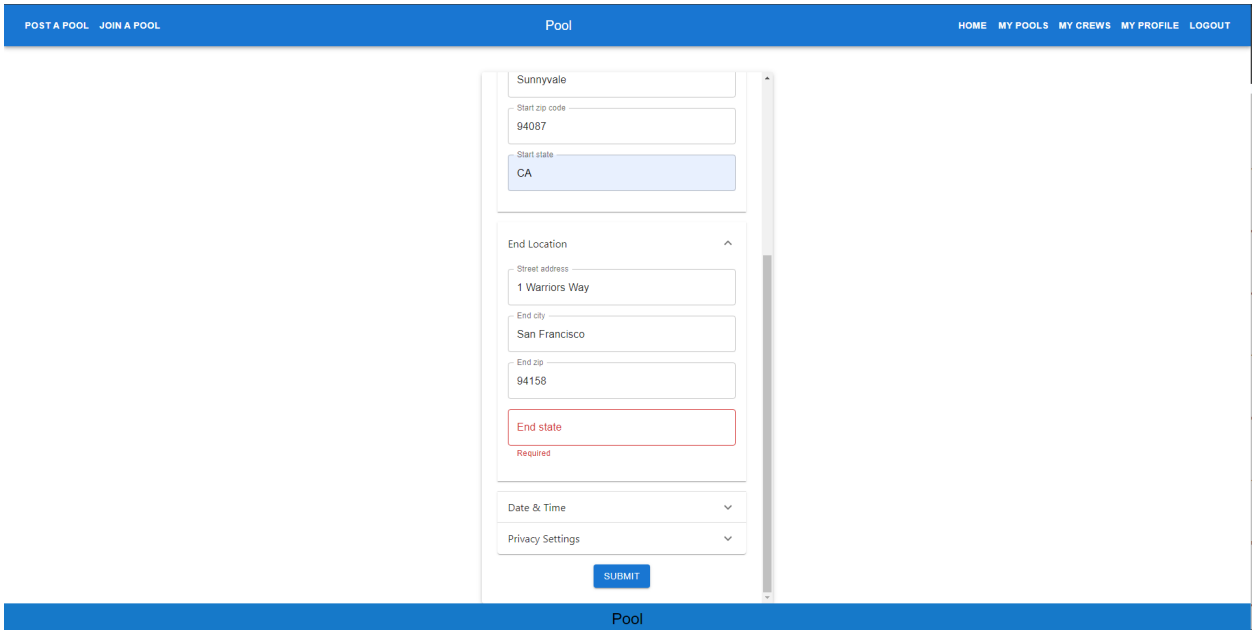

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Warriors Game
Start Location
Street address
850 Russet Dr
Start city
Sunnyvale
Start zip code
Required
Start state
Required
End Location
Street address
Pool

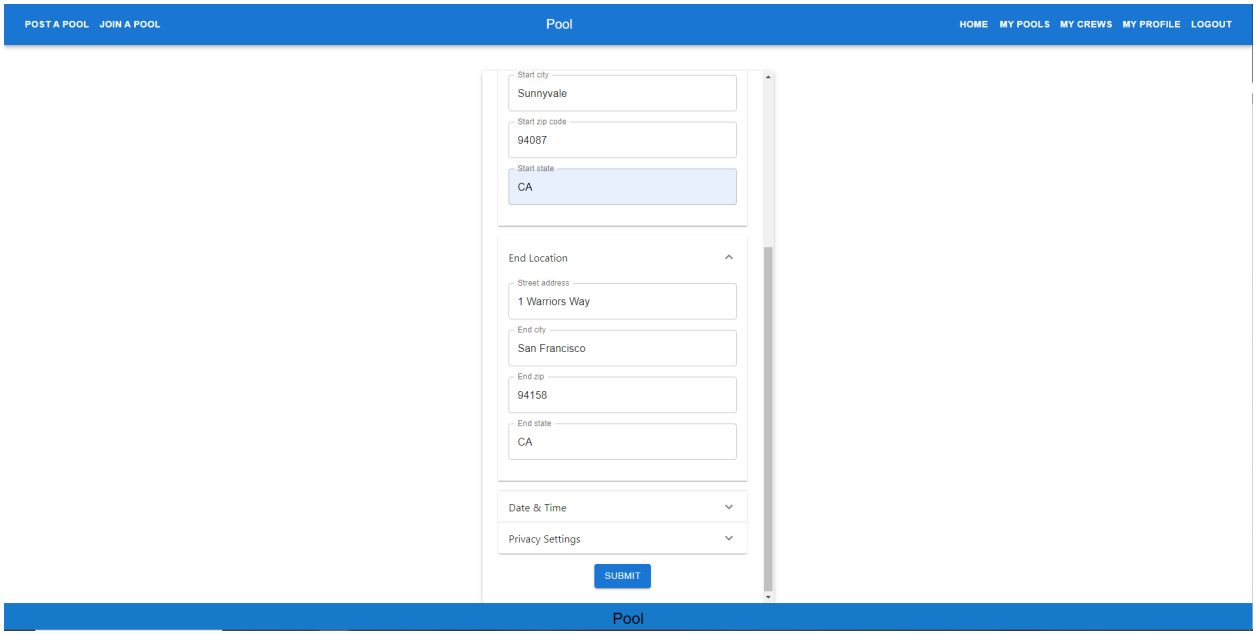

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Warriors Game
Start Location
Street address
850 Russet Dr
Start city
Sunnyvale
Start zip code
94087
Start state
Required
End Location
Street address
Required
Pool

