

# Introduction to Webapp Development

# Open Government Products

# Objectives

- Learn more about digital product development
- Learn about building blocks of web applications
  - Frontend (HTML, Javascript, CSS)
  - APIs and libraries
- Be unafraid of code and engineers

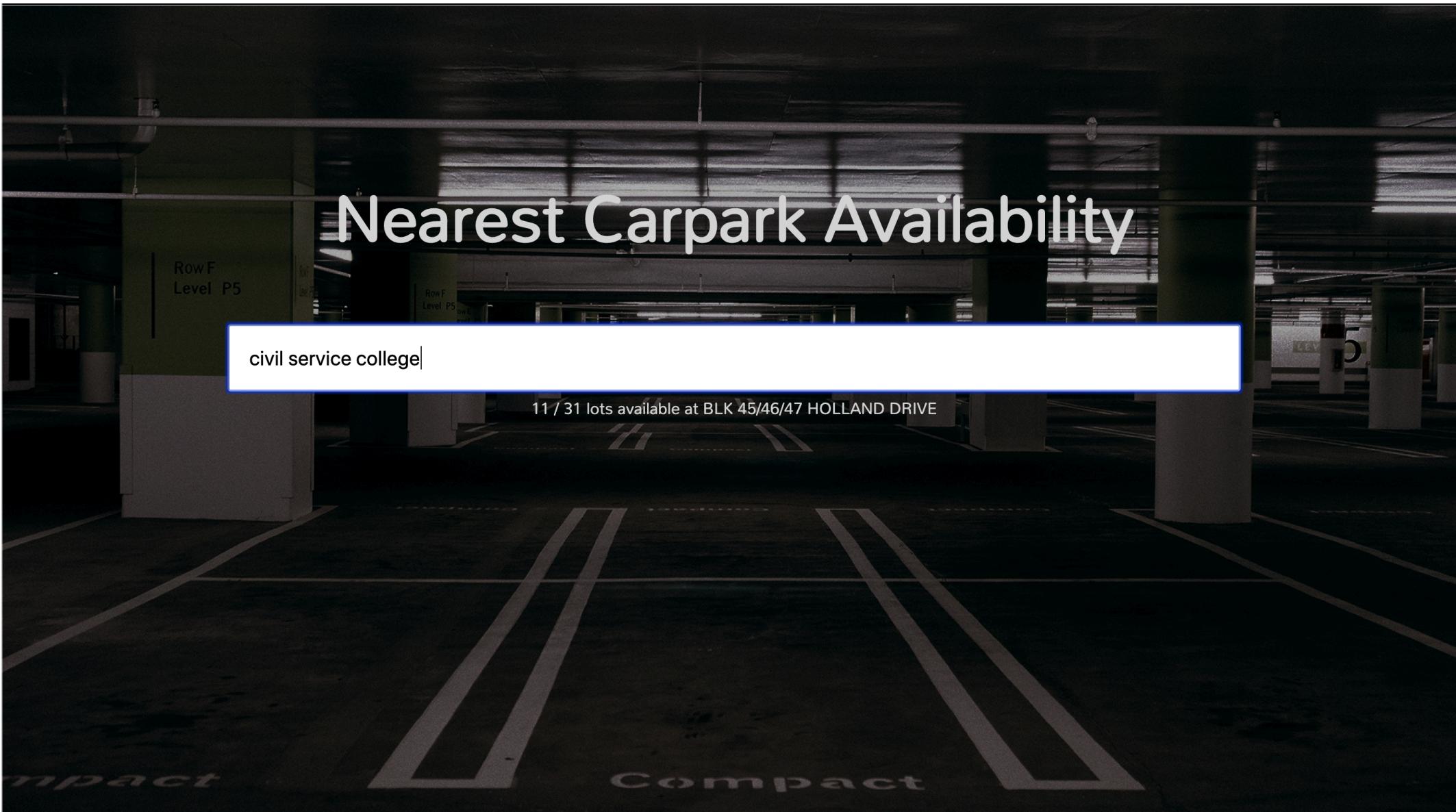
# Overview

- Sharing on Parking.sg
- Hands on coding workshop

# Sharing on Parking.sg

# Hands on Coding Workshop

# What you're going to build



# Outline

1. Introduction to HTML - building the skeleton of our site
2. Introduction to Javascript - adding interactivity to our site
3. Introduction to APIs - fetching and displaying data on the site
4. Introduction to CSS - styling the site
5. Deploying the site to the internet

# What to expect

This is a fast paced introduction to web technologies that covers a lot of ground in a very short time

