CAB230

[ASSIGNMENT 2: CLIENT SIDE]

['Volcano DB' React Web Application]

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Report Contents

Introduction

Purpose & description

'*Volcano DB*' is a web application written in React and Typescript, with the intended purpose of allowing users to view and analyze data on a range of volcanoes with data taken from The Smithsonian Institution's Global Volcanism Program. By using a Javascript framework like React, the web application provides the user with a comparatively more modern and intuitive front-end interface to a small subset of the data available in the Global Volcanism Program database.

The application makes use of Tailwind CSS to help build a bespoke set of functions and React components to glue the style and functionality of the site together, as a way to make the application feel less 'generic' while remaining visually interesting, interactive and familiar to the application's users.

Completeness & Limitations

The application as a whole uses Tailwind CSS, a "utility first" CSS framework (Tailwind Labs, n.d.), to create a more purpose-built application in comparison to CSS/component libraries like Bootstrap, while still streamlining the development process in comparison to "vanilla" CSS stylesheets. Navigation options are handled in a menu bar running along the top of the website, with all routing handled by React Router - this means the application performs its page updates in a "single page application" style, where page elements are only re-rendered as their state changes, rather than performing a page-wide re-render when a new page is requested.

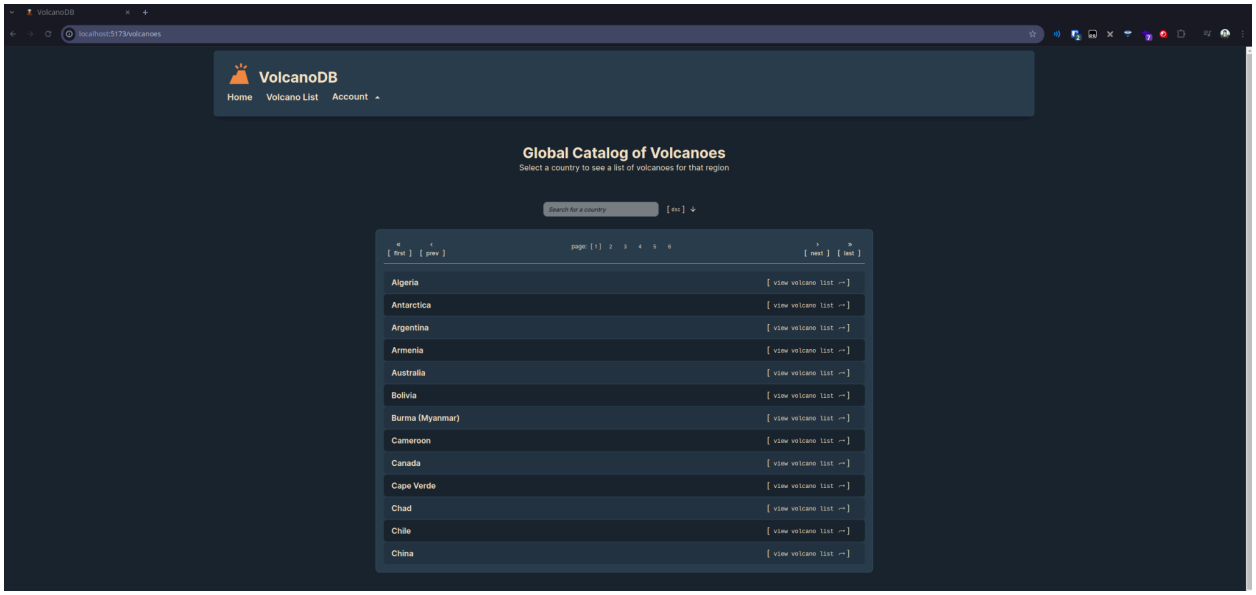
The display of thorough and intuitive data displays and filtering options are presented via a mix of bespoke solutions (such as the countries list, which implements a custom fuzzy-matching search function, list reordering, and pagination), with complex functionality handled by Node modules like Chart.js (which handles the rendering of a bar graph for population information), and Ag Grid React (to display the more complex tables of volcanoes and handle volcano table sorting).

User accounts are (for the most part) managed on the server side (e.g, passwords & hashing, secrets for token generation, user information, responses, and so on), so the implementation here is simply handling the provided tokens and related session status - if user signs in, the token is cached in the client's local storage, and if a user signs out, the token is cleared. The main reason for a user session is to facilitate access to gated information, so if a token is available to a user, it is sent with a request to fetch the authenticated dataset instead of the "free" dataset. Client data is appropriately cleared on logout so that authenticated information cannot be accessed by an unauthenticated user.

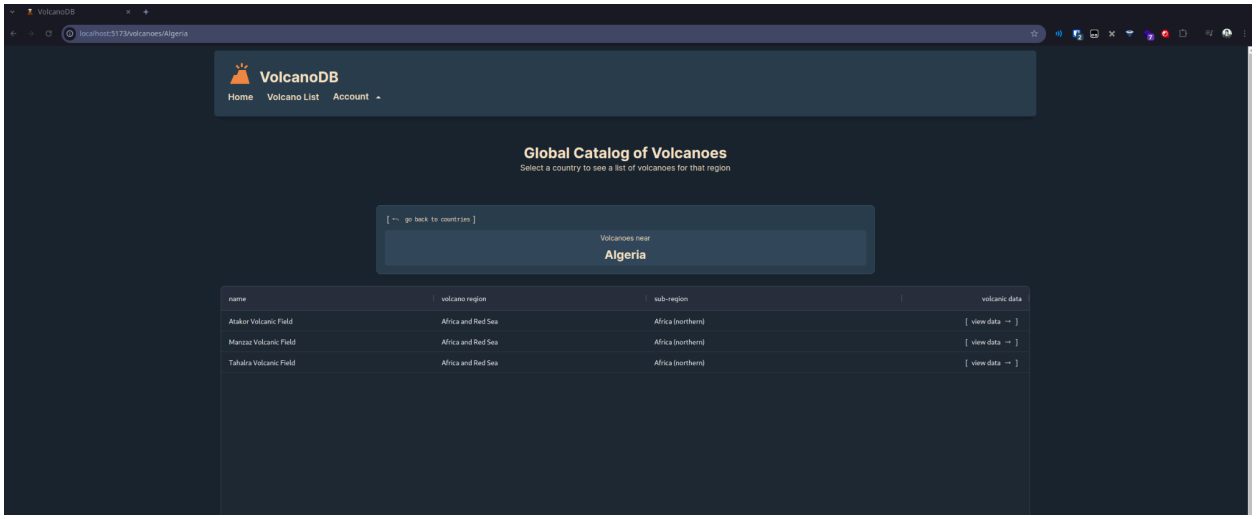
Use of Endpoints

/countries, */volcano*

The `/countries` endpoint is coupled with the `/volcanoes` endpoint on the client side, as the two have coupled functionality given a user is intended to view volcanoes dependent on a selected country. It should be noted that the client side endpoint naming convention is the reverse of that on the server side to reflect the intended control flow (i.e, viewing a list of volcanoes by specifying a country).



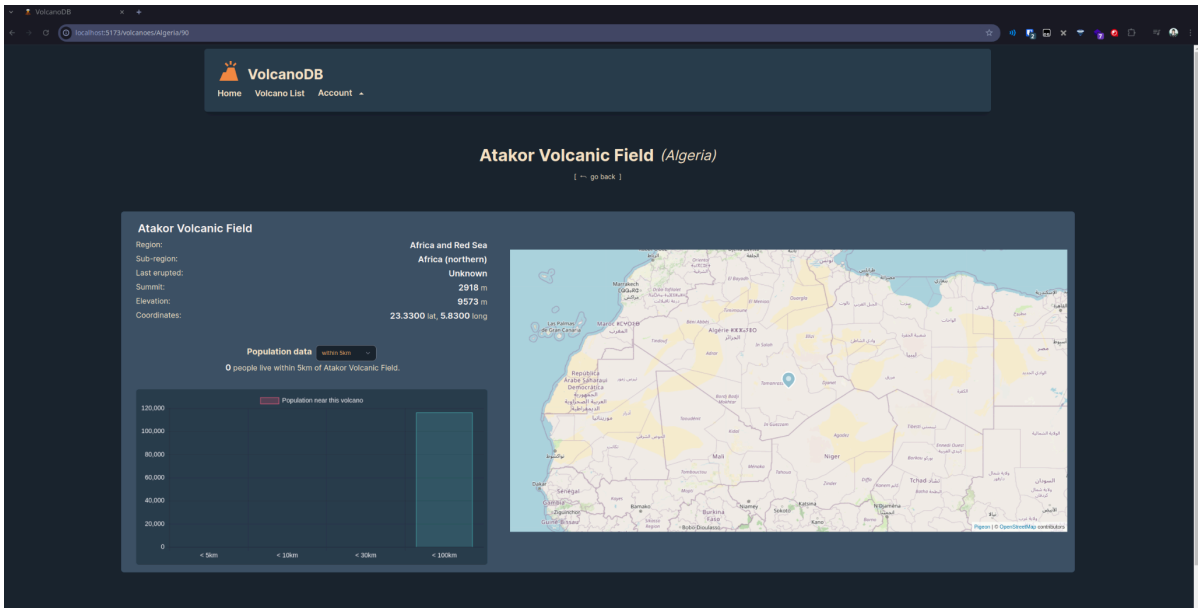
The list of countries presented to a user at the `/volcanoes` route



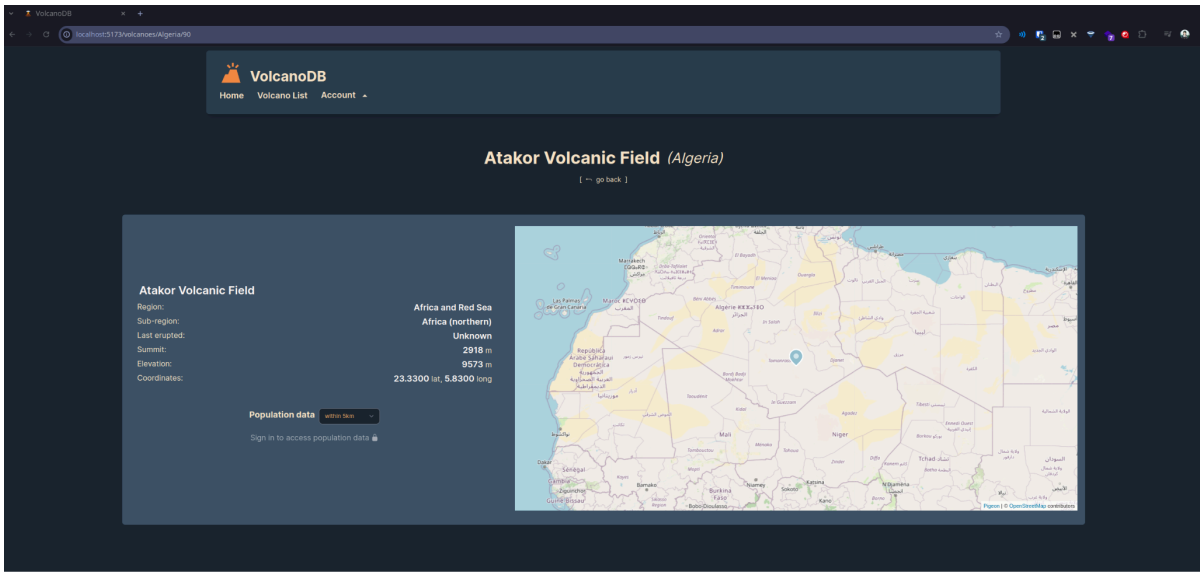
The volcanoes grid at `/volcanoes/{country}` - the above example uses `/volcanoes/Algeria`.

/volcano/{id}

The client handles data from this endpoint at `/volcanoes/{country}/{id}` (where `{id}` represents a specific volcano ID). The exact presentation changes depending on a user's authorization status:



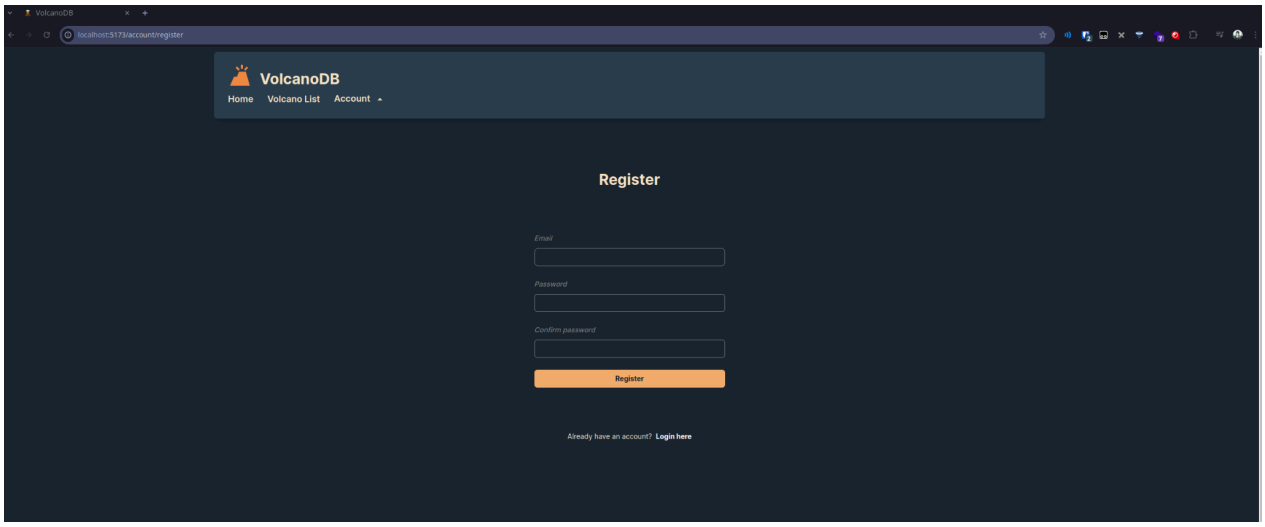
The authenticated view at `/volcanoes/{country}/{id}` - the example above features `/volcanoes/Algeria/90`



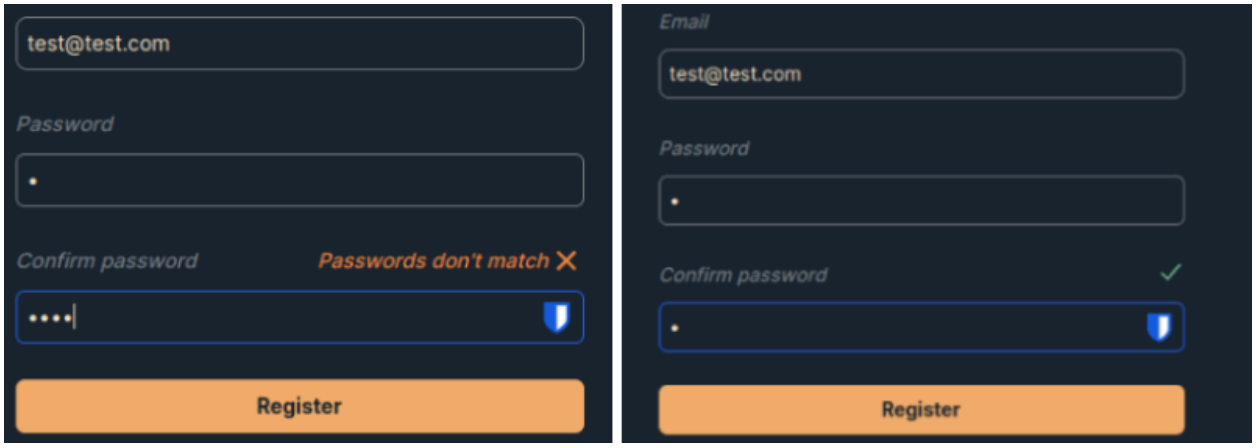
The unauthenticated view of the same page, `/volcanoes/Algeria/90`, where the text and graph of population data is replaced with a sign-in prompt and link.

/user/register

A controlled form at `/account/register` corresponds with this endpoint form that accepts user input for an email and password, with the value of each input binding to a React state, which is updated on a change of value. The password confirmation field that attempts to mitigate the creation of an account that includes a typo in the password field.



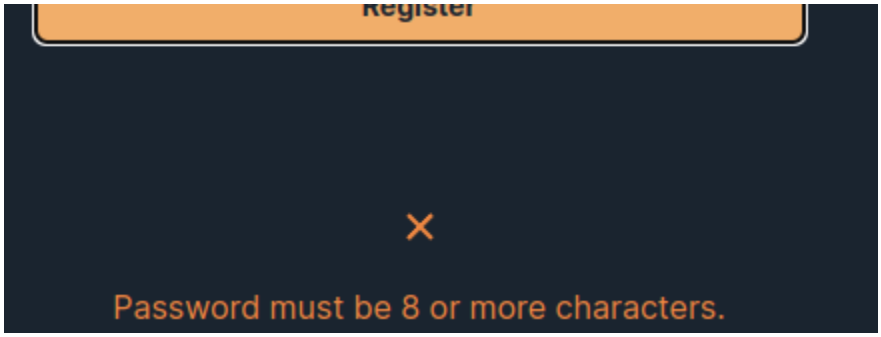
The base registration form



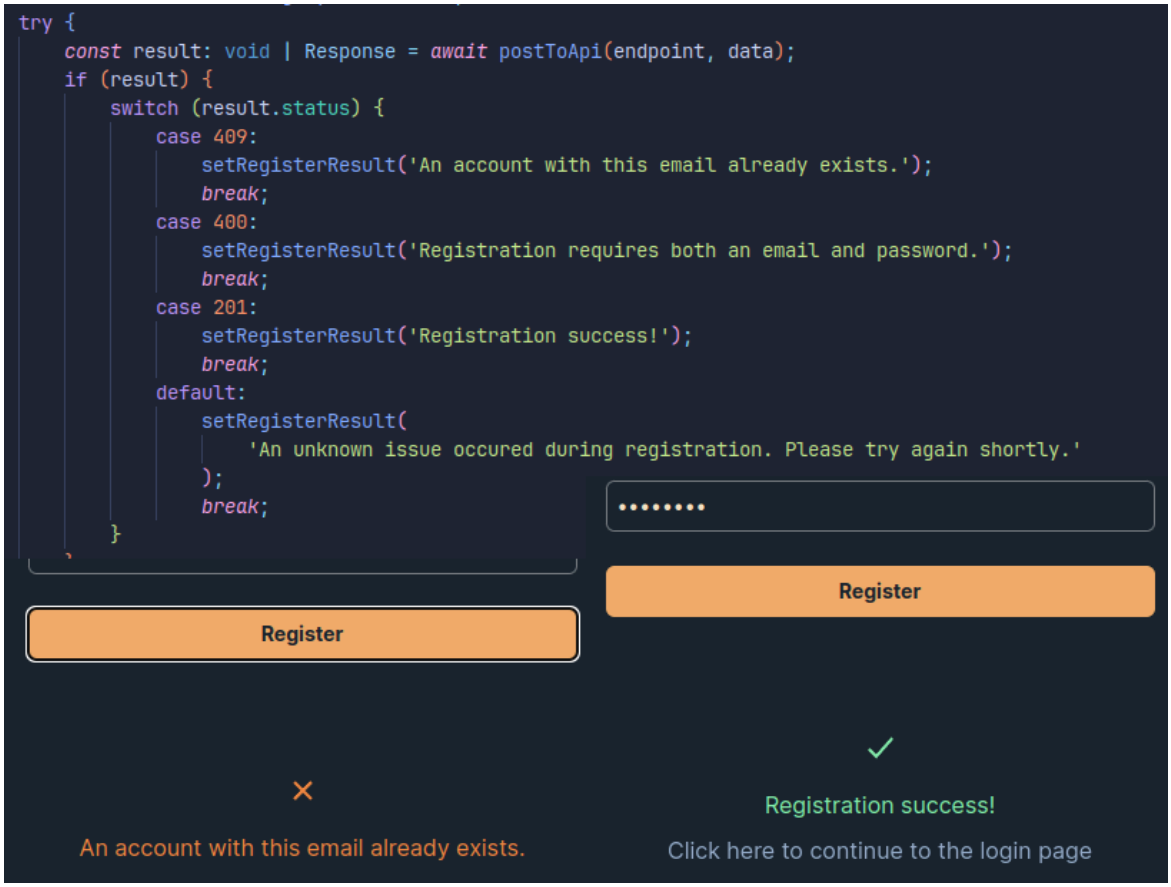
Password intent check - non-matching vs. matching confirmation entries

/user/register (cont.)