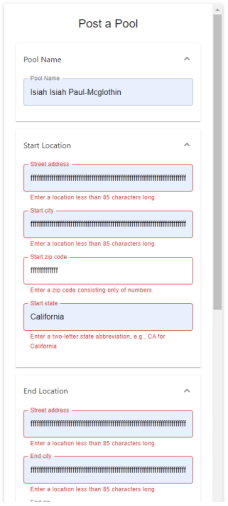

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Post a Pool
Pool Name
Pool Name
Warriors Game
Start Location
Street address
850 Russet Dr
Start city
Sunnyvale
Start zip code
94087
Start state
CA
End Location
Street address
Required
Pool

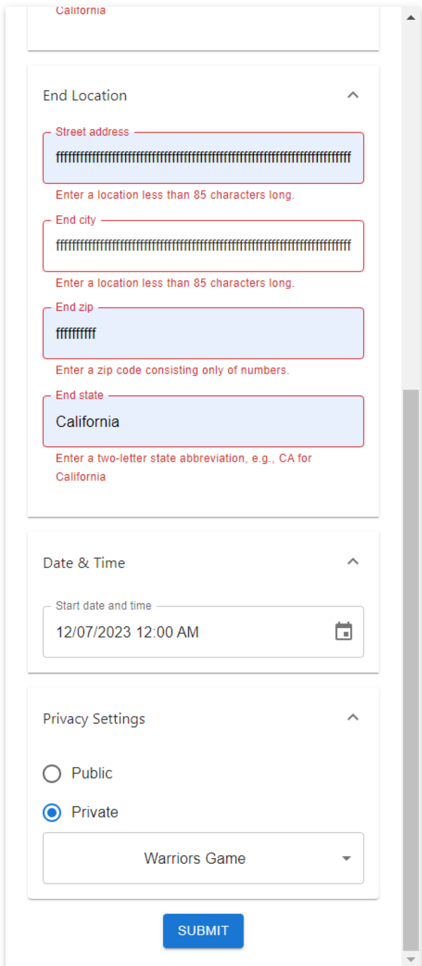

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Start zip code
94087
Start state
CA
End Location
Street address
1 Warriors Way
End city
Required
End zip
Required
End state
Required
Date & Time
Privacy Settings
SUBMIT
Pool

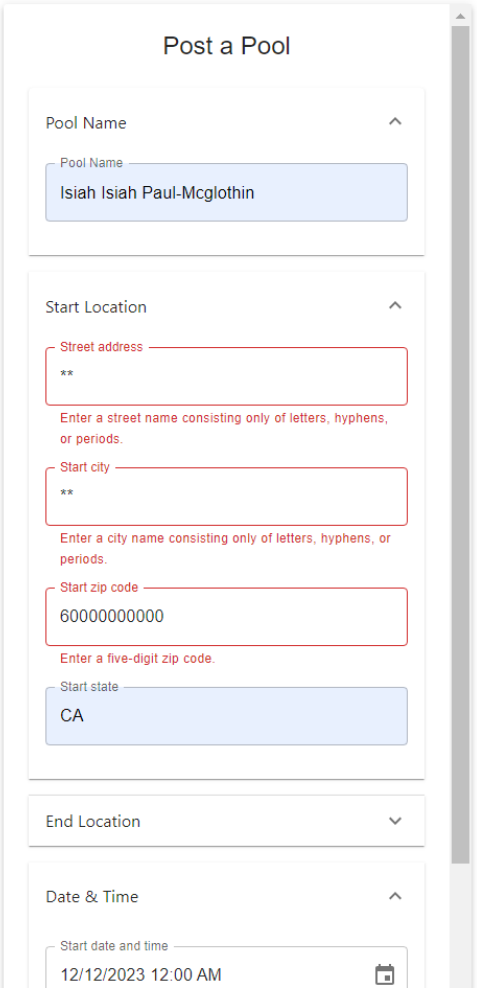

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Start zip code
94087
Start state
CA
End Location
Street address
1 Warriors Way
End city
San Francisco
End zip
Required
End state
Required
Date & Time
Privacy Settings
SUBMIT
Pool

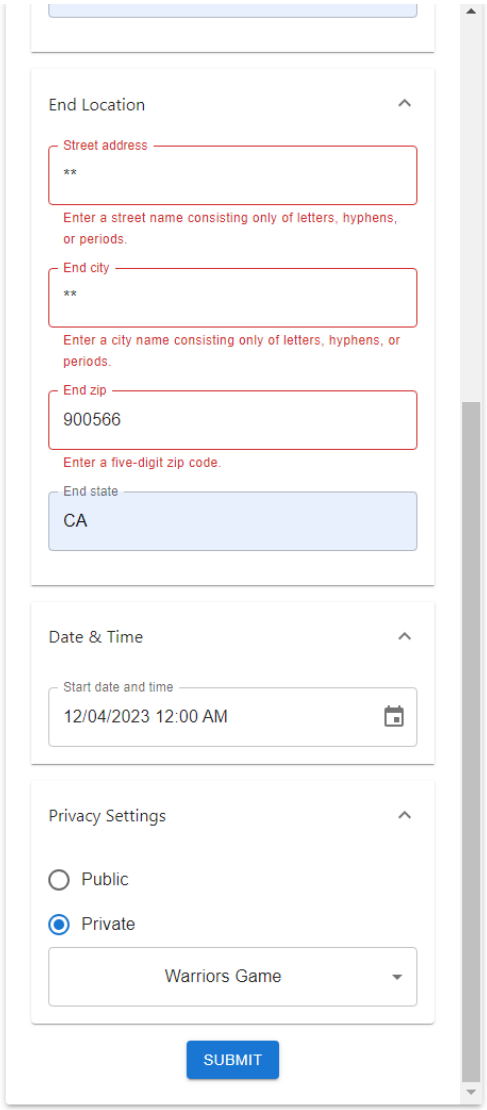

POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Sunnyvale
Start zip code
94087
Start state
CA
End Location
Street address
1 Warriors Way
End city
San Francisco
End zip
94158
End state
Required
Date & Time
Privacy Settings
SUBMIT
Pool


POST A POOL
JOIN A POOL
Pool
HOME
MY POOLS
MY CREWS
MY PROFILE
LOGOUT
Start city
Sunnyvale
Start zip code
94087
Start state
CA
End Location
Street address
1 Warriors Way
End city
San Francisco
End zip
94158
End state
CA
Date & Time
Privacy Settings
SUBMIT
Pool


Post a Pool
Pool Name
Isiah Isiah Paul-Mcglothin
Start Location
Enter a location less than 85 characters long.
Enter a location less than 85 characters long.
Enter a zip code consisting only of numbers.
California
Enter a two-letter state abbreviation, e.g., CA for California
End Location
Enter a location less than 85 characters long.
Enter a location less than 85 characters long.


California
End Location
Street address
Enter a location less than 85 characters long.
End city
Enter a location less than 85 characters long.
End zip
Enter a zip code consisting only of numbers.
End state
California
Enter a two-letter state abbreviation, e.g., CA for California
Date & Time
Start date and time
12/07/2023 12:00 AM
Privacy Settings
Public
Private
Warriors Game
SUBMIT

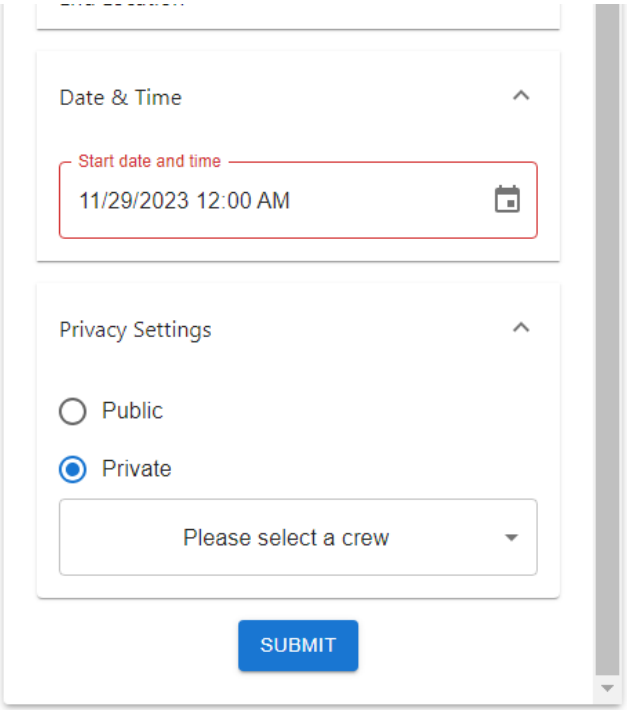

Post a Pool
Pool Name
Pool Name
Isiah Isiah Paul-Mcglothin
Start Location
Street address
**
Enter a street name consisting only of letters, hyphens, or periods.
Start city
**
Enter a city name consisting only of letters, hyphens, or periods.
Start zip code
60000000000
Enter a five-digit zip code.
Start state
CA
End Location
Date & Time
Start date and time
12/12/2023 12:00 AM