The form checks for a minimum password length of 8, and returns user-friendly status information to the user depending on the server's response.



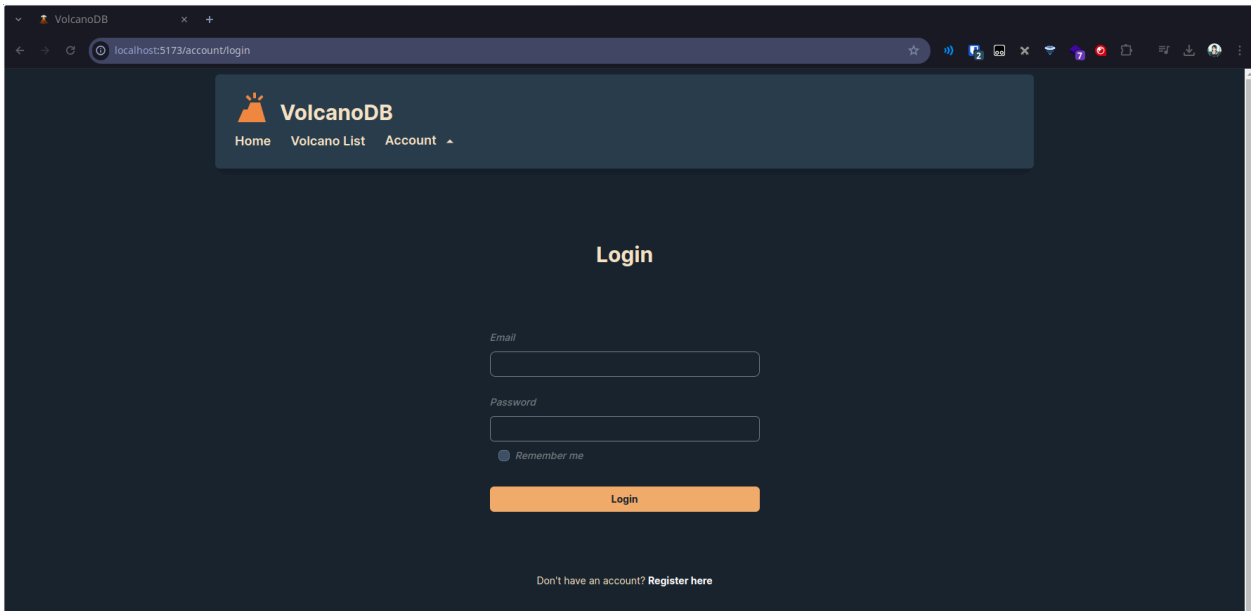
A password entry with an invalid length; note that this can be bypassed by making a direct POST request to the API (e.g with a tool like cURL), so in an ideal scenario, password restrictions like this would also be accounted for on the server.



The server may respond to invalid POST requests with a range of vague and/or jargon-like messages, so these are reinterpreted via the responses status code so the user can better understand why their request has returned an error, and adjust accordingly.

/user/login

The client login endpoint (at `/account/login`) functions similarly to the register endpoint, using a controlled form to post values to the corresponding `/user/login` API endpoint, handling a small range of server responses.



The base login page

/user/login (cont.)

On a successful login, the server provides a JWT in its response; this token is stored in the browser's local storage to facilitate session persistence between browser sessions - note that, for security purposes, JWTs are not stored like this in production environments and should instead be stored as an `HttpOnly` cookie (where the Javascript runtime cannot read or write data); for the purposes of this example application, however, real user data is not handled. After token storage, unauthenticated data pulled from the API is cleared, and the user is redirected to the `/account/me` page.

Example response handling based on the code returned from the server - functionality is similar to the register page.

Modules Used

Using `Vite`'s `react-ts` template (i.e, Vite is used instead of Webpack to bundle React code, which is built with Typescript, a Javascript superset that implements strong types) as a base for the application. The following `npm` modules where then installed on top of this for additional functionality:

Vite	Javascript bundler	https://github.com/vitejs/vite
React Router	Client side routing - re-renders just the changed parts of a web application when the user moves to a new page	https://github.com/remix-run/react-router
Tailwind CSS	CSS framework that implements a set of pre-defined "utility" classes that are implemented directly inside HTML markup	https://github.com/tailwindlabs/tailwindcss
Tailwind Forms	A Tailwind plugin which overrides default form styling for Tailwind integration	https://github.com/tailwindlabs/tailwindcss-forms
React icons	A large range of icons that can be imported into React components as React components	https://github.com/react-icons/react-icons
Ag-grid-react	Exposes a simple API to implement an interactive data grid	https://github.com/ag-grid/ag-grid
Pigeon Maps	Exposes a simple API to implement an interactive map	https://github.com/mariusandra/pigeon-maps

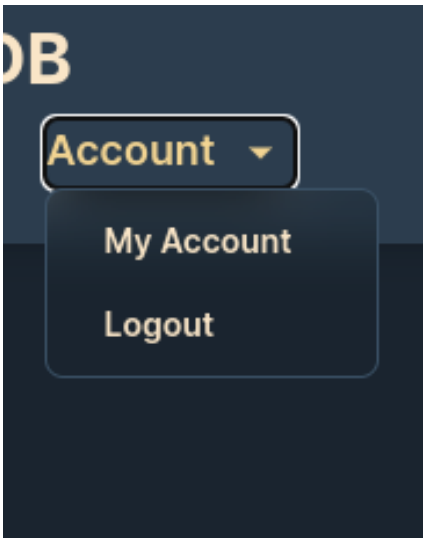
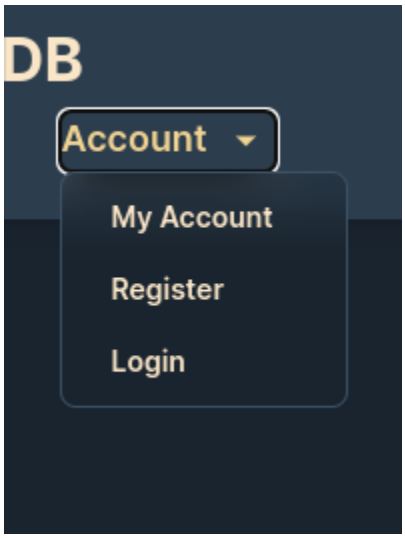
Application Design

Navigation & Layout

Generally, the application is designed to be simple, intuitive, and familiar:

- Tailwind CSS helps to maintain a consistent size and color palette throughout the application
- UI elements behave according to user muscle memory; for example, the dropdown in the navigation bar can be dismissed by clicking elsewhere in the application
- Buttons are positioned according to their intended direction; buttons that will move a user deeper into the application are positioned on the right, whereas buttons on the left direct a user back towards a starting point (with the same progression as if a user were to click the `back` arrow in their browser).
    - Interactive elements are highlighted by a color, opacity, or size change when hovered by a user.

A user's account authentication state is visible when opening the `Account` dropdown.

Logged in/authenticated	Logged out/unauthenticated
	

To reiterate earlier sentiments, the website is meant to be used in a way that allows a user to navigate with increasingly specific requests - it is intended to be used in the following order:

1. Search/browse countries with available volcano data,
2. Choose a country, displaying a list of volcanoes available for that country, with a small range of extra information on each volcano,
3. Choose a volcano to view specific details for that volcano,
4. Filter specific population data for that country (if the user is authenticated), either by hovering over the bars on the graph or making a selection from the select box menu.

Usability and Quality of Design

Given the above criteria, the application's design is mostly in-line with what a user would be familiar with given current web application design trends. For example, the difference between buttons from UI component libraries (the form submission buttons at the `/account/login` and `/account/register` endpoints) in comparison to the custom navigation menu items and other buttons may be an issue with some users as they might appear too much like plain text.
Similarly, the spacing of various elements can leave the page feeling bare, which might make pages appear as if they are still loading content when they are not.

The Nav bar along the top is constrained to a portion of the screen to make links more obvious; originally, this ran along the entire length of the screen, but the addition of content on the landing page drew attention away from this aspect (which may still somewhat be the case).

Aside from this, the general page-to-page navigational flow is intended to gradually dial into a user's desired dataset, and the difference between interactive elements vs static elements is given using a combination of CSS color/opacity changes alongside cursor changes to provide contextual hints to a user. For example, users can hover their cursor over an element to determine whether it can be clicked, with the 'direction' or resulting action being described through the button's text. Each page should contain a link that either moves the user

- Further into each site area, increasing the specificity of the displayed data, to the end goal of a volcano's data,
- Backward into previously-visited areas; users are taken back to *their previously visited* page, rather than the previous page in the site's page flow (i.e, a link to a volcano from the landing page will take a user to that volcano's dataset, and the 'return' button on that volcano dataset page will move that user back to the landing page, instead of throwing them into the volcano list, which may be confusing or disorienting for a new user).

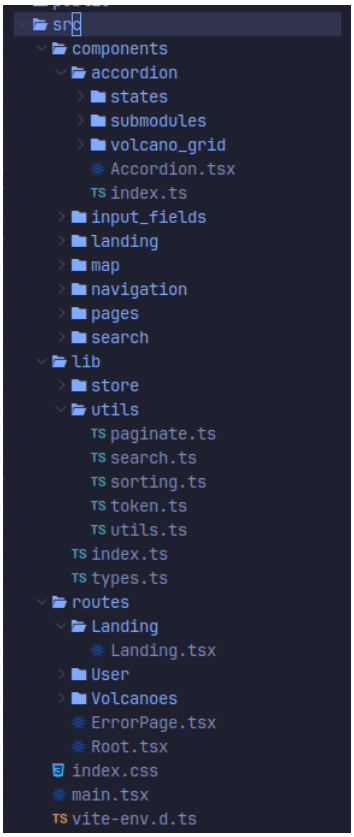
Accessibility

In terms of the accessibility of the content of this site, most custom elements require significant work. While Tailwind can be relied upon to provide a small range of accessibility utilities for screen readers and color content, as well as conditional ARIA (Accessible Rich Internet Applications) styling, these - along with most of the items on the W3C accessibility checklist - need to be implemented by hand based on the application's structure.

For example, as SPA routing means that entire page reloads won't occur, and while care has been taken to avoid jarring screen layout shifts or rapid and drastic color changes, some content in *Volcano DB* will still flicker when navigating between routes while content is fetched and DOM hydration occurs. In this case, SvelteKit, a relatively new Javascript framework, features built-in animations and hooks to fade content in and out as the page changes. As React is comparatively not so much a Javascript framework, similar functionality must be handled by a separate package (or hand-rolled by a developer), which is extra time spent programming or learning the API for a package.

Furthermore, *Volcano DB*'s HTML markup is constructed mostly via the use of `<div>` HTML elements, which, in the absence of CSS and scripting, means it is difficult to determine the structure of the page. Similarly, many of the buttons rely on Javascript and color changes to indicate to a user that they are a button, so users with Javascript disabled or a sight disability may find it difficult to determine the purpose of a range of UI elements.

Technical Description



Architecture

The source code for *Volcano DB* is organized into three main directories:

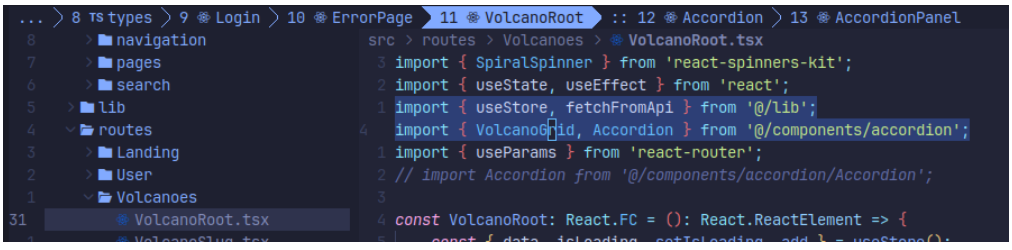
- `components/`
- `lib/`
- `routes/`

The `components` and `routes` directories should be reasonably self explanatory; portions of the UI are broken down into components and component sub-modules for improved code maintenance and reusability. Components may not necessarily be constrained to a particular route, so they are decoupled and stored separately. Components are constructed into a coherent UI on each page, which are in the `routes` directory, where a route reflects a URL. The NavBar and Footer components don't change from route to route, so they are rendered in the `Root.tsx` route, with "main" content renders handled by React Router from `main.tsx`.

`lib` houses reusable function content - things like `fetch` calls, cache `context` providers, and Typescript types, which would crowd a component with logic that benefit from reuse in other components.

To compliment the application's modularity, Vite, ESLint and Typescript are all configured in their respective config files (see `/vite.config.ts`, `/tsconfig.json` and `/.eslint.cjs`) such that an alias is set to use an '`@`' specifier to import the `src/` root directory (Vite, n.d.).

Each module is then re-exported in its own `index.ts` file. This allows a given module to be imported from, for example, '`@/lib`', or '`@/components/{component}`', which sacrifices some extra boilerplate code for simplified module management:



Test plan

(screenshot appendices from page 24)

Application Area	Task	Expected Outcome	Result	Screenshot appendix
Landing page	View a random volcano (logged out)	Taken to the corresponding volcano page *without* population data	PASS	**01**
Landing page	View a random volcano (logged in)	Taken to the corresponding volcano page *with* population data	PASS	**02**
Account - login	Use valid details to log into an account using test credentials: **email**: 'mike@gmail.com' , **password**: 'password'	The account is logged into, a token is stored in the browser's local storage, and the user is redirected to the '`/account/me`' client endpoint	PASS	**03**
Account - logout	Logout using the 'logout' button in the navbar drop down	User is logged out, the JWT in the browser's local storage is cleared, cached volcano data requiring authorization is reset, and the user is redirected to `/account/login`	PASS	**04, 05**
Account - login	Login with invalid email	Request sent to API, which will return a `401` status. 'Incorrect email or password' message is displayed to the user	PASS	**06**
Account - login	Login with valid email but invalid password	Request sent to API, which will return a `401` status. 'Incorrect email or password' message is displayed to the user	PASS	**07**
Account - login	Send a login request with no email/password	HTML form inputs carry '`required`' attribute. Requests with Chrome/Firefox will highlight missing fields (no form submission).	PASS	**08**
Account - register	Send a valid registration request: **email:** 'askdjhflaksdjhflkasjdhfklasdhf@a.com', **password:** 'password'	Request is sent to API, `201` response returned. 'Registration success' message displayed, user is requested to log in.	PASS	**09**
Account - login	Login to account with newly-created credentials **email:** 'askdjhflaksdjhflkasjdhfklasdhf@a.com',	The account is logged into, a token is stored in the browser's local storage, and the user is redirected to the '`/account/me`' client endpoint	PASS	**10**

	password: 'password'			
Account - register	Attempt to register with an existing email	Request is sent to API, `409` response returned. 'An account with this email already exists' message displayed to user.	PASS	**11**
Account - register	Attempt to register with a password shorter than 8 characters	Request is filtered on the client. 'Password must be 8 or more characters' displayed to user.	PASS	**12**
Account - register	Attempt to register with invalid confirmation password	Request is filtered on the client. 'Password doesn't match the confirmation' is displayed to user.	PASS	**13**
Volcanoes - countries	Search for a country	List of countries is filtered to contain only those approximately matching the search query	PASS	**14**
Volcanoes - countries	Delete search term	Full list of countries is restored	PASS	**15**
Volcanoes - countries	Change country ordering	List of countries are sorted in ascending [Z-A] order	PASS	**16**
Volcanoes - countries	Change country page	Countries from the desired page are returned	PASS	**17**
Volcanoes - countries	Attempt to change to an invalid page (e.g clicking 'next' on the final page)	No state change	PASS	**18**
Volcanoes - Volcano list	Navigate to a country and view its list of volcanoes	Shows a small overview of each volcano in a table, with a button to view detailed data in the far right column	PASS	**19**
Volcanoes - details	View details on an arbitrary volcano while logged out	Shows all details other than population data and chart	PASS	**20**
Volcanoes - details	View details on an arbitrary volcano while logged in	Shows all details including population data and chart	PASS	**21**

Difficulties, Exclusions, Unresolved Errors

Where all 'critically important' functions were implemented, a small number of non-critical features were not finalized or able to be implemented on time:

- A 'Remember me' checkbox on the login form,
- An indicator in the NavBar to display whether a user is logged in or not,
- Searching and pagination features for the volcanoes grid (similar to that of the countries list),
- A way to search for volcanoes without first knowing the country (though this may not have been feasible due to API limitations).

This is mostly a case of time management, where more time was allocated to perfecting non-critical aspects of critical functions (e.g, using a basic fuzzy-matching search over a direct equality check, or registration password confirmation fields) rather than implement the similarly non-critical aspects above.

Relating to time restrictions, the application has a tendency for an over-reliance on `useEffect()` hooks where they may not have been necessary - this indicates that some aspects of the application's functionality are less efficient than the optimal case. Greater scrutiny into which functions truly require an effect and refactoring and retesting these components and functions would be ideal, though the smaller scale of the application means it was able to run responsively and without noticeable latency.

The codebase also uses naming conventions that may not have been named optimally - for example, the `Accordion` component and its sub-modules was initially implemented as an accordion that could be opened and closed to reveal or hide its contents. Ultimately, later changes to `/volcanoes` implementation to handle the user's selected country inside the URL means that this accordion-like functionality was dropped for simplicity. The remaining artifact - a slightly 'deceptive' naming scheme - means this might be confusing for code maintainability reasons, and would be ideal as a candidate for a simple fix in future iterations.

Similarly, the functionality for the NavBar's 'click of to dismiss' functionality still requires a vanilla `document.addEventListener()` function to attach an `onClick` attribute to the DOM as a whole; this was initially developed using a `composedPath()` to check a tree of elements after a click event was heard and find whether the click target was part of the drop down. This was changed to a React `useRef()` hook (code examples on the following page).