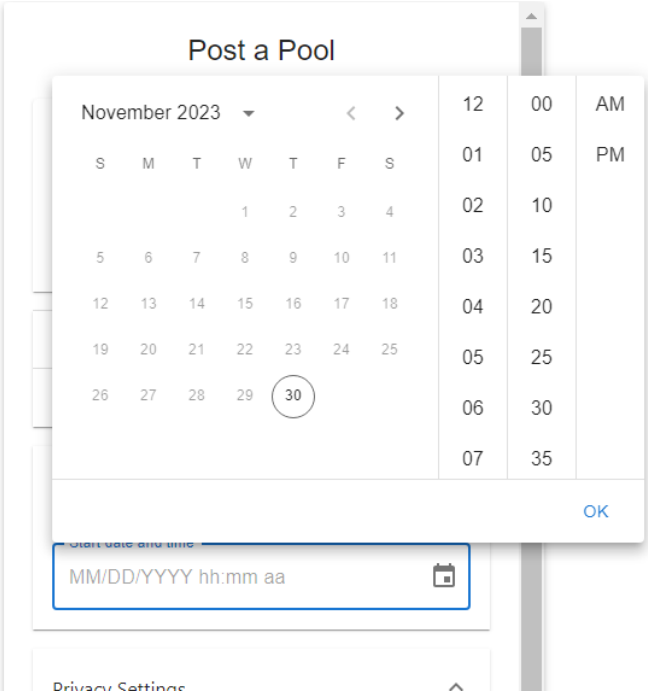

End Location
Street address
**
Enter a street name consisting only of letters, hyphens, or periods.
End city
**
Enter a city name consisting only of letters, hyphens, or periods.
End zip
900566
Enter a five-digit zip code.
End state
CA
Date & Time
Start date and time
12/04/2023 12:00 AM
Privacy Settings
Public
Private
Warriors Game
SUBMIT

```
//field validations
if (!validateName(name)) {
  setNameError("Required");
} else {
  setNameError(null);
}

if (!startStreet) {
  setStartStreetError("Required");
} else if (!validateStreetName(startStreet)) {
  setStartStreetError(
    "Enter a street name consisting only of letters, hyphens, or periods."
  );
} else if (!validateStreetAddress(startStreet)) {
  setStartStreetError("Enter a location less than 85 characters long.");
} else {
  setStartStreetError(null);
}
// Start City Validation

if (!startCity) {
  setStartCityError("Required");
} else if (!validateCityName(startCity)) {
  setStartCityError(
    "Enter a city name consisting only of letters, hyphens, or periods."
  );
} else if (!validateLength(startCity, maxLength)) {
  setStartCityError("Enter a location less than 85 characters long.");
} else {
  setStartCityError(null);
}

if (!startState) {
  setStartStateError("Required");
} else if (!validateState(startState)) {
  setStartStateError(
    "Enter a two-letter state abbreviation, e.g., CA for California"
  );
} else {
  setStartStateError(null);
}

if (!endStreet) {
  setEndStreetError("Required");
} else if (!validateStreetName(endStreet)) {
  setEndStreetError(
    "Enter a street name consisting only of letters, hyphens, or periods."
  );
} else if (!validateStreetAddress(endStreet)) {
  setEndStreetError("Enter a location less than 85 characters long.");
} else {
  setEndStreetError(null);
}

// End City Validation
if (!endCity) {
  setEndCityError("Required");
} else if (!validateCityName(endCity)) {
  setEndCityError(
    "Enter a city name consisting only of letters, hyphens, or periods."
  );
} else if (!validateLength(endCity, maxLength)) {
  setEndCityError("Enter a location less than 85 characters long.");
} else {
  setEndCityError(null);
}
```

```
  if (!endState) {
    setEndStateError("Required");
  } else if (!validateState(endState)) {
    setEndStateError(
      "Enter a two-letter state abbreviation, e.g., CA for California"
    );
    return;
  } else {
    setEndStateError(null);
  }

  // Start Zip Validation
  if (!startZip) {
    setStartZipError("Required");
  } else if (!/^\d+$/.test(startZip)) {
    setStartZipError("Enter a zip code consisting only of numbers.");
  } else if (startZip.length !== 5) {
    setStartZipError("Enter a five-digit zip code.");
  } else {
    setStartZipError(null);
  }

  // End Zip Validation
  if (!endZip) {
    setEndZipError("Required");
  } else if (!/^\d+$/.test(endZip)) {
    setEndZipError("Enter a zip code consisting only of numbers.");
  } else if (endZip.length !== 5) {
    setEndZipError("Enter a five-digit zip code.");
  } else {
    setEndZipError(null);
  }

  return;
};
```

Frontend validation for pool date and time

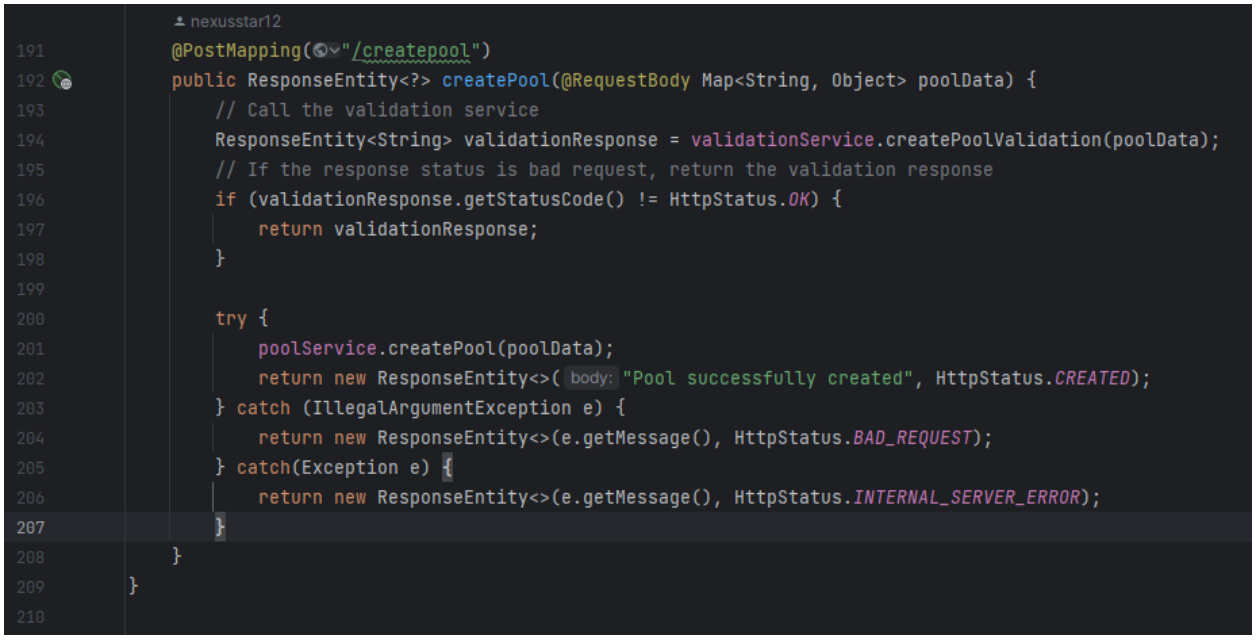




```
    if (newValue && dayjs().isAfter(newValue)) {
      setDateError("Time can not be in the past.");
    } else {
      setDateError(null);
    }
  };
```

```
        </Accordion>
        {/* Start time/date section */}
        <Accordion>
          <AccordionSummary expandIcon={<ExpandMoreIcon />}>
            Date & Time
          </AccordionSummary>
          <AccordionDetails>
            <LocalizationProvider dateAdapter={AdapterDayjs}>
              <DemoContainer components={["DateTimePicker"]}>
              <DateTimePicker
                  required
                  label="Start date and time"
                  value={selectedDate}
                  onChange={handleDateChange}
                  minDate={dayjs()}
                />
```

Backend validation for createpool api (calling from validation service):



```
nexusstar12
@PostMapping("/createpool")
public ResponseEntity<?> createPool(@RequestBody Map<String, Object> poolData) {
    // Call the validation service
    ResponseEntity<String> validationResponse = validationService.createPoolValidation(poolData);
    // If the response status is bad request, return the validation response
    if (validationResponse.getStatusCode() != HttpStatus.OK) {
        return validationResponse;
    }

    try {
        poolService.createPool(poolData);
        return new ResponseEntity<>( body: "Pool successfully created", HttpStatus.CREATED);
    } catch (IllegalArgumentException e) {
        return new ResponseEntity<>(e.getMessage(), HttpStatus.BAD_REQUEST);
    } catch(Exception e) {
        return new ResponseEntity<>(e.getMessage(), HttpStatus.INTERNAL_SERVER_ERROR);
    }
}
}
```

6. Self-check: Adherence to original Non-functional specs

1. Scalability
   - 1.1. Pool shall use scalable storage in Google Cloud Platform. DONE
   - 1.2. Pool shall use load balancing on GCP as demand increases. DONE (approach and implementation plan documented here)
   - 1.3. Pool team shall monitor CPU usage and traffic on GCP and allocate resources as necessary. DONE

2. Reliability
   - 2.1. Pool shall be available to users 24/7 with minimal downtime. DONE (approach and implementation plan documented here)
   - 2.2. Pool shall use user input validation to ensure the integrity of data stored and retrieved. DONE
   - 2.3. Pool shall perform regular data backups in GCP to ensure no data loss. DONE

3. Regulatory
   - 3.1. Pool shall be in compliance with cookie and tracking regulations. DONE
   - 3.2. Pool shall comply with Web Content Accessibility Guidelines (WCAG) to ensure accessibility to individuals with disabilities. DONE (full compliance report here)

4. Maintainability
   - 4.1. Pool shall implement version control using GitHub to track changes to the codebase. DONE
   - 4.2. Pool shall use a GitHub flow branching strategy. DONE
   - 4.3. Pool shall use Apache Maven version 3.9.4 for backend dependency management. DONE
   - 4.4. Pool shall use the latest npm version 7.0 (Node package Manager) for the react.js front end. DONE

5. Serviceability
   - 5.1. Application backend is capable of switching between different data sources when it is required to call a backup data source. DONE
   - 5.2. Application has an intentional splash page for unexpected downtime. DONE
   - 5.3. Code deployments and maintenance will not require downtime. DONE

6. Utility
   - 6.1. Web Application will have search functionality to assist users. DONE
   - 6.2. The system will have a user-friendly interface for new and existing users. DONE

7. Manageability
   - 7.1. Alerting mechanisms should allow administrators to easily & quickly understand problems during critical events. DONE
   - 7.2. Administrators will have control of Pool's system through dev portals of Google Cloud and MySQL Workbench v 8.0.34. DONE

8. Data Integrity
   - 8.1. Passwords shall be encrypted. DONE
   - 8.2. Encryption and decryption shall be tested for accuracy. DONE

9. Capacity
   - 9.1. Pool shall specify the amount of data the application can handle DONE
     - 9.1.1. Auto Storage Increase is enabled in our Google Cloud MySQL database – meaning, if available storage falls below a specified threshold (calculated by Google based on storage currently available and defined upper limits, currently set to 3,054 GB), storage auto increases. More information may be found here.
   - 9.2. Pool shall specify maximum number of concurrent user sessions to support seamless user experience when in high traffic periods. DONE
     - 9.2.1. In its current pre launch phase, Pool does not expect (or support) more than 80 concurrent user sessions during its highest traffic periods (the lower limit default for GCP applications). If this upper limit is approached, this use case would justify the cost associated with implementing load balancing to better manage numbers at and above the current upper bounds. If high traffic periods persist, at this point Pool would begin conducting regular performance testing to better identify its limits and identify ways to increase performance during these periods.

10. Availability
    - 10.1. Application shall have a high level of system uptime DONE
    - 10.2. Application shall be available through various platforms and devices DONE

11. Usability

11.1. Users shall be able to easily navigate through Pool. DONE
11.2. Pool shall give error messages that are clear and helpful when wanting to resolve issue. DONE

12. Interoperability

12.1. Pool shall be able to integrate with map services to provide directions. ISSUE: related feature descoped to P3 functional requirement
12.2. Pool shall be compatible for different a range of vehicles. ISSUE: related feature descoped to P3 functional requirement

13. Privacy

13.1. Passwords shall be stored as hashes, ie. SHA256 hashing function. DONE
13.2. Pool shall have a response plan in the event of a data breach. DONE
13.3. User accounts shall require authentication for access. DONE
13.4. PII shall be handled with an added layer of care and protection. DONE
13.5. Requesting systems must have the required credentials in order to access application data. DONE

14. Coding Standards

14.1. Testing coverage tooling such as SonarQube will be implemented to expose areas of the codebase requiring test coverage. DONE
14.1.1. Read about our SonarQube implementation here.
14.2. Code shall be peer reviewed prior to being merged into the master branch. DONE