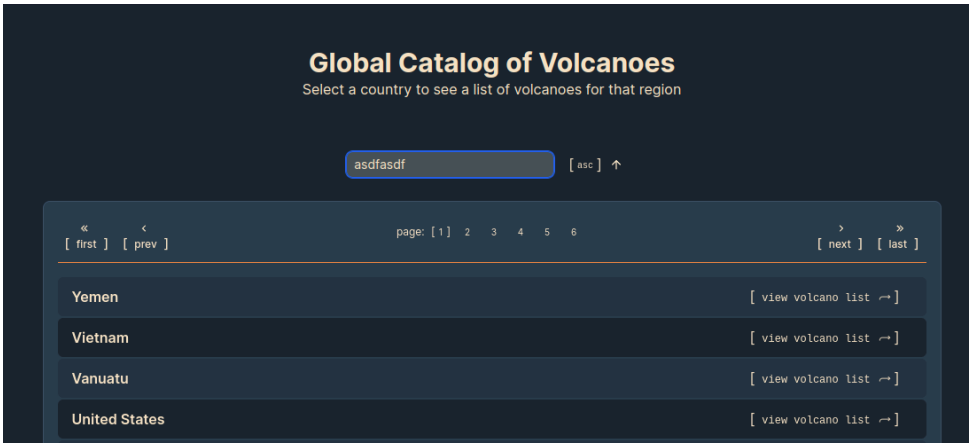
The component's initial design:

```
- const NavigationD: FC = (): ReactElement => {
-     const [dropdownOpen, setDropdownOpen] = useState('');
-
-     // dismiss open dropdown by clicking other section of the screen
-     const handleDismissClickout = (event: MouseEvent) => {
-         const path = event.composedPath();
-         const isClickInside = path.some((el: EventTarget) =>
-             (el as HTMLElement).classList?.contains('dropdown')
-         );
-         if (dropdownOpen === '' && !isClickInside) {
-             setDropdownOpen('');
-         }
-     };
-
-     // add/remove onclick listener to the dropdown on component mount/destroy
-     useEffect(() => {
-         document.addEventListener('click', handleDismissClickout);
-         return () => {
-             document.removeEventListener('click', handleDismissClickout);
-         };
-     }, []); // only run this hook on mount/destroy
-
-     // dropdown toggle handler function
-     const handleClickDropdown = (parent: string) => {
-         dropdownOpen === parent ? setDropdownOpen('') : setDropdownOpen(parent);
-     };
```

Refactored `useRef()` approach:

```
+ const Navigation: React.FC = (): React.ReactElement => {
+     const [open, setOpen] = useState<string>('');
+     const deepRef = useRef<HTMLLIElement>(null);
+
+     // useRef to close the dropdown if the user clicks on a non-dropdown portion of the DOM
+     const clickOutside = (event: MouseEvent) => {
+         console.log(deepRef, event.target);
+         if (deepRef.current && !deepRef.current.contains(event.target as Node)) {
+             setOpen('');
+         }
+     };
+
+     // lifetime hook - attach/cleanup an event listener to the document to receive clicks from
+     // any element
+     useEffect(() => {
+         document.addEventListener('click', clickOutside);
+         return () => {
+             document.removeEventListener('click', clickOutside);
+         };
+     }, []);
+
+     const toggleDropdown = (identifier: string) => {
+         setOpen(open === identifier ? '' : identifier);
+     };
```

Aside from this, manual testing only turned up one remaining bug (though there are likely other edge cases that are yet to be found) - searching for a country and then clicking the reorder button causes the states of the two components to de-sync, where they would ideally be aware of each others' current states.



Here, the two components need to correctly synchronize as children of a common parent component, sharing state so that each function call and variable check can be done with consideration for the state of the sibling component.

User Guide

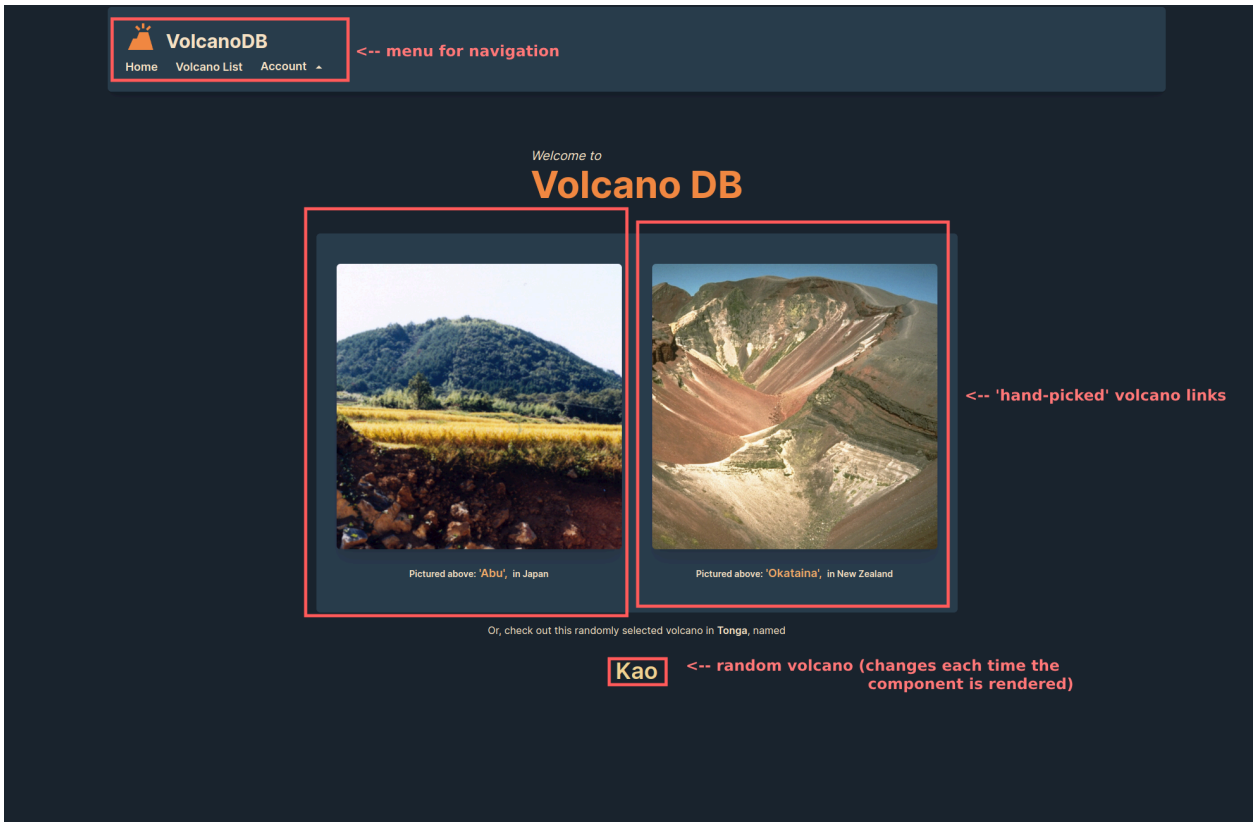
The two general audiences that *Volcano DB* is intended for may be one of two types of users:

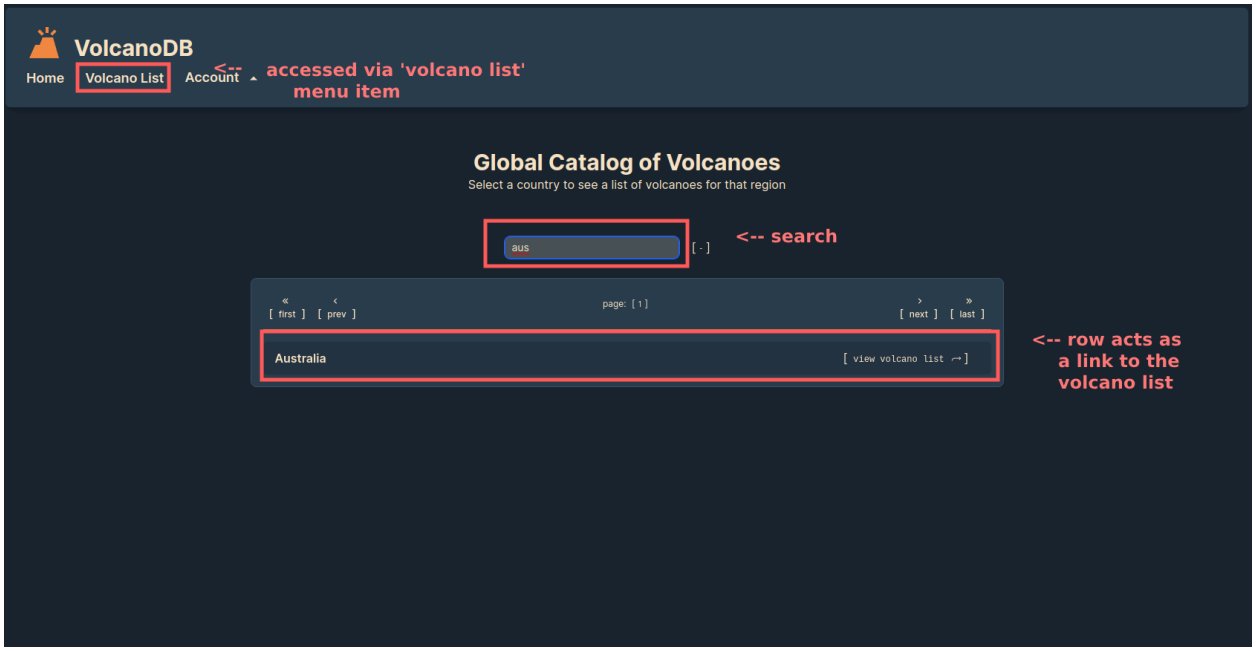
a) 'Just browsing' (e.g to browse the database at a whim - there is no desire to create an account and no specific search terms in mind),

b) 'Data hunters' (e.g a user looking for specific information on volcanoes - this could be data about a specific volcano, or about the volcanic activity of the region, for example).

Use Case A

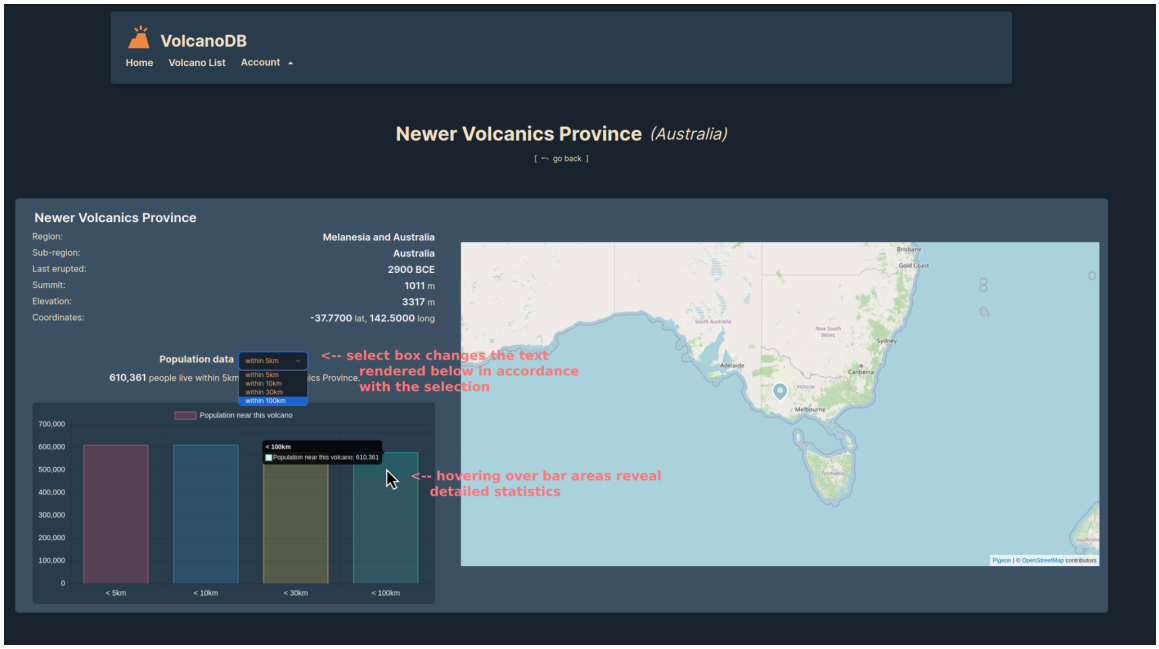
In *use case a*, the user is immediately presented with a way to access some random data - either via one of two images linking to hand-picked volcanoes, or a link to randomly chosen volcano. From there, this user might casually browse the catalog by country. This user represents a more relaxed approach to content consumption, with no active 'goal' in mind; here, *Volcano DB* immediately attempts to provide that user with interesting data from the landing page.



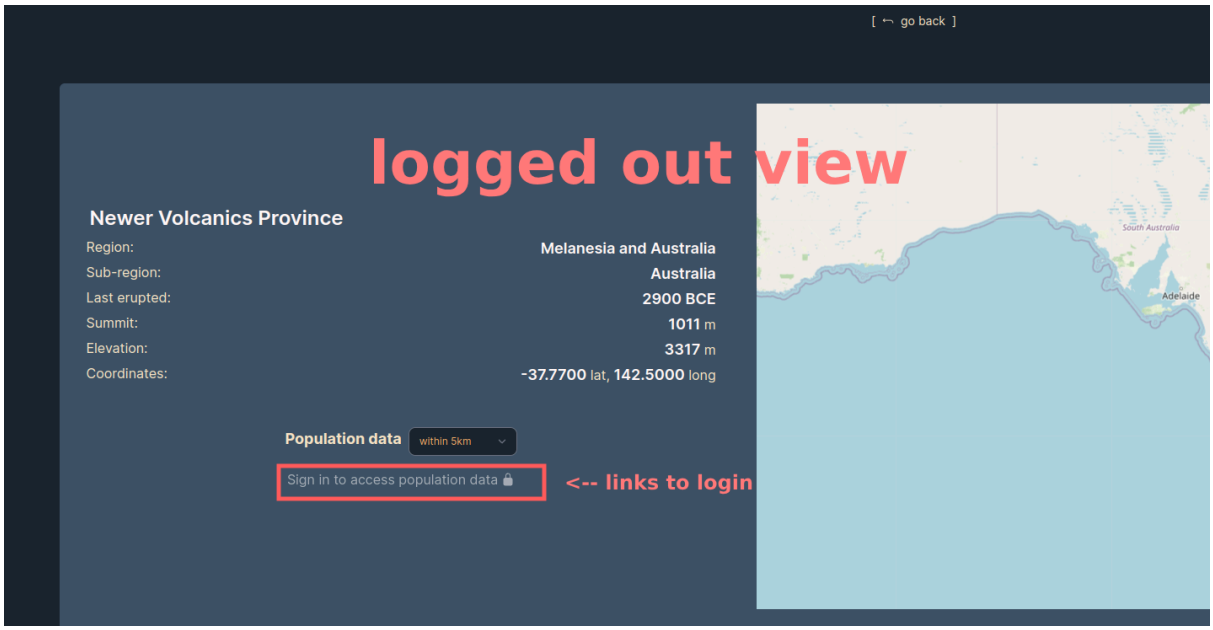


Use Case B

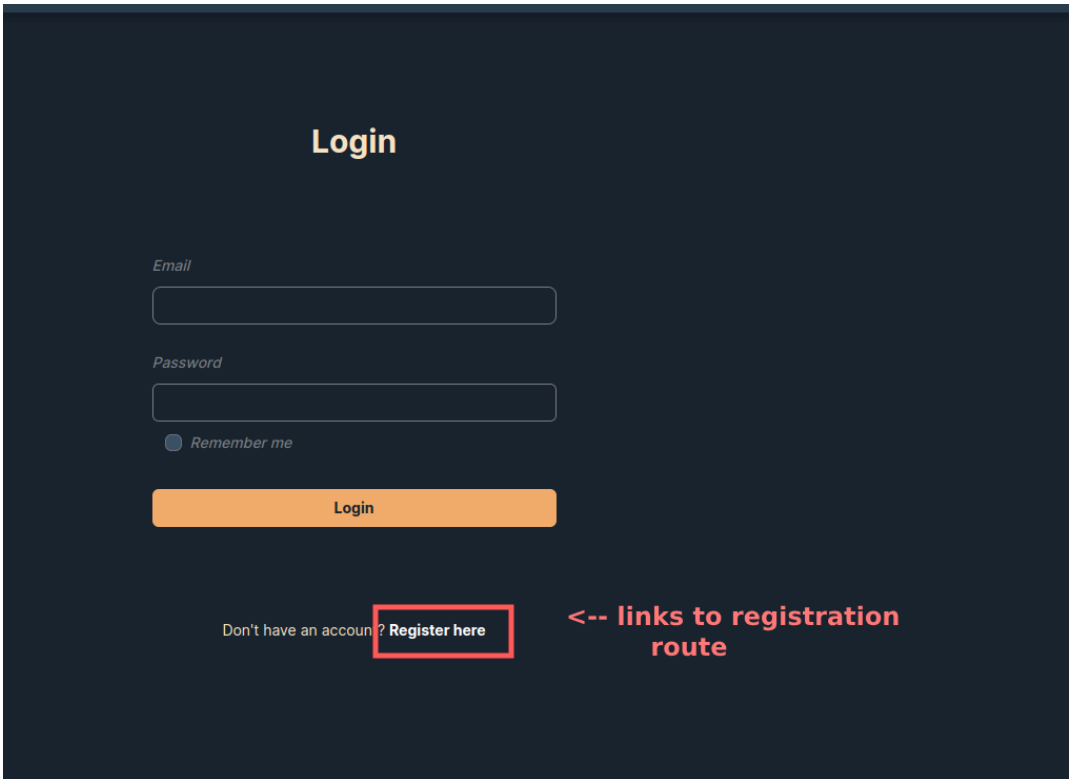
Otherwise, *use case b* allows a user to quickly access the countries list from the NavBar, filtering the list of countries with a search term or moving forward/backward through the paginated country list.



The user can then choose a country by clicking ‘view volcano list’, and continue to a chosen volcano from this list using the ‘view data’ button in the right-hand column.



If this user is not signed in and wants to view the account-gated population data, there is a link to login on the volcano data page to take the user to the client side `/account/login` endpoint, where they can either to an existing account. On arriving at this page, users without an account can easily access the register page via the link below the login form.