15. Networks

15.1. Pool shall be performant on low bandwidth networks. DONE
15.2. Pool shall leverage caching to increase performance during periods of reduced network availability. ON TRACK (documenting approach to caching as alternative to implementing, as per guidance from professor)

16. Databases

16.1. Pool shall use database optimization techniques to increase performance. DONE (documented database optimization opportunities here)
16.2. User actions and associated data shall be preserved at the database level. DONE

17. Performance

17.1. Application will have an average response time of 2 seconds or less. DONE
17.2. Application utilizes efficient data storage techniques to reduce load time. DONE (documented database optimization opportunities here)
17.3. Pool shall minimize device CPU usage. DONE
17.4. Pool shall minimize device memory usage. DONE

18. Navigation & Wayfinding

18.1. All open fields shall have sufficient validations. DONE
18.2. All open validations shall have helpful error handling that help the user course correct. DONE
18.3. Open fields shall auto suggest and when possible, pre-fill data to reduce the cognitive burden required to complete an action. ISSUE: Partially fulfilled by built-in browser pre-filling mechanisms, otherwise descoped due to cost associated with Google Maps API integration for address pre-filling.

19. Security

19.1. Data shall be backed up regularly. DONE
19.2. Data shall be sent over https protocol. DONE

20. Portability

20.1. Application shall have cross platform compatibility across all actively supported iOS, MacOS, Windows OS, Linux OS, and Android OS devices. DONE
20.2. Application shall function on the latest version of most common web browsers, i.e. Safari, Chrome, Firefox, DuckDuckGo. DONE

21. Cost & Budgeting

21.1. Application operating entities shall maintain sufficient financial resources capable of maintaining and scaling core services including the database, servers, third party applications and software, etc. DONE
21.2. Google Cloud should not have to incur any charges based on memory usage. DONE

22. Storage

22.1. Tables should not exceed 400 bytes. DONE
22.2. Values in tables should not exceed 50 bytes. DONE

23. Accessibility

23.1. Application frontend can accommodate users who may require a larger font size. ON TRACK

23.2. Application frontend can be easily translated to any language. ISSUE: This nonfunctional requirement is partially fulfilled; while the app was tested using Google Translate and other browser-based translation tools, the app name “Pool” and commonly used in-app terms such as “carpool” do not translate well to other languages. (This was tested in Bulgarian, Spanish, and Vietnamese.)

23.3. Application frontend can be easily navigated by users without sight. ON TRACK

23.4. Application frontend is optimized for readability. DONE

23.5. Application signup should take no more than 10 clicks DONE

24. Environmental Impact

24.1. The application shall incentivize making full use of a car’s capacity to optimize environmental impacts. ISSUE: related feature descoped to P3 functional requirement

24.2. The application shall have a feature that will remind drivers to turn off their engines if they’re waiting for long periods of time, like waiting for carpool participants. ISSUE: related feature descoped to P3 functional requirement

24.3. The application shall give priority or recognition to drivers with hybrid or electric vehicles to promote environmental sustainability. ISSUE: related feature descoped to P3 functional requirement

24.4. The application shall provide periodic emission saving reports to users to keep them motivated and informed. ISSUE: related feature descoped to P3 functional requirement

Achieving High Availability for the Pool Application:

The Pool application is currently deployed on a single Ubuntu virtual machine on Google Compute Engine, where HTTPS is configured with SSL through “Let's Encrypt.” Having only one VM makes Pool vulnerable to outages and complicates upgrades and maintenance without causing downtime.

Our solution for making Pool more highly available involves adding a Google Load Balancer with HTTPS and Health Checks. These will direct traffic to two VMs on Compute Engine. If one of the VMs goes down, the Health Checks will instruct the load balancer to route traffic only to the operational VM.

One challenge in making Pool highly available with this setup is transitioning the HTTPS logic from the single virtual machine to the load balancer without compromising our project. This may require extensive troubleshooting and configuration due to our team's limited expertise in this area. Additionally, financial constraints are a concern; the cost for services like extra virtual machines and a load balancer could potentially triple our current expenditure over our single VM setup. These factors make achieving high availability a future goal for the Pool team.

High-Level Implementation Steps:

1. **Create a Second VM:** Set up a second VM with settings identical to the original VM.
2. **Add Health Checks:** Implement Health Checks for the HTTP/HTTPS protocol, setting intervals and thresholds. This will inform the load balancer about any issues with the Pool VMs.
3. **Create an Instance Group:** Select the same region as the VMs and add both Pool VMs to this group.
4. **Configure the Load Balancer:**
    - Use HTTP(S) Load Balancing.
    - Create a backend service using the instance group and incorporate the earlier configured Health Checks.
    - Set up a frontend service to dictate how the load balancer handles incoming traffic. Select HTTPS as the protocol, add a Google-managed SSL certificate, and include Pool's domain (https://www.carpoolwith.me/).