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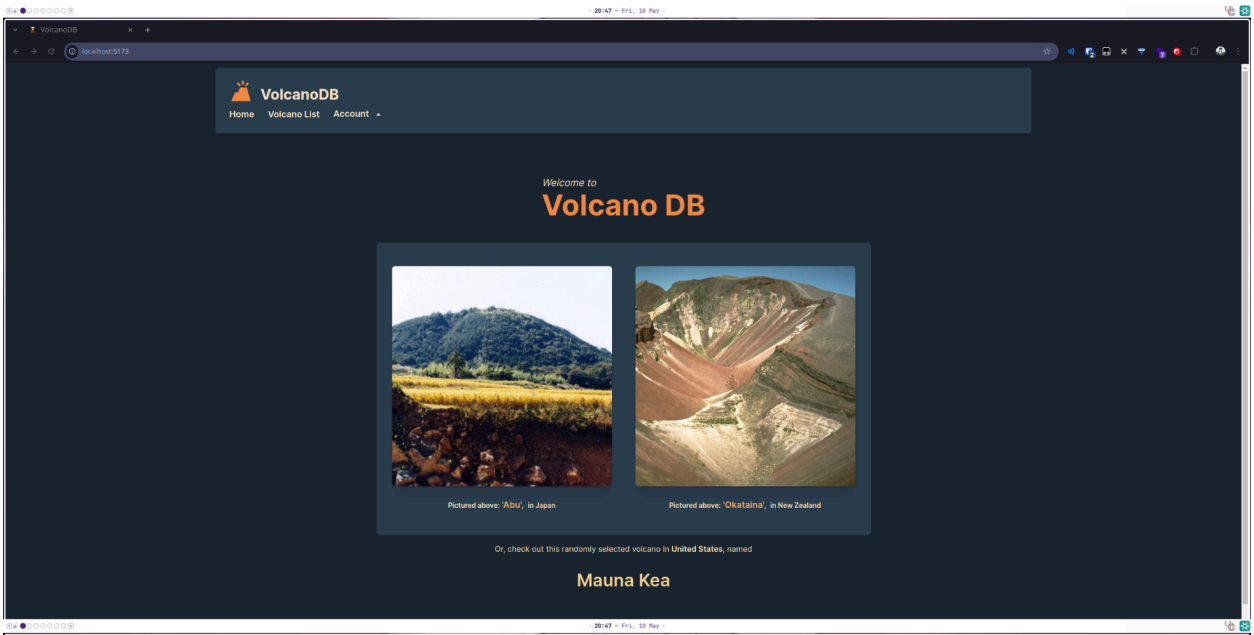
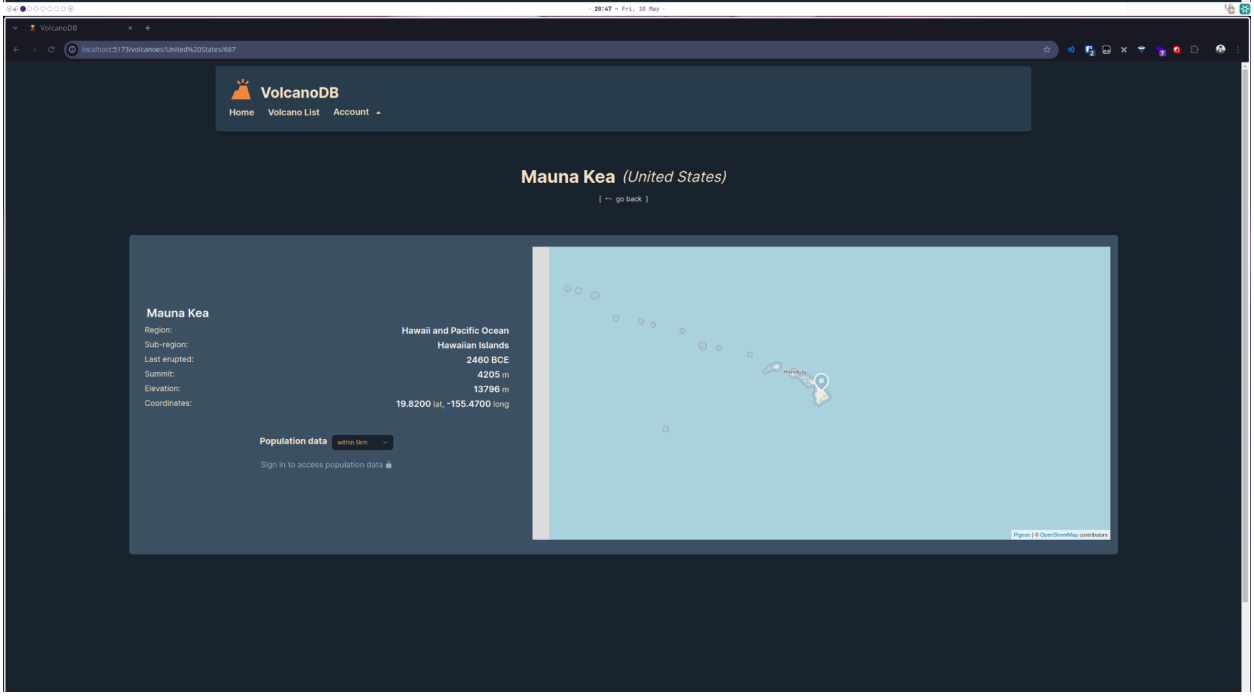
Screenshot Appendices

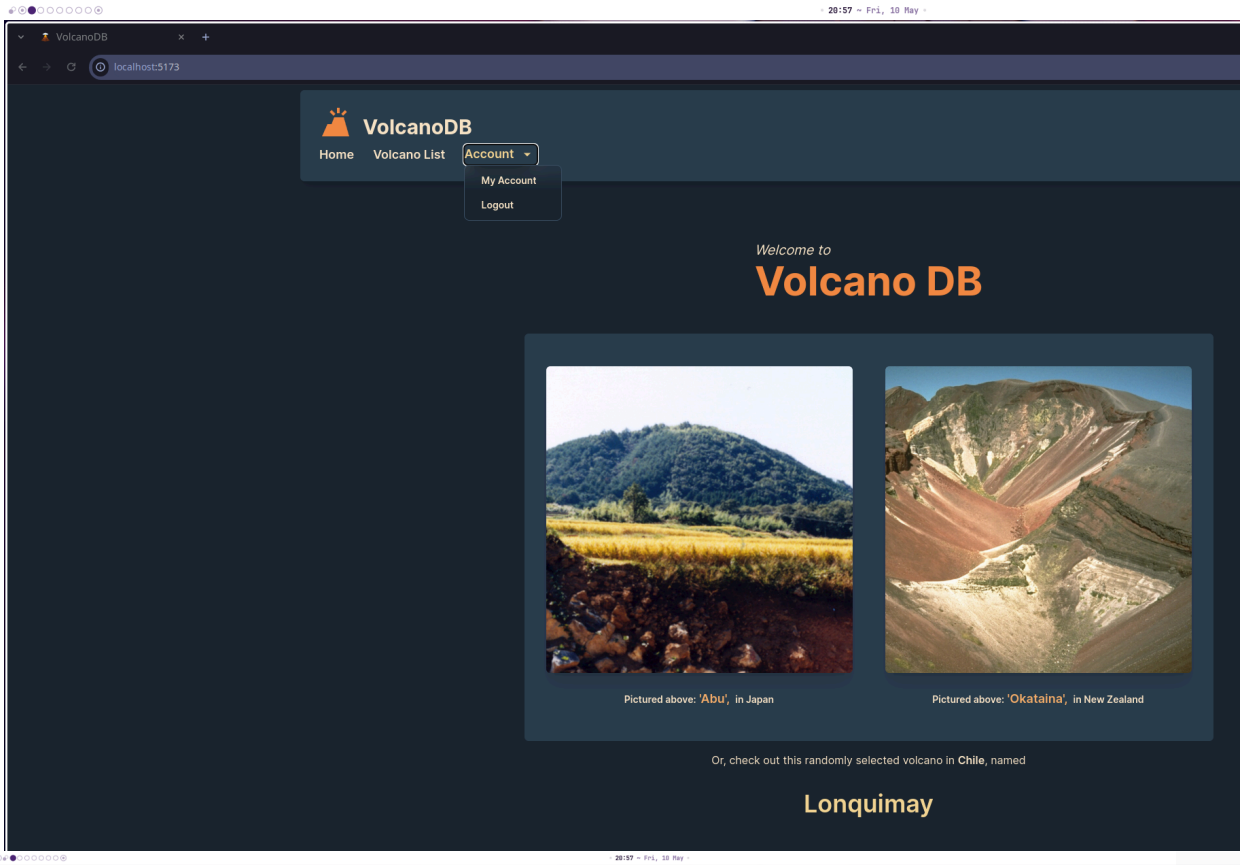
(starting on the following page)

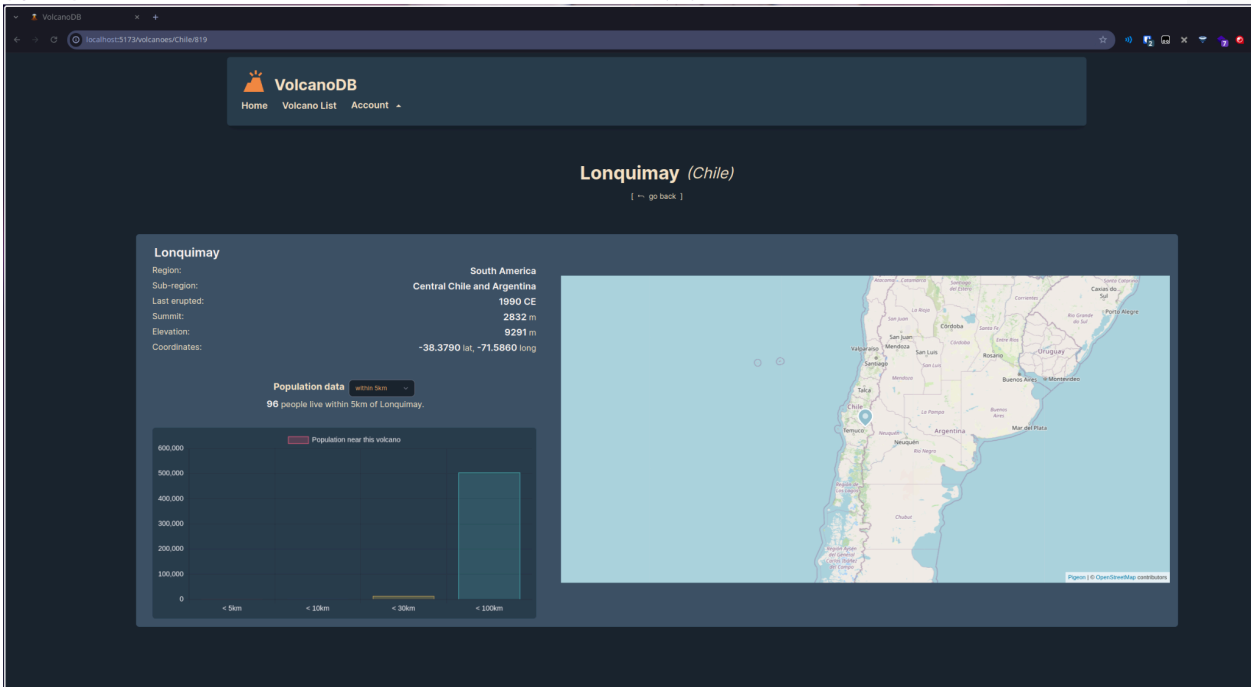
Appendix 01


VolcanoDB
Home
Volcano List
Account
Welcome to
Volcano DB
Pictured above: 'Abu', in Japan
Pictured above: 'Okataina', in New Zealand
Or, check out this randomly selected volcano in United States, named
Mauna Kea

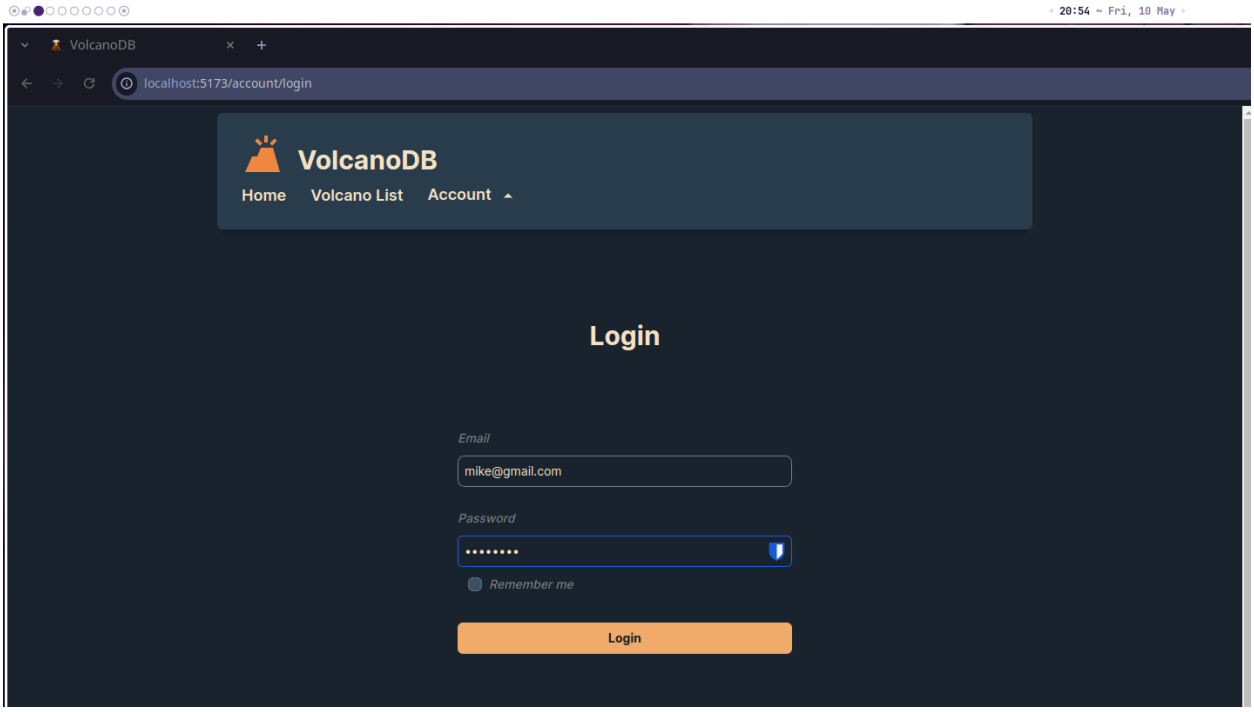

VolcanoDB
Home
Volcano List
Account
Mauna Kea (United States)
[← go back]
Mauna Kea
Region: Hawaii and Pacific Ocean
Sub-region: Hawaiian Islands
Last erupted: 2460 BCE
Summit: 4205 m
Elevation: 13796 m
Coordinates: 19.8200 lat, -155.4700 long
Population data
Sign in to access population data

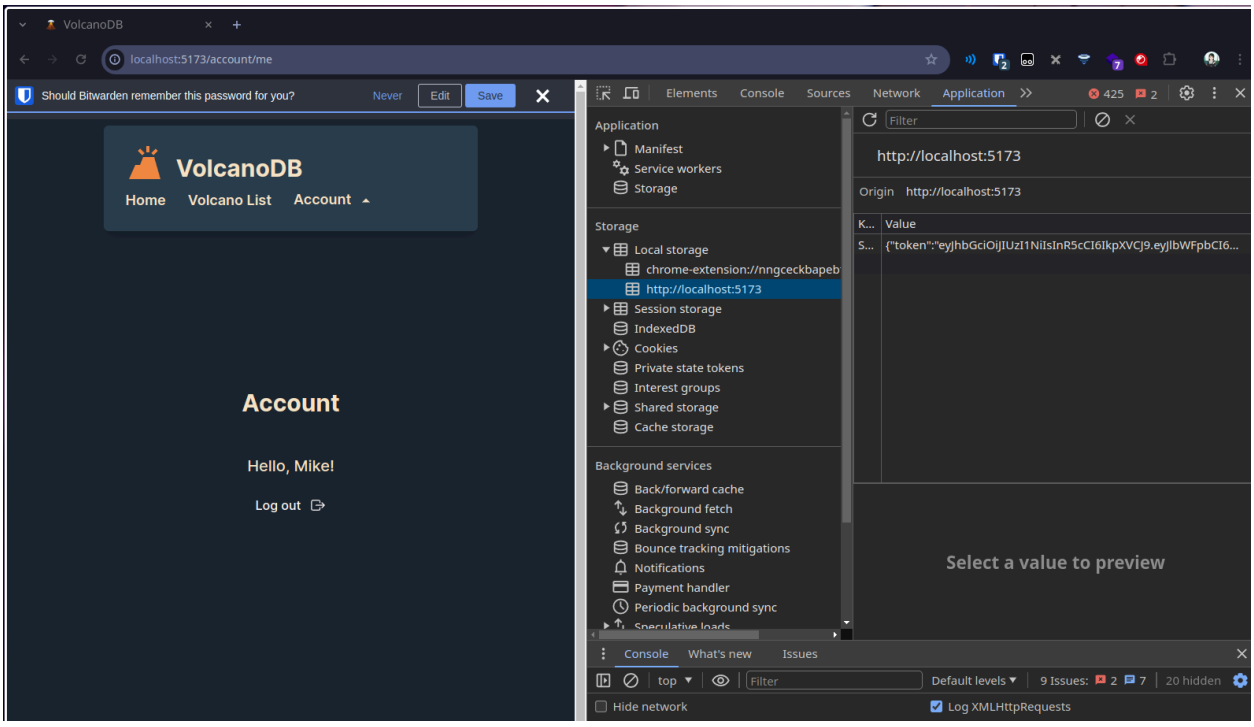
Appendix 02


VolcanoDB
localhost:5173
VolcanoDB
Home
Volcano List
Account
My Account
Logout
Welcome to
Volcano DB
Pictured above: 'Abu', in Japan
Pictured above: 'Okataina', in New Zealand
Or, check out this randomly selected volcano in Chile, named
Lonquimay


localhost:5173/volcanoes/Chile/819
VolcanoDB
Home
Volcano List
Account
Lonquimay (Chile)
[go back]
Lonquimay
Region: South America
Sub-region: Central Chile and Argentina
Last erupted: 1990 CE
Summit: 2832 m
Elevation: 9291 m
Coordinates: -38.3790 lat, -71.5860 long
Population data
96 people live within 5km of Lonquimay.
Population near this volcano
600,000
500,000
400,000
300,000
200,000
100,000
0
< 5km
< 10km
< 30km
< 100km

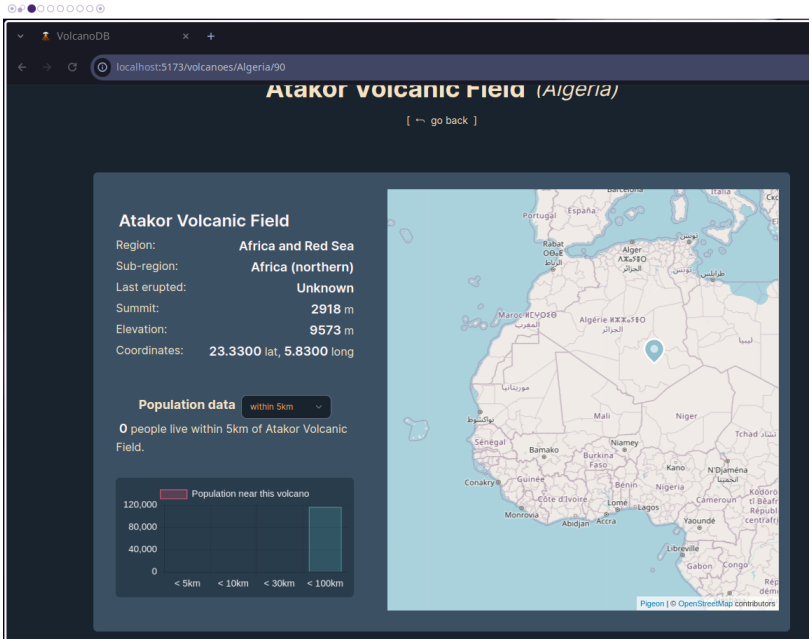
Appendix 03

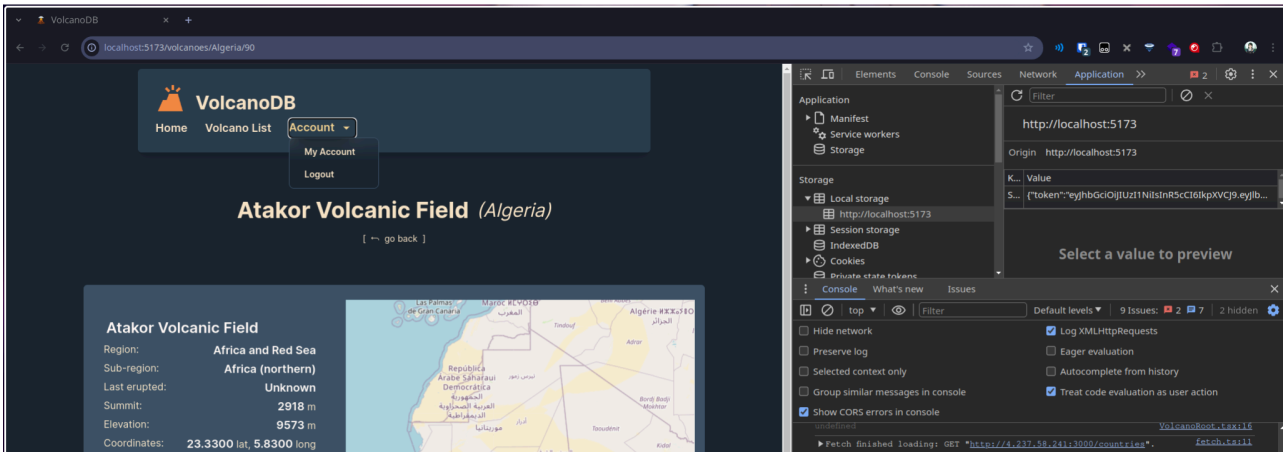

20:54 ~ Fri, 10 May
VolcanoDB
localhost:5173/account/login
VolcanoDB
Home
Volcano List
Account
Login
Email
mike@gmail.com
Password
Remember me
Login


20:54 ~ Fri, 10 May
VolcanoDB
localhost:5173/account/me
Should Bitwarden remember this password for you?
Never
Edit
Save
VolcanoDB
Home
Volcano List
Account
Account
Hello, Mike!
Log out
Elements
Console
Sources
Network
Application
Application
Manifest
Service workers
Storage
Storage
Local storage
chrome-extension://nngceckbapeb
http://localhost:5173
Session storage
IndexedDB
Cookies
Private state tokens
Interest groups
Shared storage
Cache storage
Background services
Back/forward cache
Background fetch
Background sync
Bounce tracking mitigations
Notifications
Payment handler
Periodic background sync
http://localhost:5173
Origin http://localhost:5173
Key
Value
{"token":"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJlbWFpbCI6...
Select a value to preview
Console
What's new
Issues
Hide network
Log XMLHttpRequests

Appendix 04

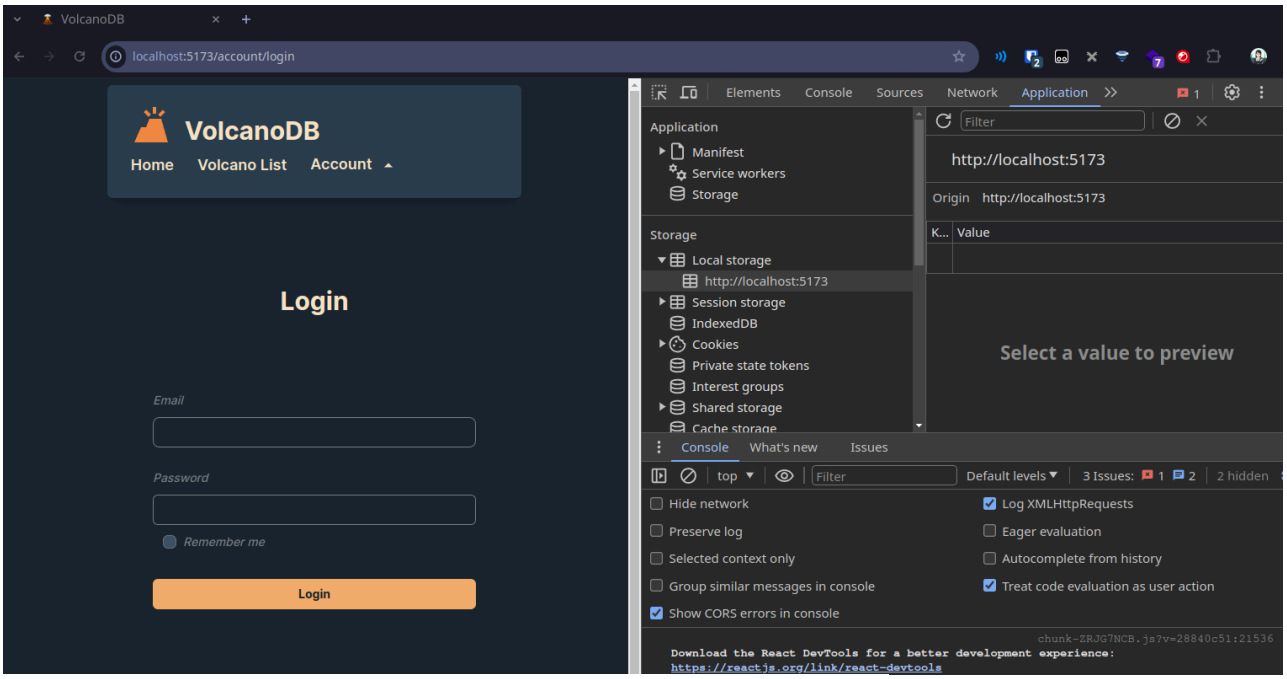
(Pre-logout)

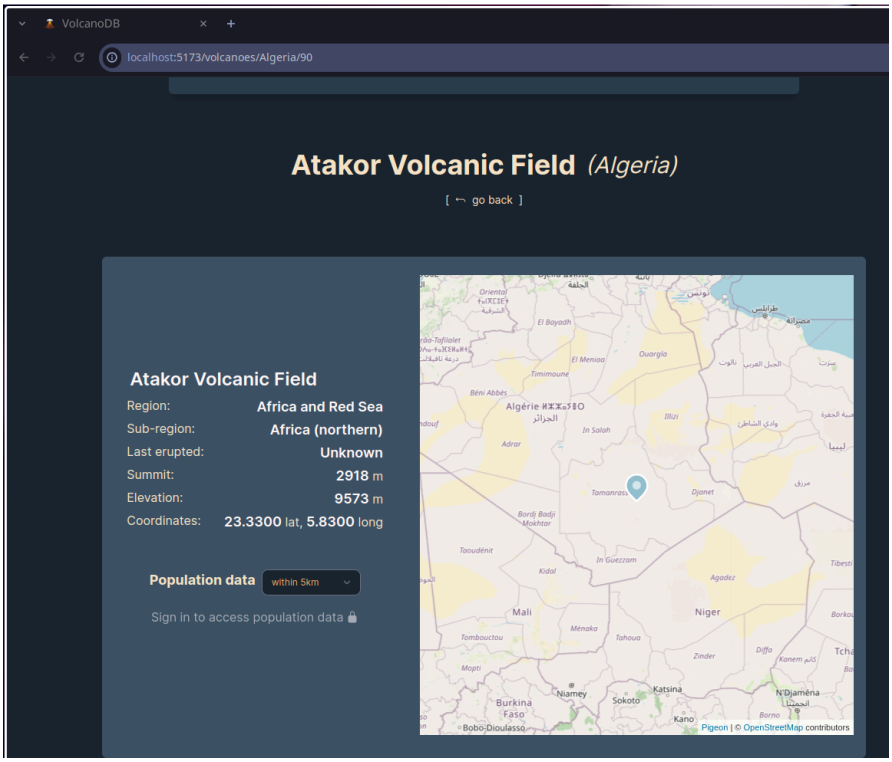




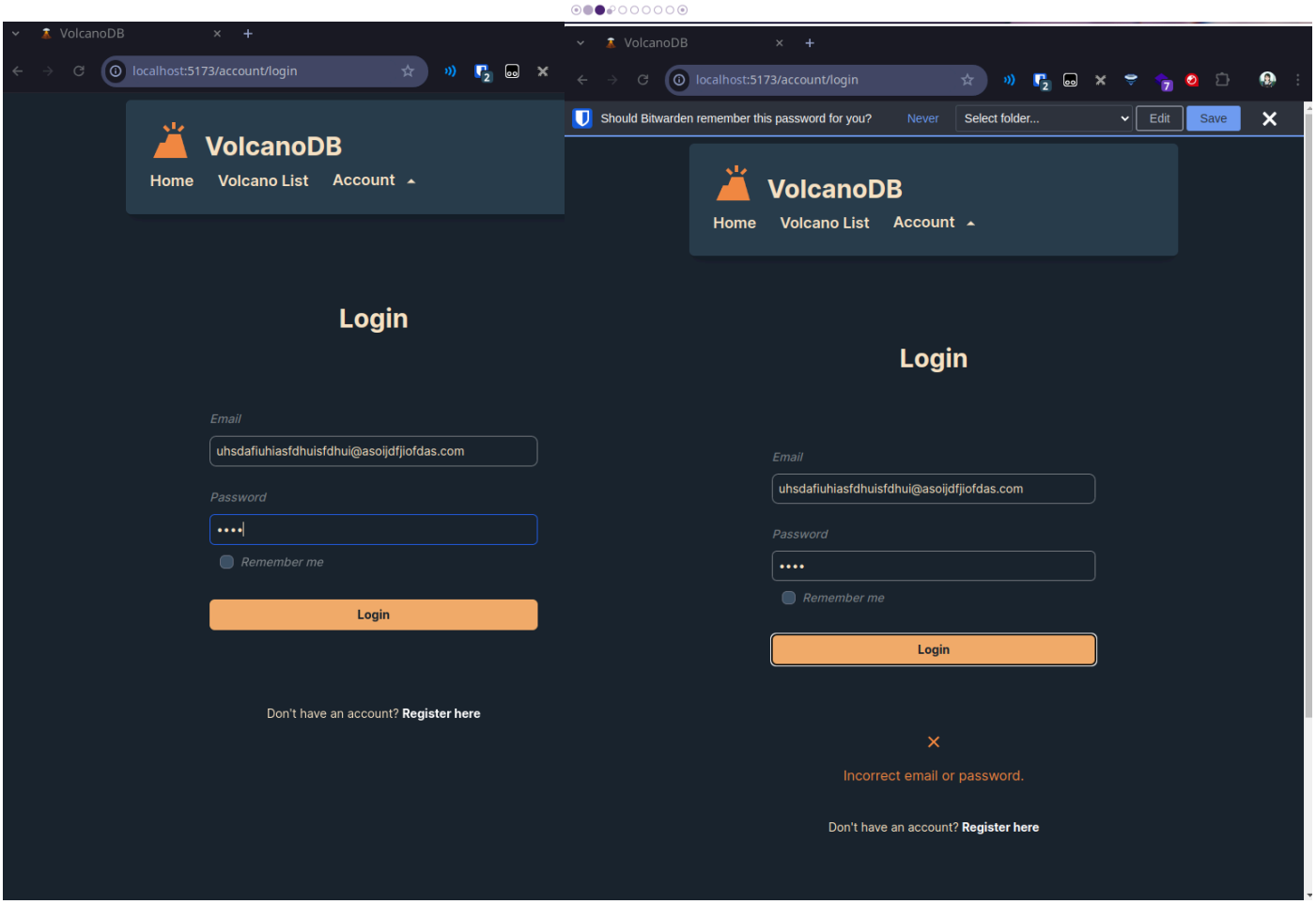
Appendix 05

(Post-logout)

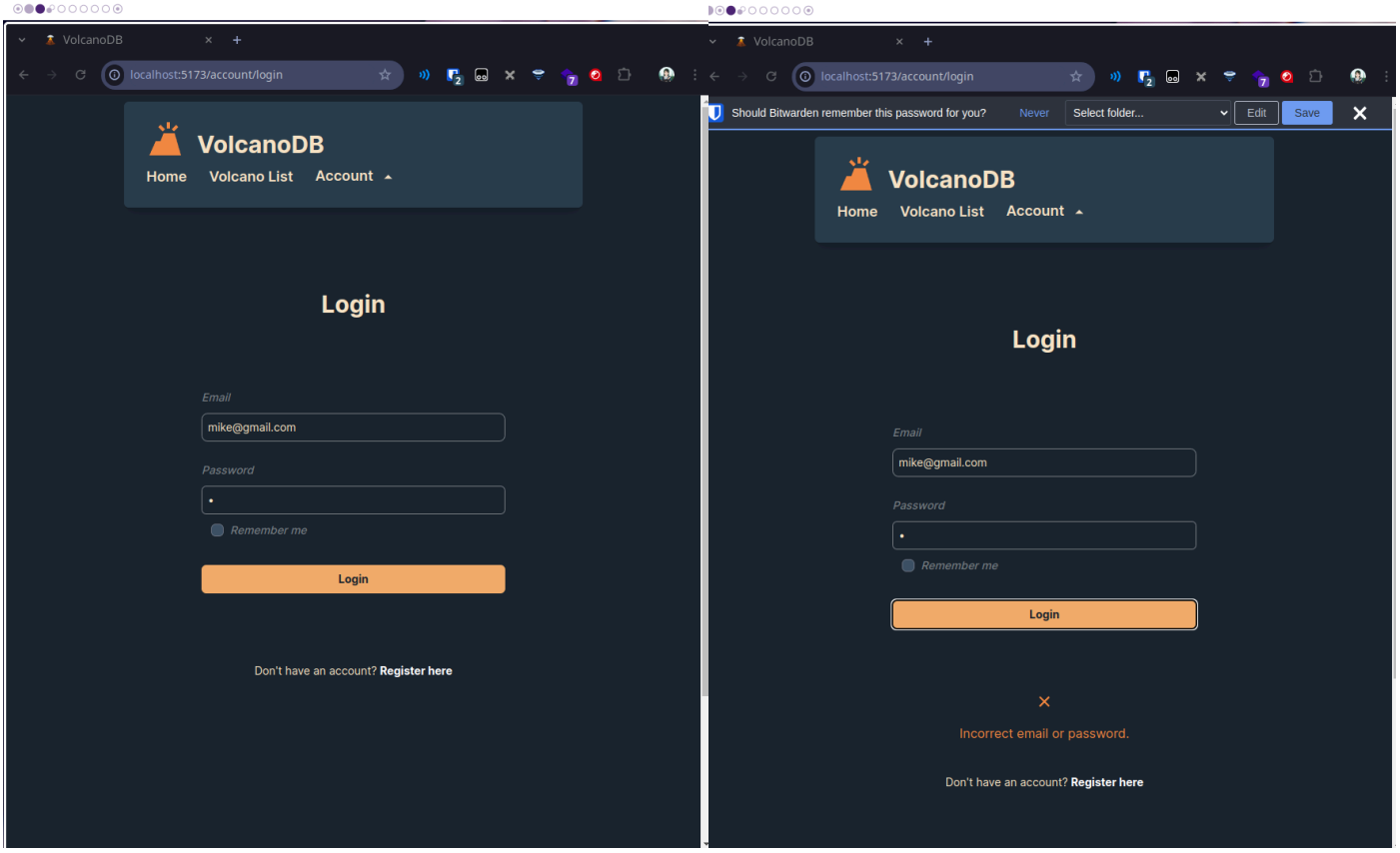




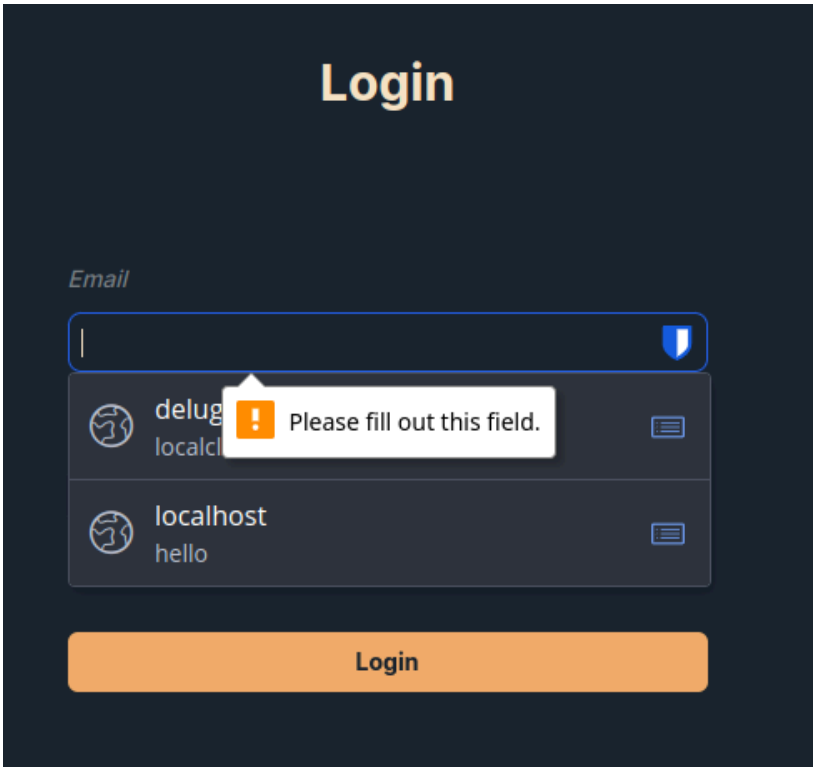
Appendix 06

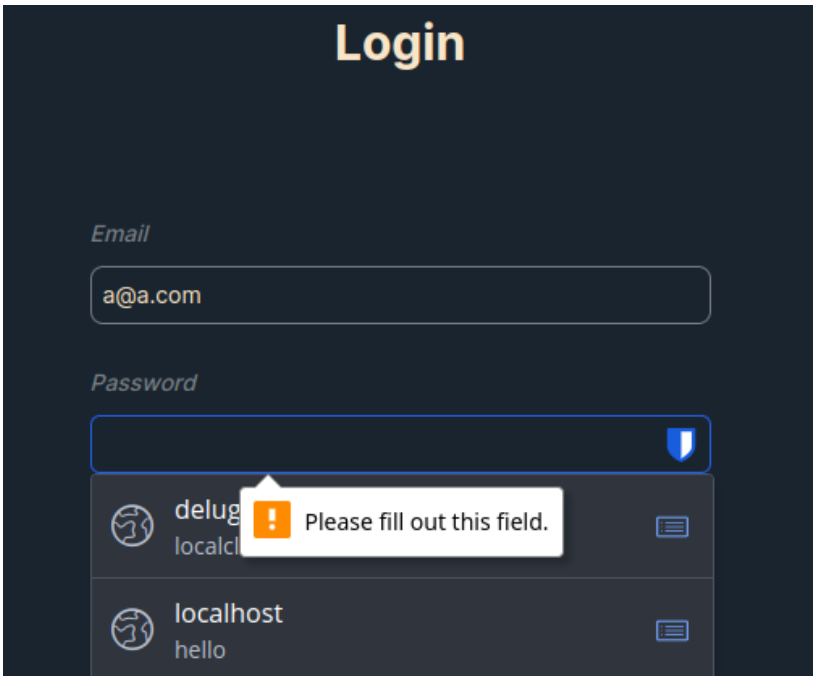

VolcanoDB
localhost:5173/account/login
VolcanoDB
Home
Volcano List
Account
Login
Email
uhsdafiuhiasfdhuisfdhui@asoijdfjiofdas.com
Password
Remember me
Login
Don't have an account? Register here
Should Bitwarden remember this password for you?
Never
Select folder...
Edit
Save
Incorrect email or password.