SonarQube: Code Analysis Tool

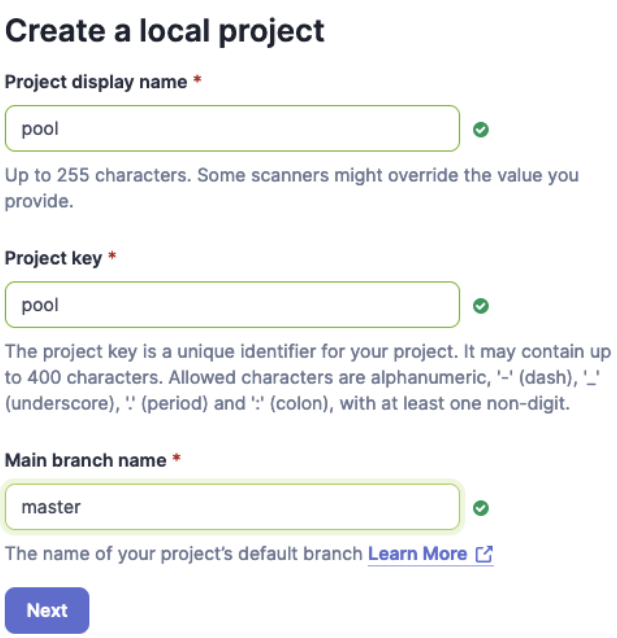
Getting SonarQube Set up:

Get the official SonarQube Docker Image:
Run **docker pull sonarqube** the terminal.

Start the SonarQube docker container:
Run **docker run --name sonarqube --restart always -p 9000:9000 -d sonarqube**

Login:
Default username: admin password: admin
Change default username and password.

Create a local project (see next page for screenshot):

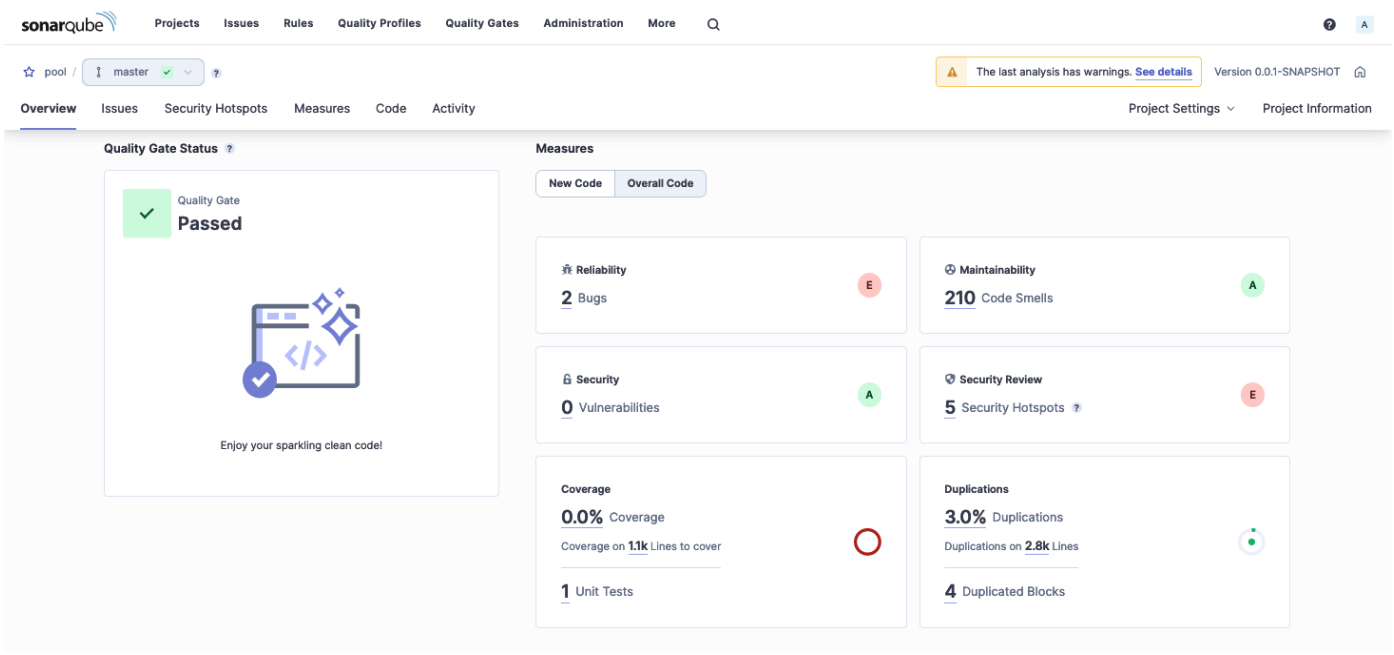


Create a SonarQube project token and store it somewhere safe.

Run analysis locally:
In the Intellij terminal navigate to the poolapp folder or the folder that contains the pom.xm and run: (SonarQube will provide you this code automatically when prompting the user, the SonarQube token will be different for each user).

```
mvn clean verify sonar:sonar \
  -Dsonar.projectKey=pool \
  -Dsonar.projectName='pool' \
  -Dsonar.host.url=http://localhost:9000 \
  -Dsonar.token=sqp_a66fbb4c752de8e70a23fe68717dce895589e2c8
```

Get analysis from the SonarQube application dashboard (see next page for screenshot):


sonarqube
Projects
Issues
Rules
Quality Profiles
Quality Gates
Administration
More
pool
master
The last analysis has warnings. See details
Version 0.0.1-SNAPSHOT
Overview
Issues
Security Hotspots
Measures
Code
Activity
Project Settings
Project Information
Quality Gate Status
Quality Gate
Passed
Enjoy your sparkling clean code!
Measures
New Code
Overall Code
Reliability
2 Bugs
E
Maintainability
210 Code Smells
A
Security
0 Vulnerabilities
A
Security Review
5 Security Hotspots
E
Coverage
0.0% Coverage
Coverage on 1.1k Lines to cover
1 Unit Tests
Duplications
3.0% Duplications
Duplications on 2.8k Lines
4 Duplicated Blocks