Appendix 07

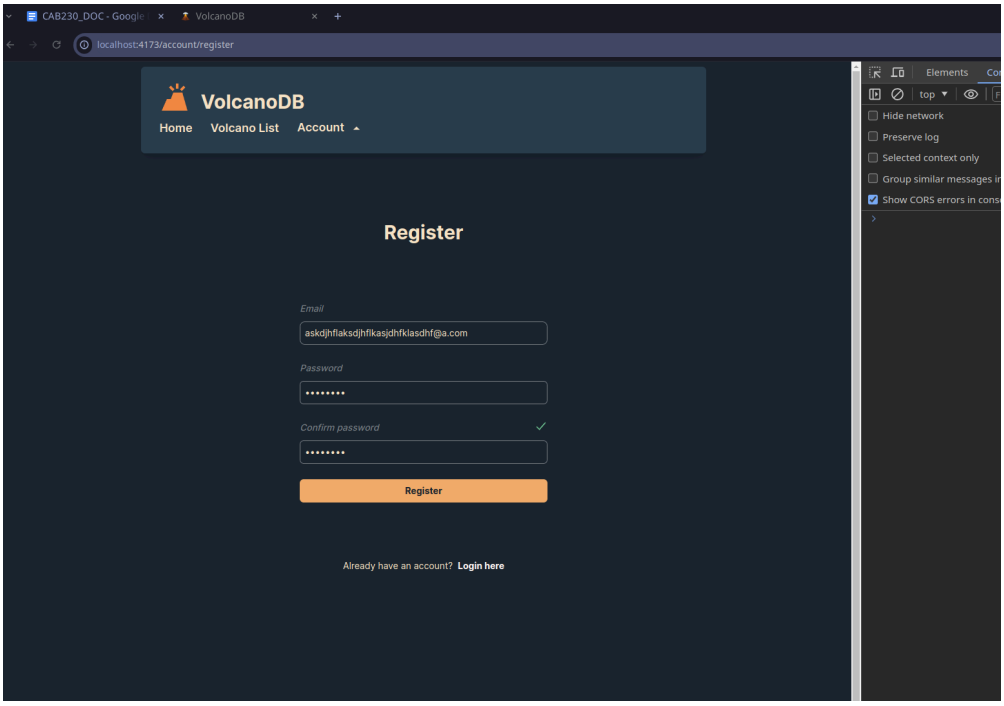

VolcanoDB
localhost:5173/account/login
VolcanoDB
Home
Volcano List
Account
Login
Email
mike@gmail.com
Password
Remember me
Login
Don't have an account? Register here
Should Bitwarden remember this password for you?
Never
Select folder...
Edit
Save
VolcanoDB
Home
Volcano List
Account
Login
Email
mike@gmail.com
Password
Remember me
Login
Incorrect email or password.
Don't have an account? Register here

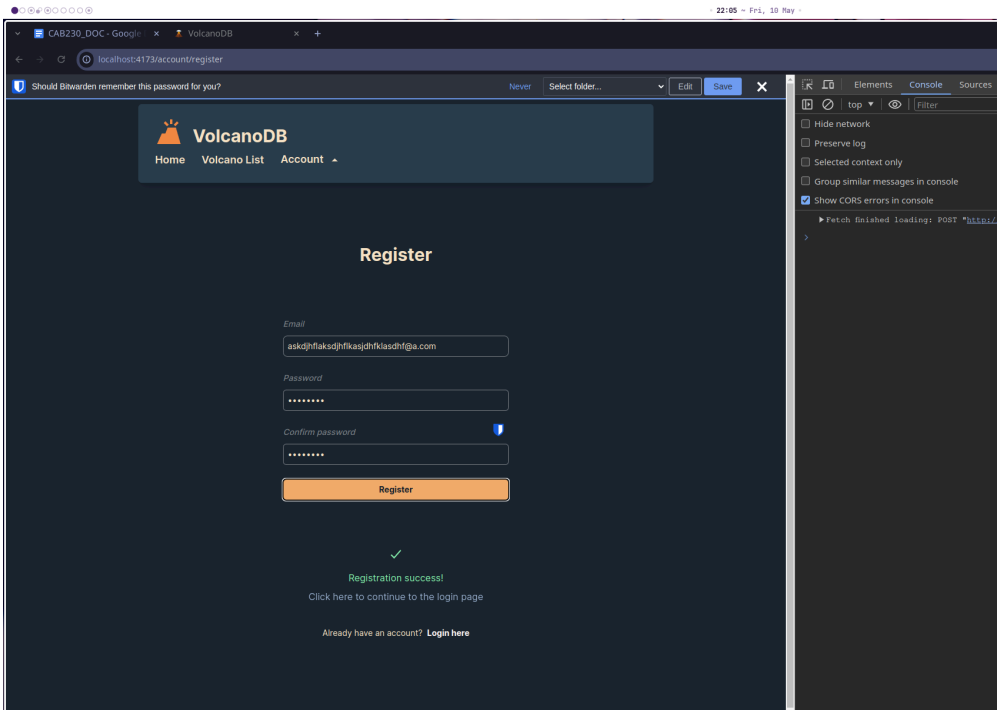
Appendix 08


Login
Email
Please fill out this field.
localhost
hello
Login

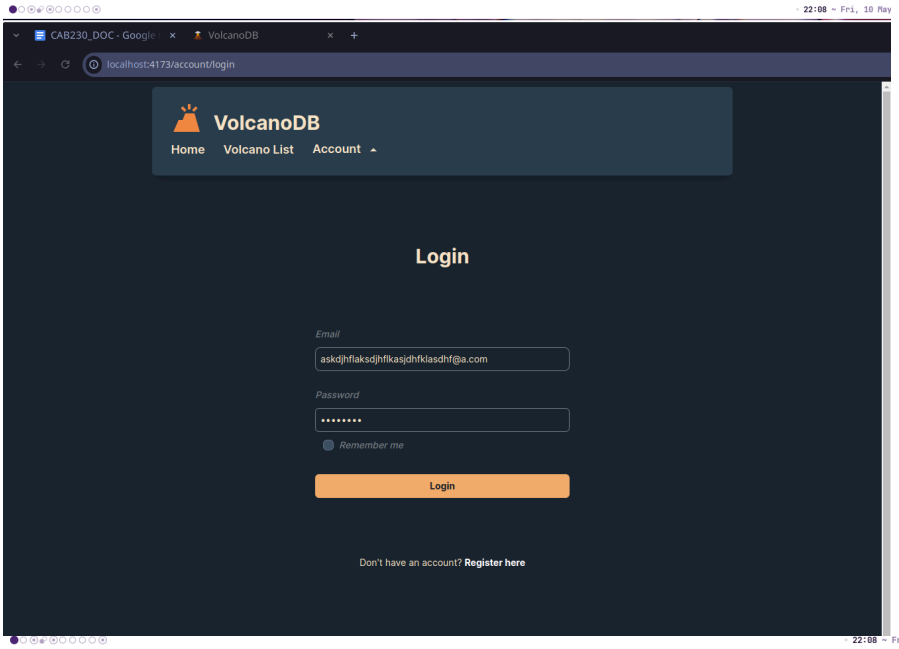

Login
Email
a@a.com
Password
Please fill out this field.
localhost
hello

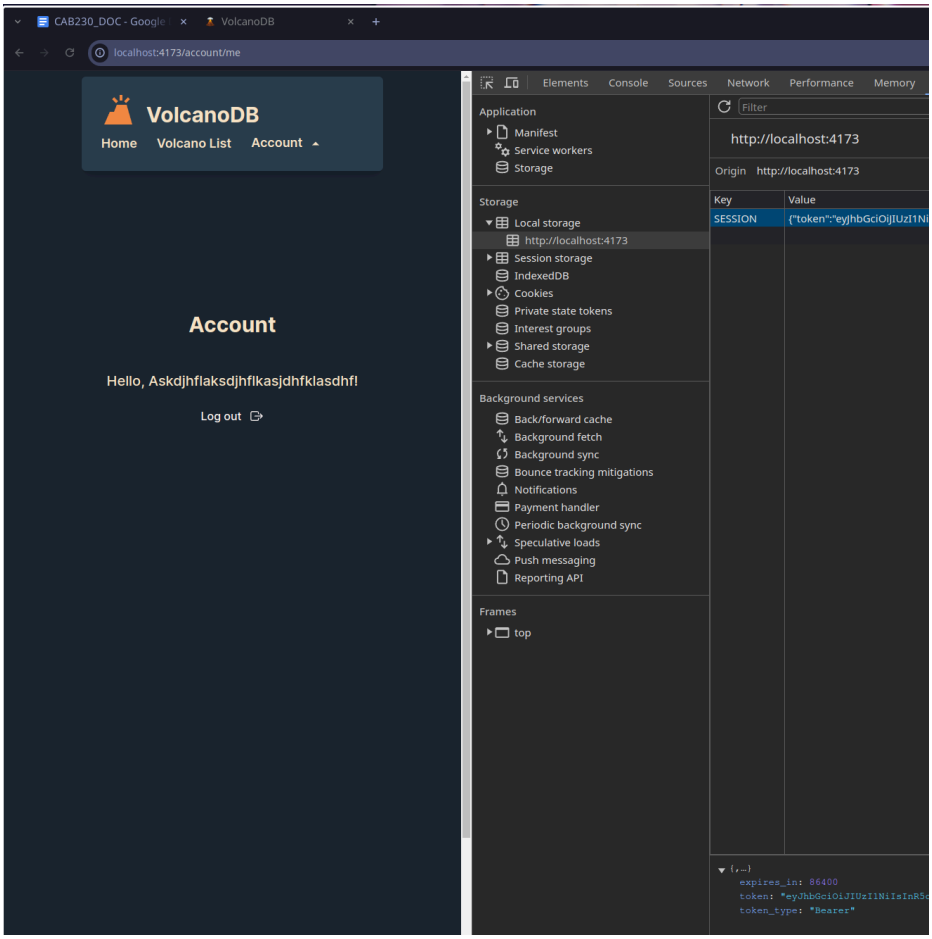
Appendix 09


CAB230_DOC - Google
VolcanoDB
localhost:4173/account/register
VolcanoDB
Home
Volcano List
Account
Register
Email
askdjhflaksdjhflkasjdhfklasdhf@a.com
Password
Confirm password
Register
Already have an account? Login here
Elements
top
Hide network
Preserve log
Selected context only
Group similar messages in
Show CORS errors in cons

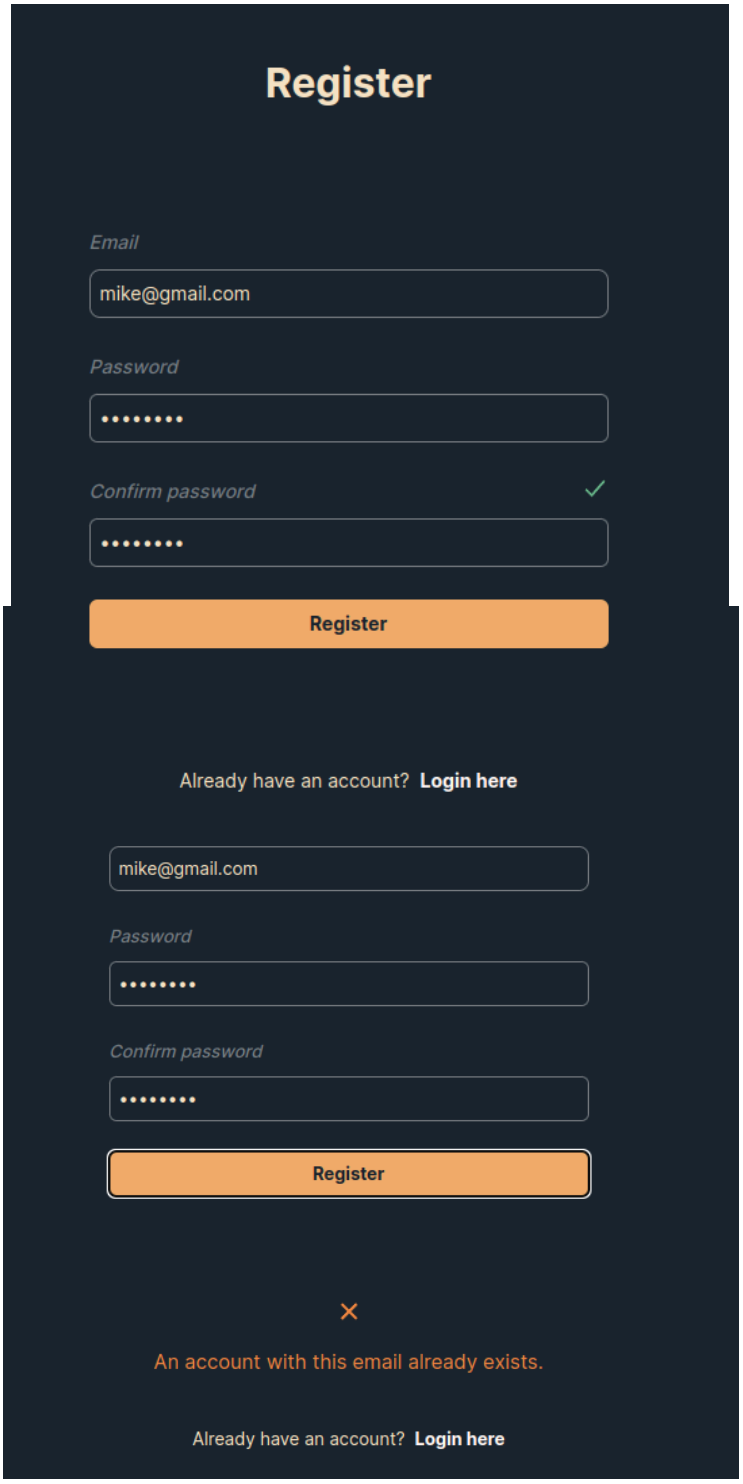

CAB230_DOC - Google
VolcanoDB
localhost:4173/account/register
Should Bitwarden remember this password for you?
Never
Select folder...
Edit
Save
VolcanoDB
Home
Volcano List
Account
Register
Email
askdjhflaksdjhflkasjdhfklasdhf@a.com
Password
Confirm password
Register
Registration success!
Click here to continue to the login page
Already have an account? Login here
Elements
Console
Sources
top
Filter
Hide network
Preserve log
Selected context only
Group similar messages in console
Show CORS errors in console
Fetch finished loading: POST

Appendix 10

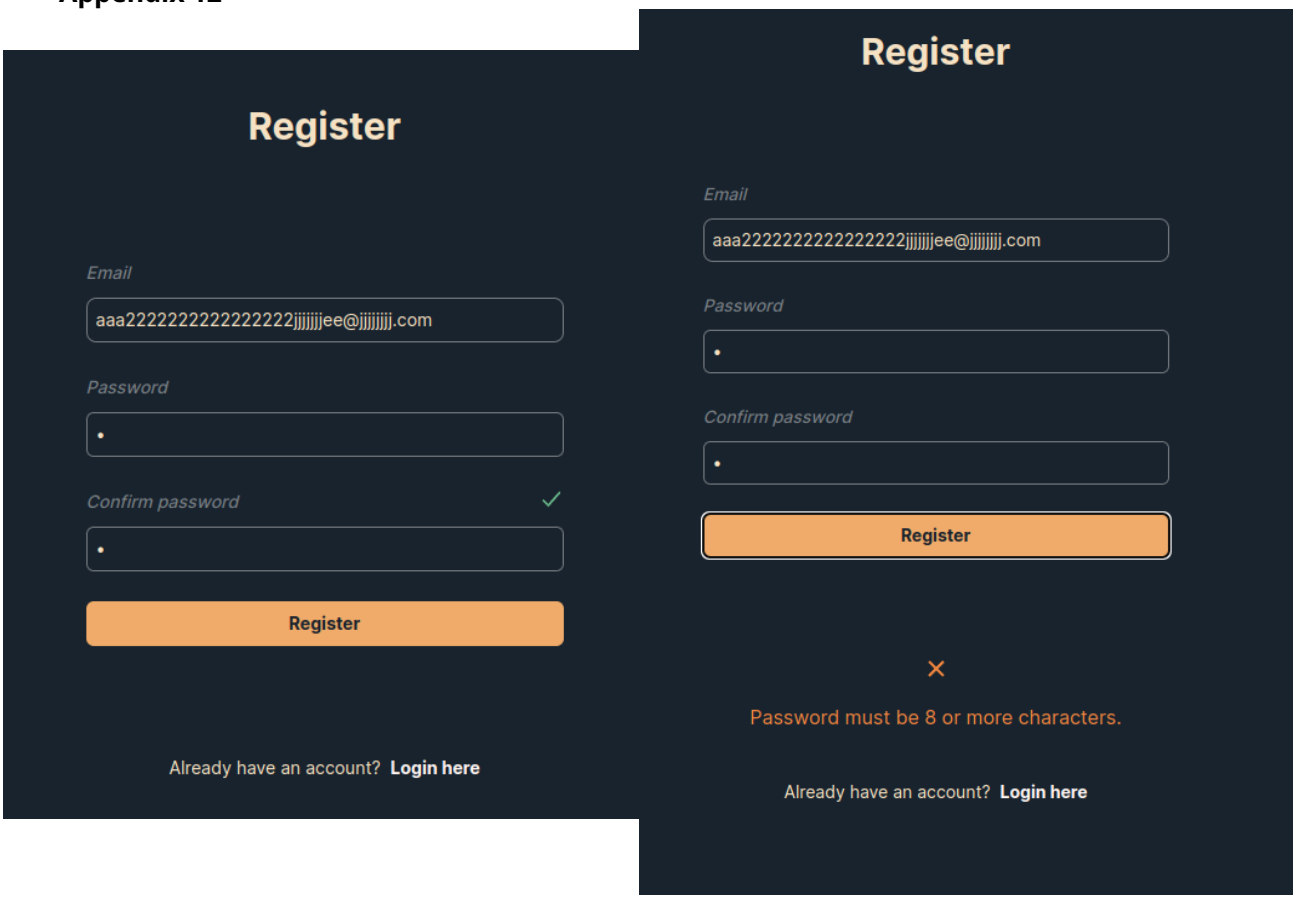

CAB230_DOC - Google
VolcanoDB
localhost:4173/account/login
VolcanoDB
Home
Volcano List
Account
Login
Email
askdjhflaksdjhflkasjdhfklasdhf@a.com
Password
Remember me
Login
Don't have an account? Register here


CAB230_DOC - Google
VolcanoDB
localhost:4173/account/me
VolcanoDB
Home
Volcano List
Account
Account
Hello, Askdjhflaksdjhflkasjdhfklasdhf!
Log out
Elements
Console
Sources
Network
Performance
Memory
Application
Manifest
Service workers
Storage
Storage
Local storage
http://localhost:4173
Session storage
IndexedDB
Cookies
Private state tokens
Interest groups
Shared storage
Cache storage
Background services
Back/forward cache
Background fetch
Background sync
Bounce tracking mitigations
Notifications
Payment handler
Periodic background sync
Speculative loads
Push messaging
Reporting API
Frames
top
Filter
http://localhost:4173
Origin http://localhost:4173
Key
Value
SESSION
expires_in: 86400
token: "eyJhbGciOiJIUzI1NiIsInR5c
token_type: "Bearer"

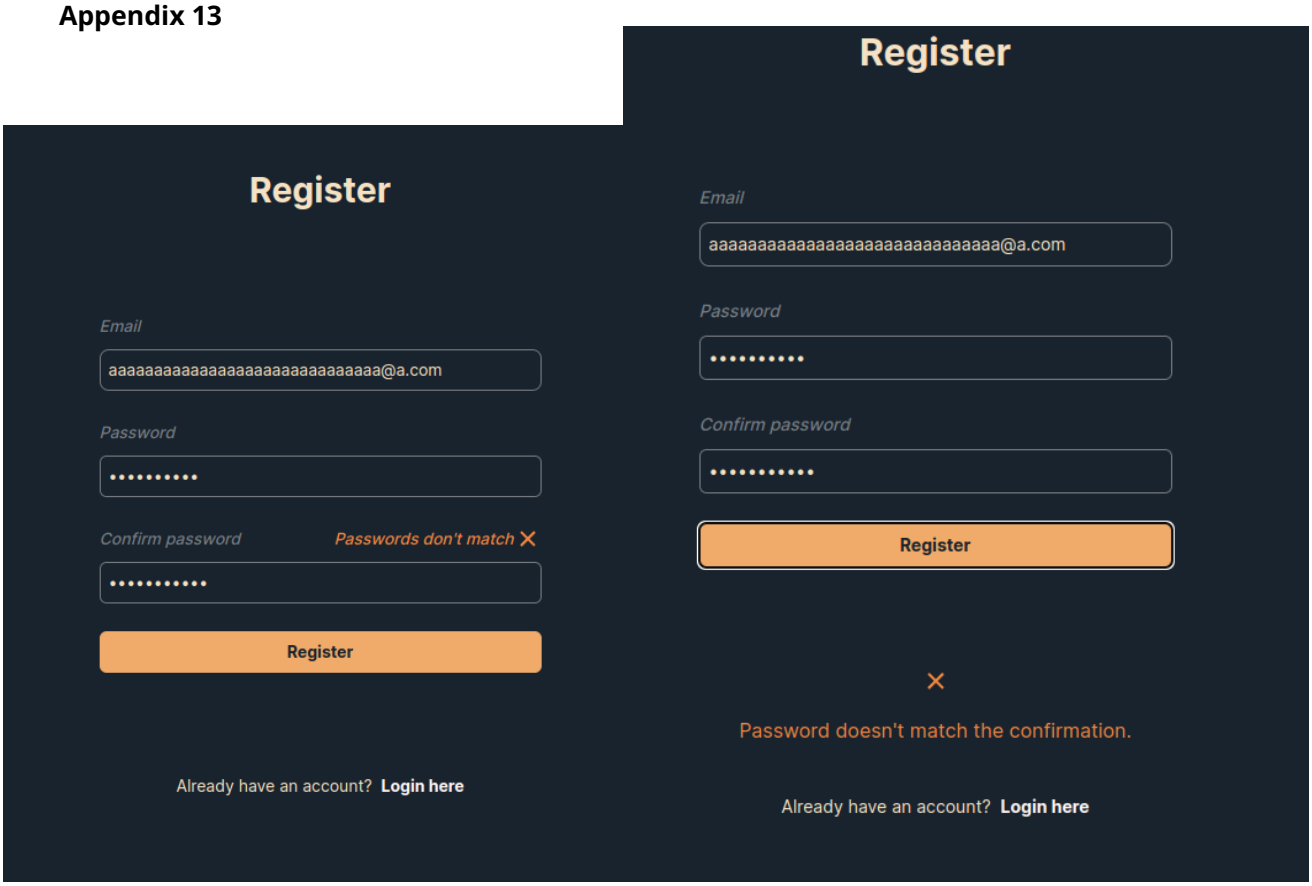
Appendix 11


Register
Email
mike@gmail.com
Password
Confirm password
Register
Already have an account? Login here
mike@gmail.com
Password
Confirm password
Register
An account with this email already exists.
Already have an account? Login here

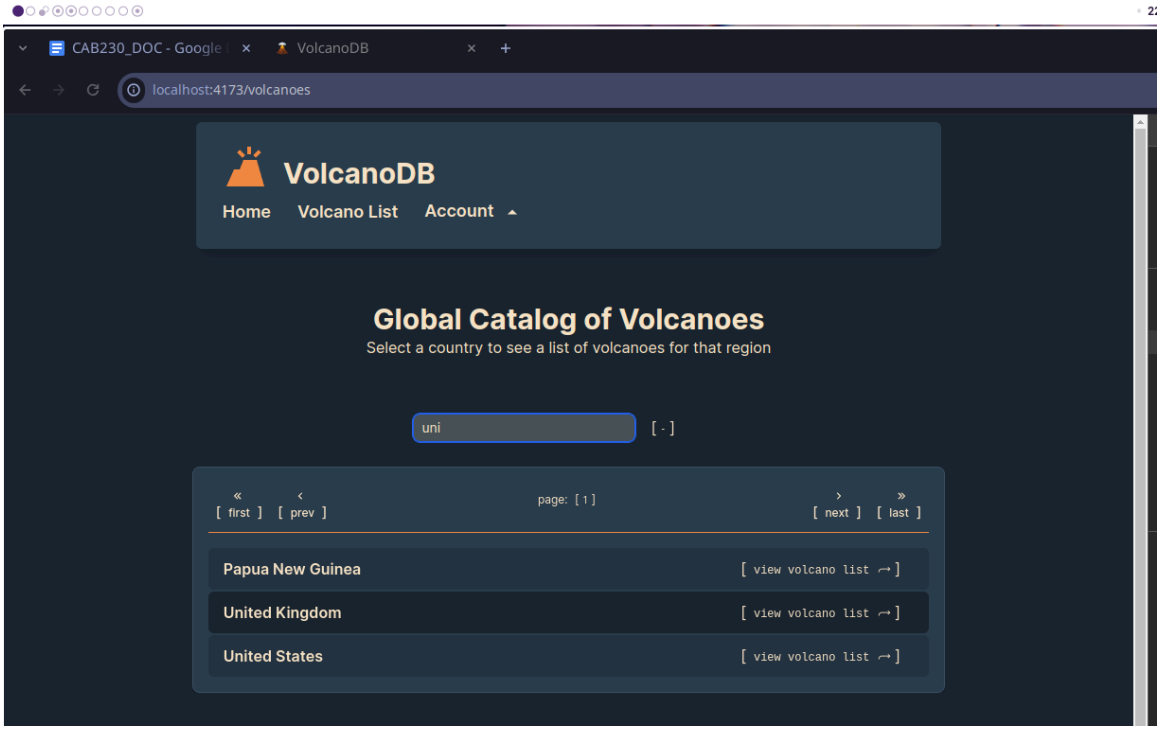
Appendix 12


Register
Email
aaa2222222222222222jjjjjjjee@jjjjjjj.com
Password
Confirm password
Register
Already have an account? Login here
Register
Email
aaa2222222222222222jjjjjjjee@jjjjjjj.com
Password
Confirm password
Register
Password must be 8 or more characters.
Already have an account? Login here

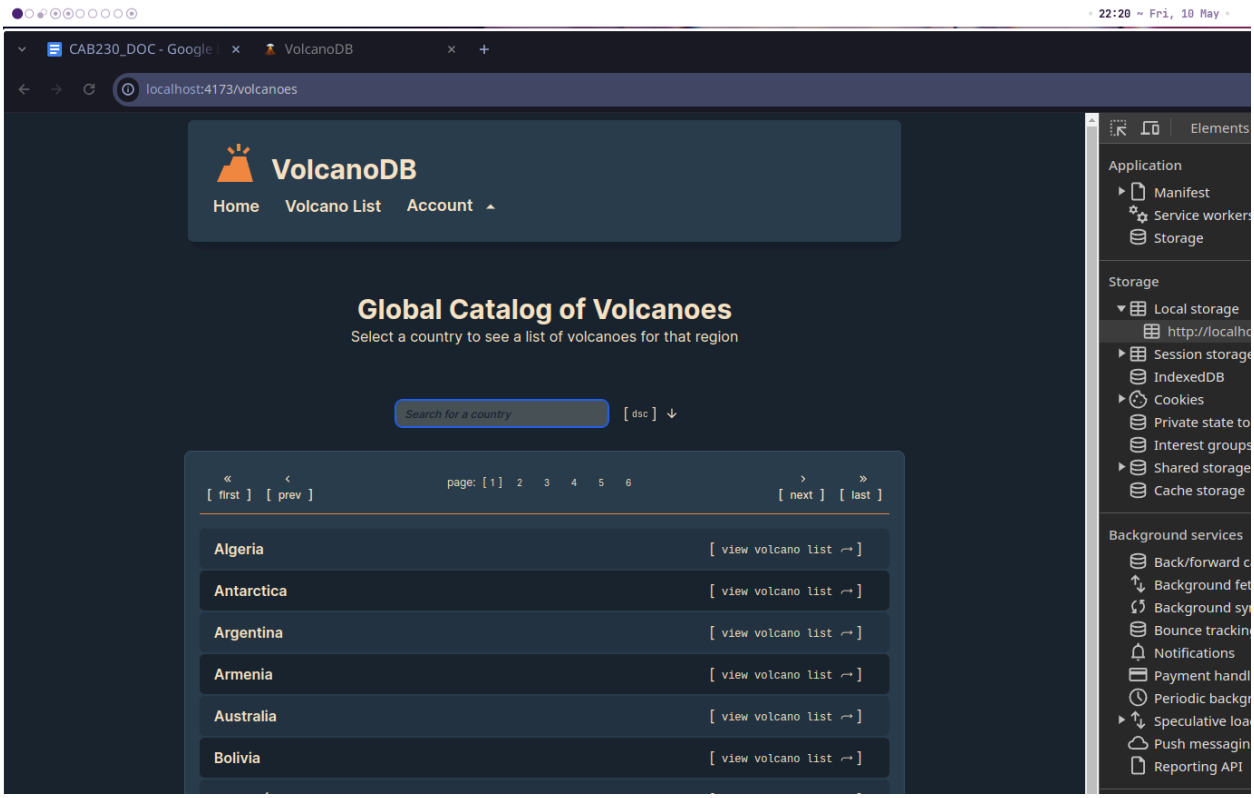
Appendix 13


Register
Email
aaaaaaaaaaaaaaaaaaaaaaaaaaaaa@a.com
Password
Confirm password
Passwords don't match
Register
Already have an account? Login here
Register
Email
aaaaaaaaaaaaaaaaaaaaaaaaaaaaa@a.com
Password
Confirm password
Register
Password doesn't match the confirmation.
Already have an account? Login here

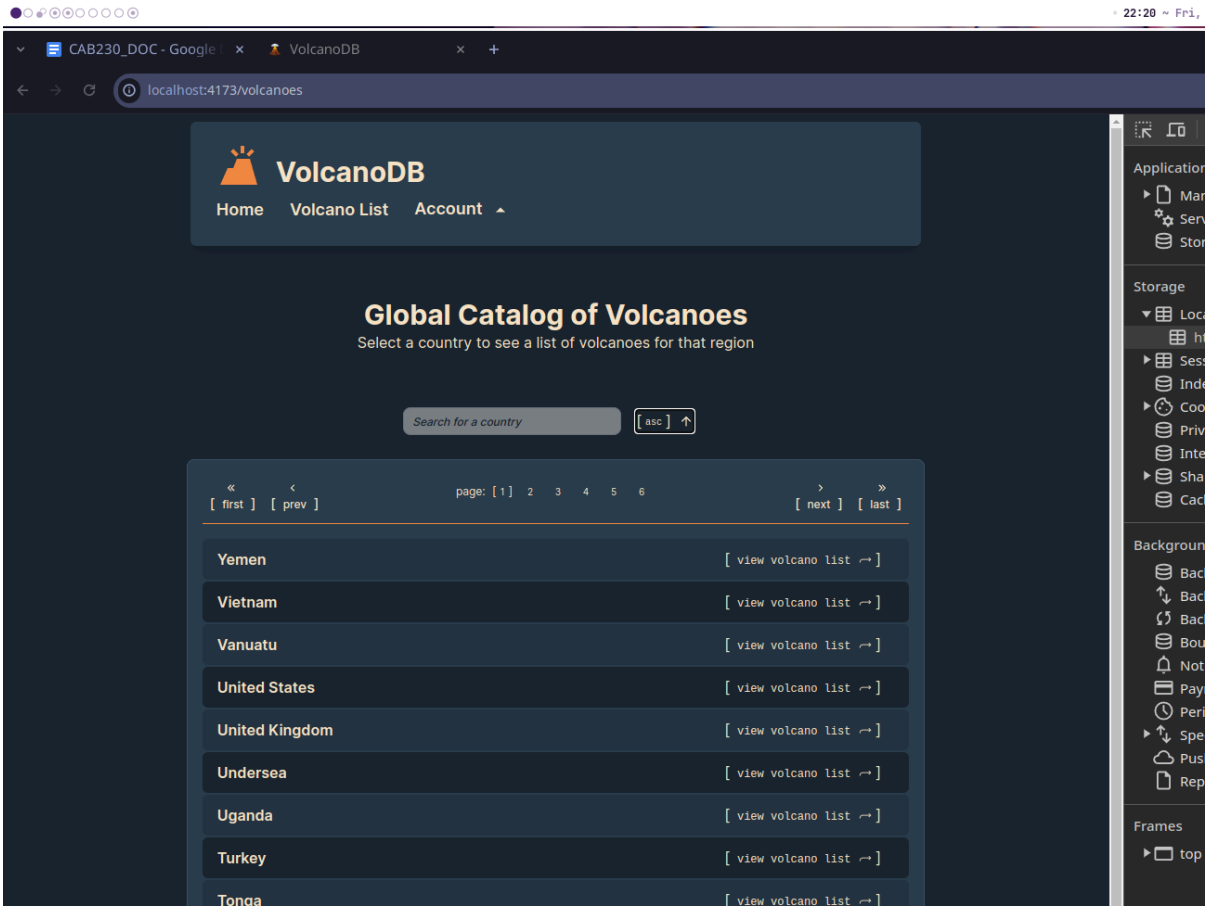
Appendix 14


CAB230_DOC - Google
VolcanoDB
localhost:4173/volcanoes
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
uni
[·]
« [first]
‹ [prev]
page: [1]
› [next]
» [last]
Papua New Guinea
[view volcano list]
United Kingdom
[view volcano list]
United States
[view volcano list]

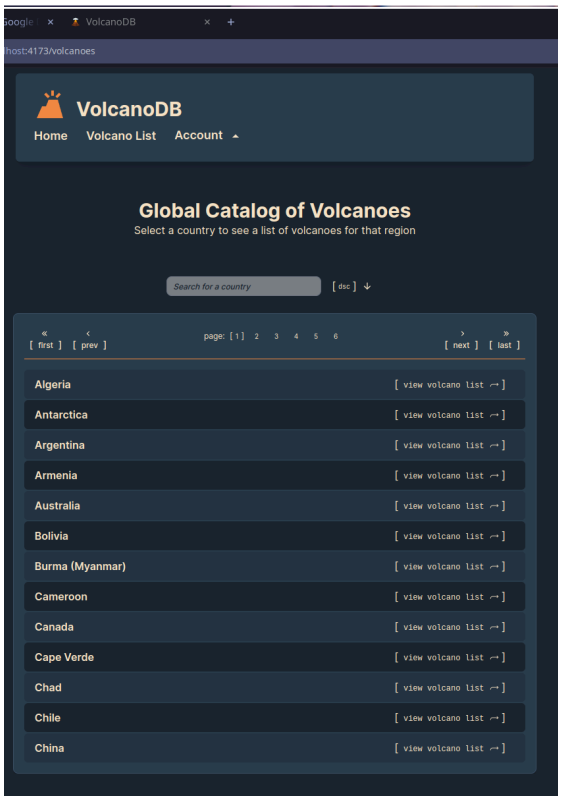
Appendix 15

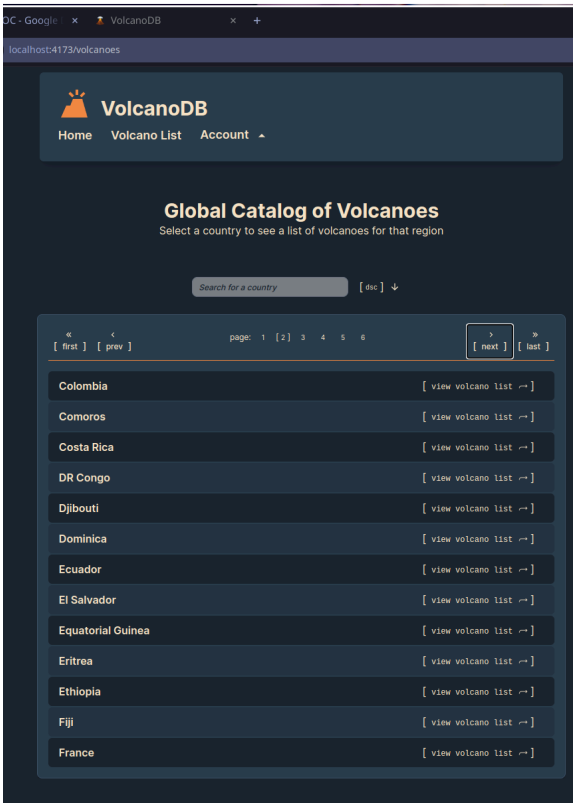

22:20 ~ Fri, 10 May
CAB230_DOC - Google
VolcanoDB
localhost:4173/volcanoes
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
Search for a country
[dsc]
[first] [prev]
page: [1] 2 3 4 5 6
[next] [last]
Algeria [view volcano list]
Antarctica [view volcano list]
Argentina [view volcano list]
Armenia [view volcano list]
Australia [view volcano list]
Bolivia [view volcano list]
Elements
Application
Manifest
Service workers
Storage
Storage
Local storage
Session storage
IndexedDB
Cookies
Private state to
Interest groups
Shared storage
Cache storage
Background services
Back/forward c
Background fet
Background sy
Bounce trackin
Notifications
Payment handl
Periodic backgr
Speculative loa
Push messagin
Reporting API