7. List of Contributions

Team Contribution Scores

- Isiah: 9
- Jonathan: 9
- Kendrick: 9
- Kristian: 10
- Phillip: 10
- Xuan: 10

Product Summary

- ✅Zoe: drafted initial versions and revised final version

Usability Test Plan & Test Moderation

- ✅Zoe: created and authored all elements of usability test plan and moderated usability test sessions

QA Test Plan & Testing

- ✅Kendrick: conducted QA testing for nonfunctional requirements 17.1 and 19.2
- ✅Kristian: developed test plan for nonfunctional requirement 8.1 and conducted QA testing for nonfunctional requirements 8.1, 17.1 and 19.2
- ✅Phillip: conducted QA testing for nonfunctional requirements 17.1 and 19.2
- ✅Zoe: created and authored all elements of usability test plan (with exception to that for nonfunctional requirement 8.1), moderated QA test sessions, and conducted QA for nonfunctional requirements 2.2 and 6.1

Code Review

- ✅Isiah: Conducted external code review for Jeremy Tran's team
- ✅Phillip: Conducted internal code review
- ✅Zoe: Analyzed and authored coding style section, coordination with Jeremy Tran's team for external code review

Self Check on Best Practices for Security

- ✅Kristian: Authored the entirety of this section

Input Validation

- ✅Isiah:
  - Required fields on “Sign up”
  - Length & Character validations on “Sign up”
  - Length & Character validations on “Post a pool”
  - Date & Time validations on “Post a pool”
- ✅Jonathan
  - Required fields on “Sign in”
  - Required fields on “Post a pool”
  - Length & Character validations on “Post a pool”
- ✅Kendrick
  - Zip code input in search bar
  - City input in search bar
  - Updated inline error messaging for phone and email on “Sign up”
- ✅Kristian
  - Backend validations for phone number received by pool/signup API
  - Backend validations for name fields received by pool/signup API
  - Backend validations for city received by pool/search API
  - Backend validations for zip code received by pool/search API
  - Backend validations for required fields received by pool/signup API
- ✅Phillip
  - Backend validations for required fields received by pool/signin API
  - Backend validations for required fields received by pool/createpool API
  - Backend length & character validations for inputs received by pool/createpool API
  - Backend validations for date and time received by pool/createpool API
- ✅Xuan
  - Assisted Kendrick with the above validations
- ✅Zoe
  - Wrote requirements for all validations and conducted testing

Self-check: Adherence to original Non-functional specs

- ✅Isiah: conducted self-check review on scalability, reliability, regulatory, and maintainability categories
- ✅Jonathan: conducted self-check review on serviceability, utility, manageability, and data integrity categories
- ✅Kendrick: conducted self-check review on capacity, availability, usability, and interoperability categories
- ✅Kristian: conducted self-check review on privacy, coding standards, networks, and databases categories
- ✅Phillip: conducted self-check review on performance, navigation & wayfinding, security, and portability categories
- ✅Xuan: conducted self-check review on cost & budgeting, storage, accessibility, and environmental impact categories

Nonfunctional Requirement Development & Implementation

- ✅Isiah:
  - created and implemented error page
- ✅Jonathan:
  - authored the entirety of the database optimization opportunities document following a thorough audit of our data types and usage
  - Tested application in DuckDuckGo and logged any found defects
- ✅Kendrick:
  - created and implemented terms and conditions page
  - Tested application in Safari and logged any found defects
  - Added terms and conditions agreement to signup
- ✅Kristian:
  - authored the entirety of the approach and implementation plan for load balancing and high availability
  - implemented SonarQube and documented the implementation and use
  - tested application in Firefox and logged any found defects
  - Set up event monitoring and alerts in Google Cloud Platform
  - Created and published internal data breach plan in GitHub repo
- ✅Phillip:

    - configured automated data backups
    - implemented ability for backend to switch to a backup CloudSQL db instance
    - ensure backend is sending proper error response to frontend for 400s and 500s
    - Test application in Chrome and logged any found defects
- ✅Xuan:
    - implemented cookie consent management
    - Made application fully screen size responsive
    - Convert header menu to hamburger menu on mobile web
- ✅Zoe:
    - Conducted accessibility compliance audit to produce final report using Accessibee
    - authored explanation of capacity nonfunctional requirement approaches

Bug Fixes

- ✅Isiah:
    - App name & tag line missing in mobile view
    - Date/time in My Pools still unreadable in military time
- ✅Jonathan:
    - Send poolId when calling create crew endpoint
- ✅Kendrick:
    - Bottom of terms & conditions screen cut off in full resolution
    - Display specific error messaging for invalid email
- ✅Kristian:
    - Supported all debugging requiring backend assistance
- ✅Phillip:
    - Supported all debugging requiring backend assistance
- ✅Xuan:
    - Nothing happens when user tries to create account in Safari
    - Search results displayed too close to bottom of screen
    - Search result display issue in select resolution
    - Fix pool creation
    - Resolve issue with frontend request to create crew endpoint
    - Pass crewId as null or INT when creating pool

    - Debug signup
    - Fix public/private post a pool feature
    - Debug create pool issue

Frontend Improvements & Updates

- ✅Isiah:
    - search result page card enhancements
- ✅Jonathan:
    - Create site footer
- ✅Xuan:
    - add confirmation for successful account creation
    - Display “crew created” on past pools when crewCreated=1
    - Convert date:time to UTC before sending to backend
    - Direct to sign up from “join pool” for unauthenticated users

Backend Improvements & Updates

- ✅Jonathan:
    - Update pools to be privacy=true or false

Deployment

- ✅Xuan: fully oversees deployment pipeline and activities