Appendix 16

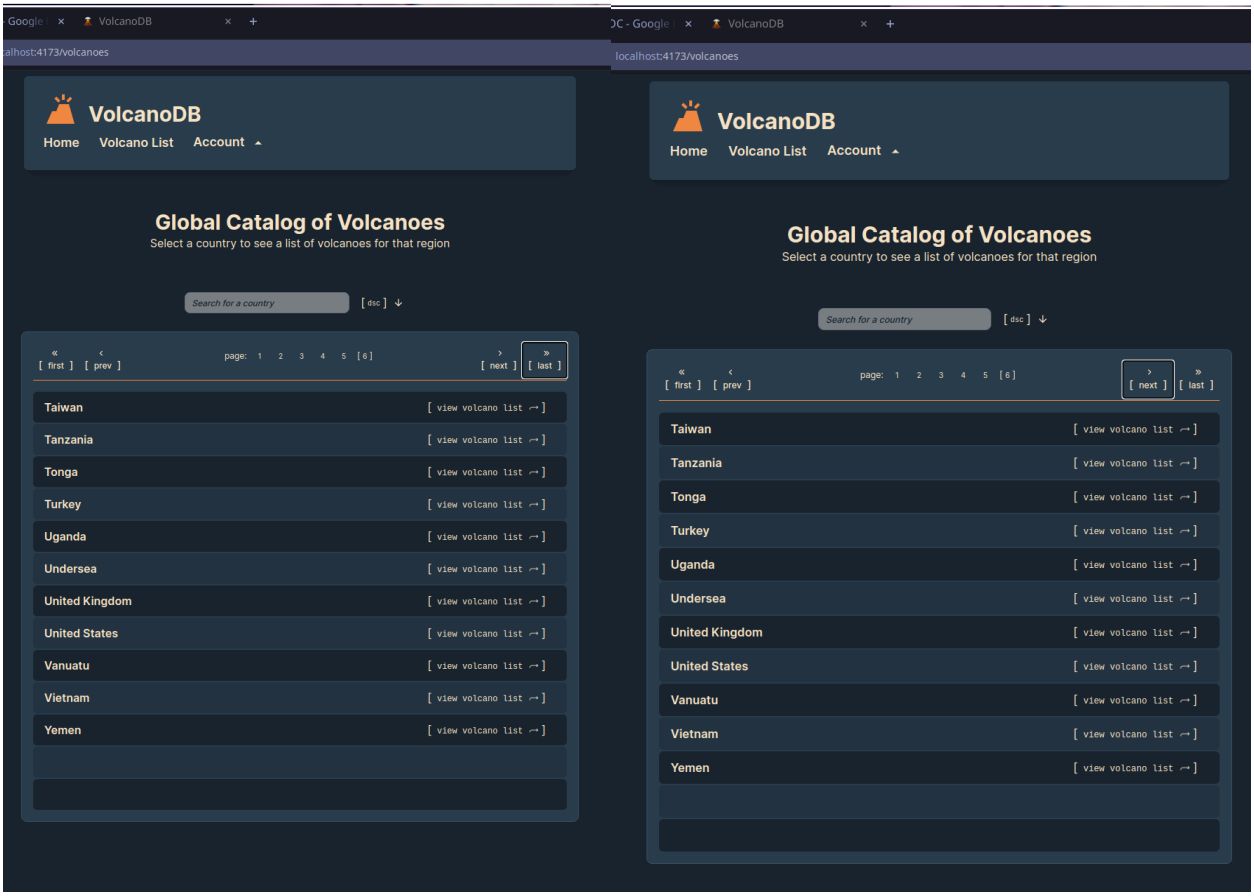

CAB230_DOC - Google
VolcanoDB
localhost:4173/volcanoes
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
Search for a country
[asc]
[first] [prev]
page: [1] 2 3 4 5 6
[next] [last]
Yemen [view volcano list]
Vietnam [view volcano list]
Vanuatu [view volcano list]
United States [view volcano list]
United Kingdom [view volcano list]
Undersea [view volcano list]
Uganda [view volcano list]
Turkey [view volcano list]
Tonga [view volcano list]

Appendix 17

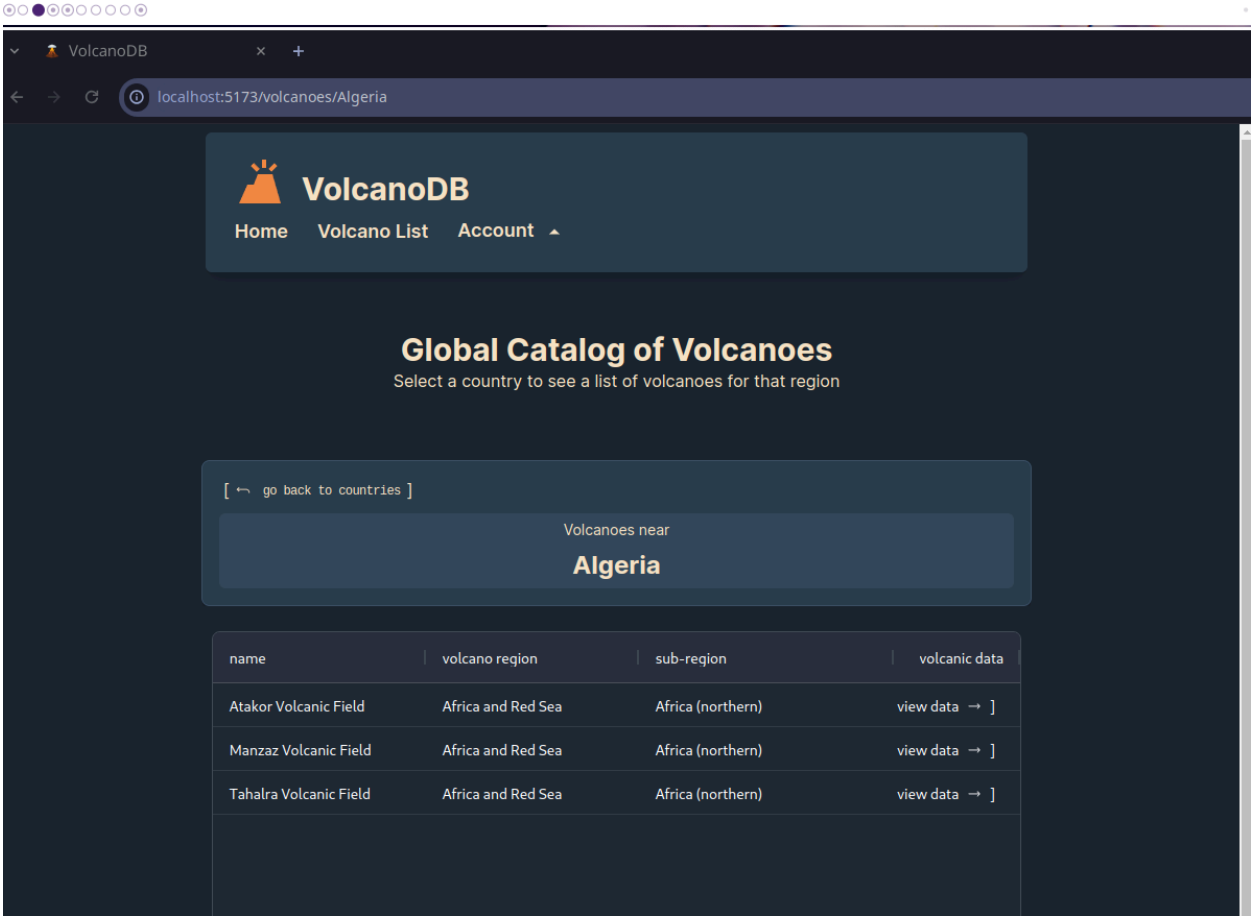

VolcanoDB
localhost:4173/volcanoes
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
Search for a country
[dsc]
[first] [prev] page: [1] 2 3 4 5 6 [next] [last]
Algeria [view volcano list]
Antarctica [view volcano list]
Argentina [view volcano list]
Armenia [view volcano list]
Australia [view volcano list]
Bolivia [view volcano list]
Burma (Myanmar) [view volcano list]
Cameroon [view volcano list]
Canada [view volcano list]
Cape Verde [view volcano list]
Chad [view volcano list]
Chile [view volcano list]
China [view volcano list]


VolcanoDB
localhost:4173/volcanoes
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
Search for a country
[dsc]
[first] [prev] page: 1 [2] 3 4 5 6 [next] [last]
Colombia [view volcano list]
Comoros [view volcano list]
Costa Rica [view volcano list]
DR Congo [view volcano list]
Djibouti [view volcano list]
Dominica [view volcano list]
Ecuador [view volcano list]
El Salvador [view volcano list]
Equatorial Guinea [view volcano list]
Eritrea [view volcano list]
Ethiopia [view volcano list]
Fiji [view volcano list]
France [view volcano list]

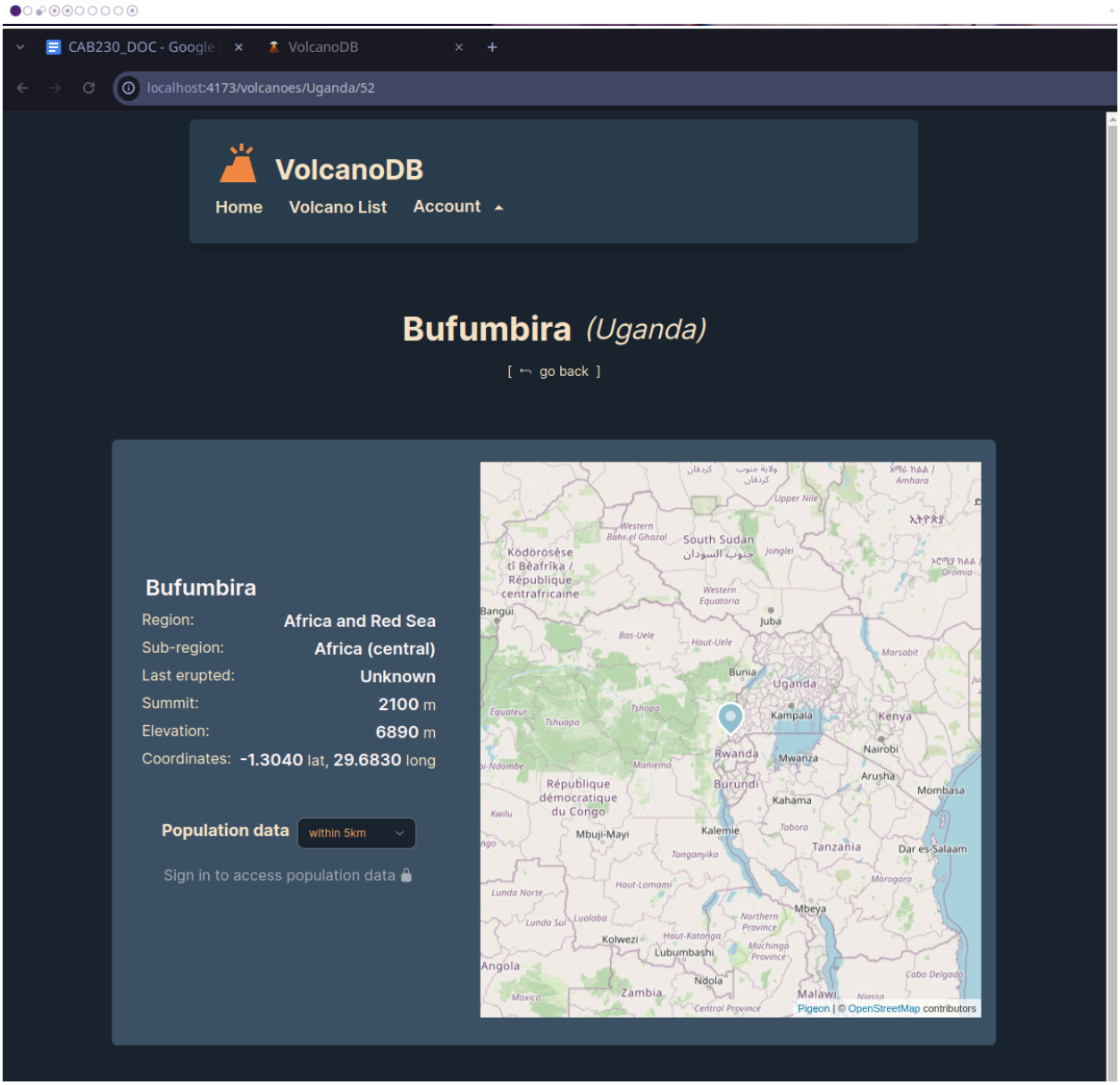
Appendix 18


VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
Search for a country
[dsc]
[first]
[prev]
page: 1 2 3 4 5 [6]
[next]
[last]
Taiwan [view volcano list]
Tanzania [view volcano list]
Tonga [view volcano list]
Turkey [view volcano list]
Uganda [view volcano list]
Undersea [view volcano list]
United Kingdom [view volcano list]
United States [view volcano list]
Vanuatu [view volcano list]
Vietnam [view volcano list]
Yemen [view volcano list]

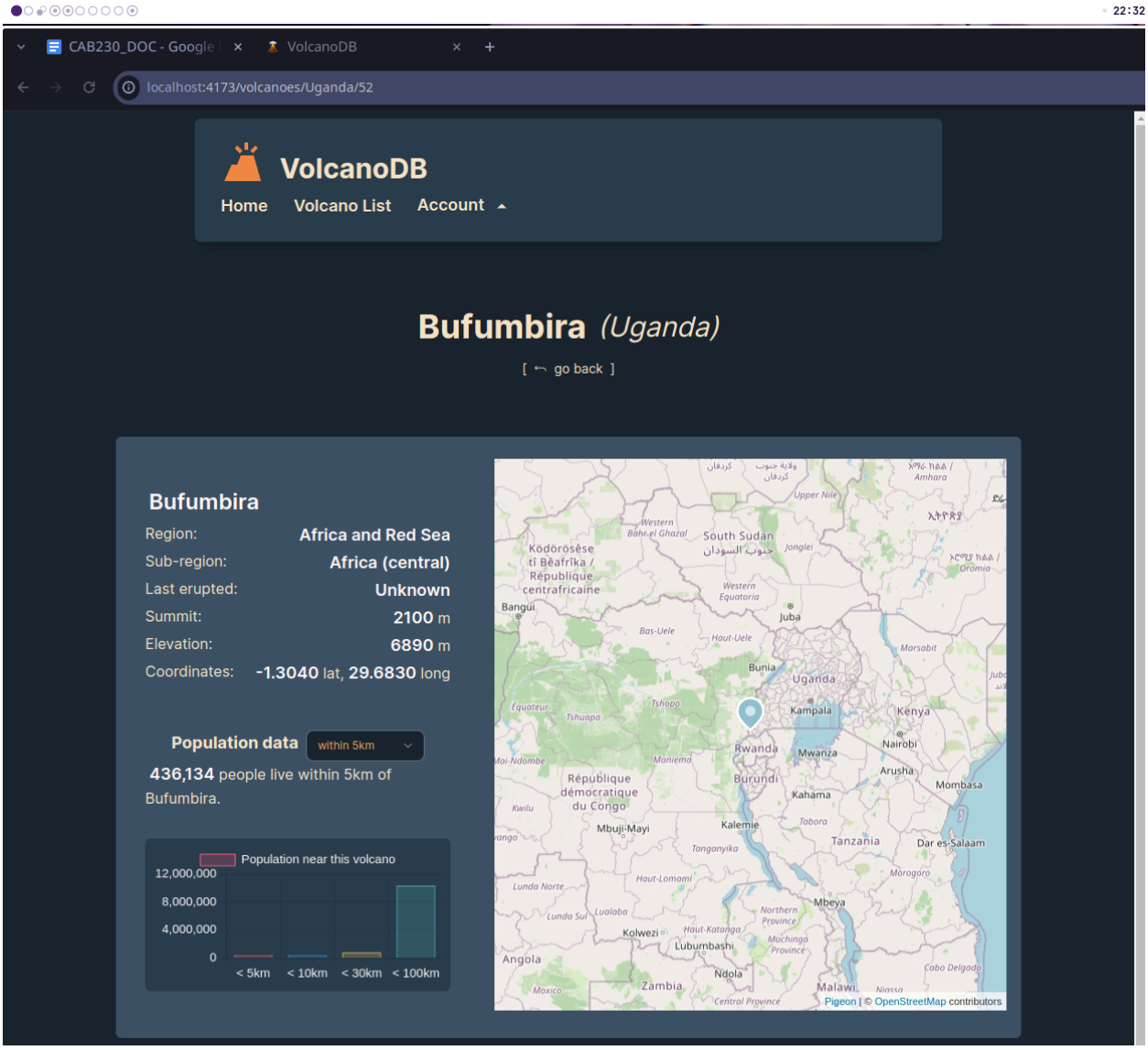
Appendix 19


VolcanoDB
localhost:5173/volcanoes/Algeria
VolcanoDB
Home
Volcano List
Account
Global Catalog of Volcanoes
Select a country to see a list of volcanoes for that region
[go back to countries]
Volcanoes near
Algeria
name
volcano region
sub-region
volcanic data
Atakor Volcanic Field
Africa and Red Sea
Africa (northern)
view data →
Manzaz Volcanic Field
Africa and Red Sea
Africa (northern)
view data →
Tahalra Volcanic Field
Africa and Red Sea
Africa (northern)
view data →

Appendix 20


CAB230_DOC - Google
VolcanoDB
localhost:4173/volcanoes/Uganda/52
VolcanoDB
Home
Volcano List
Account
Bufumbira (Uganda)
[go back]
Bufumbira
Region: Africa and Red Sea
Sub-region: Africa (central)
Last erupted: Unknown
Summit: 2100 m
Elevation: 6890 m
Coordinates: -1.3040 lat, 29.6830 long
Population data
within 5km
Sign in to access population data
South Sudan
Uganda
Kampala
Kenya
Nairobi
Rwanda
Burundi
Tanzania
Dar es Salaam
Mombasa
Arusha
Mwanza
Juba
Bunia
Kalemie
Mbeya
Lubumbashi
Kolwezi
Ndola
Zambia
Angola
Malawi
Pigeon | © OpenStreetMap contributors

Appendix 21


22:32
CAB230_DOC - Google
VolcanoDB
localhost:4173/volcanoes/Uganda/52
VolcanoDB
Home
Volcano List
Account
Bufumbira (Uganda)
[go back]
Bufumbira
Region: Africa and Red Sea
Sub-region: Africa (central)
Last erupted: Unknown
Summit: 2100 m
Elevation: 6890 m
Coordinates: -1.3040 lat, 29.6830 long
Population data
within 5km
436,134 people live within 5km of Bufumbira.
Population near this volcano
12,000,000
8,000,000
4,000,000
0
< 5km
< 10km
< 30km
< 100km
South Sudan
Kodorosese ti Beafrika / République centrafricaine
Bangui
Juba
Uganda
Kampala
Kenya
Nairobi
Rwanda
Mwanza
Burundi
Kahama
Arusha
Mombasa
République démocratique du Congo
Mbuji-Mayi
Kalemie
Tanzania
Dar es-Salaam
Mbeya
Kolwezi
Lubumbashi
Angola
Ndola
Zambia
Malawi
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