- You may not understand everything by the end of the course
- You don't need to become a proficient coder to understand the basics of web

# How we help you

- We have many instructors from diverse backgrounds, so ask them questions
- All material is available online at <https://github.com/datagovsg/live-parking-info>

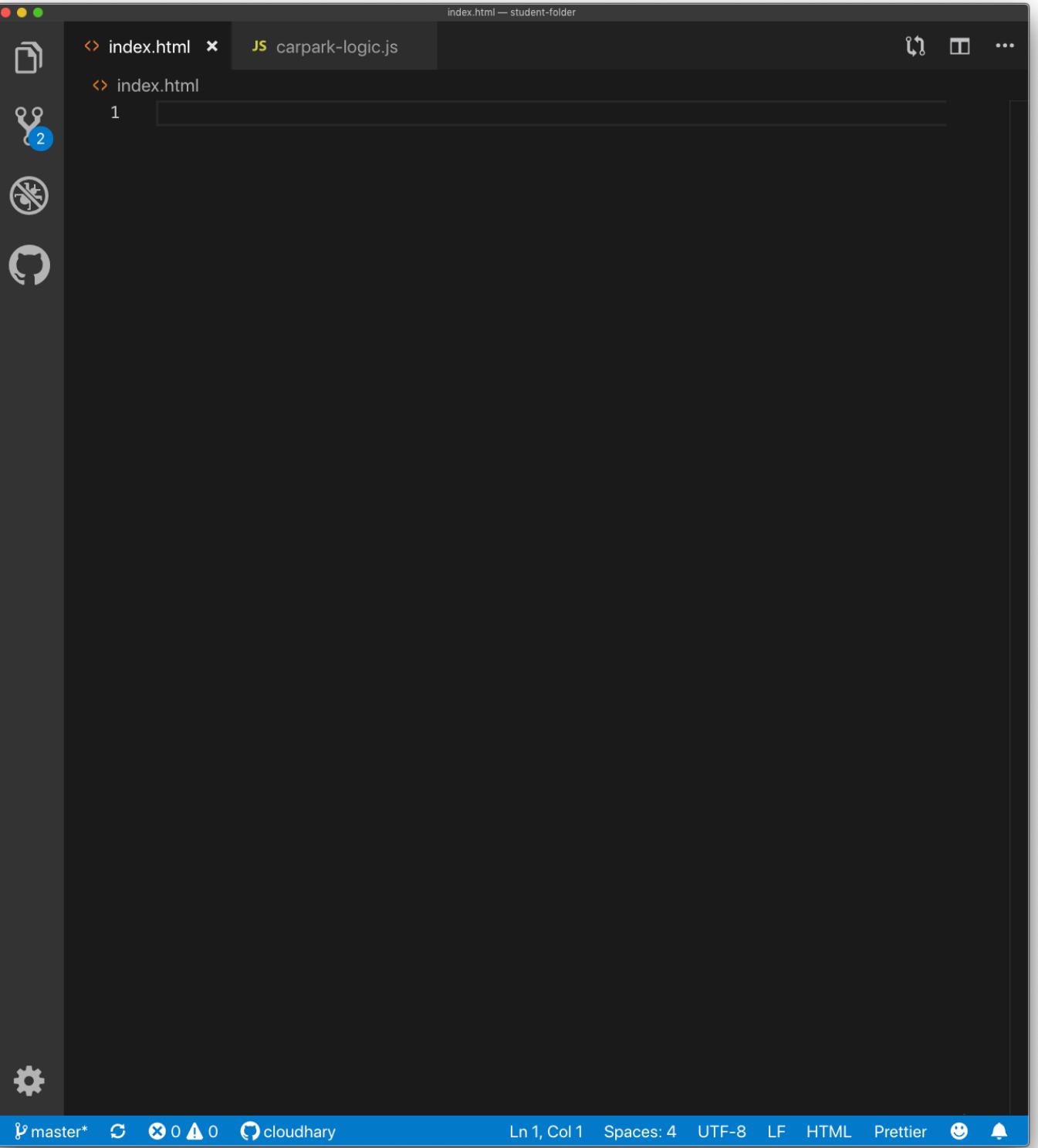
# Before we begin

- Refer to presentation/presentation.pdf for the slides
- Go into student/ folder to get started

# Step 1 - Displaying some text

# Setup

- Open the index.html file in **Visual Studio Code**
  - We will be editing our code in Visual Studio Code
  - This is a text editor (similar to Notepad) designed for coding
- Open the index.html file in **Google Chrome**
  - You should see nothing on the webpage right now, as the file is empty
  - As we progress, you will see changes you make in the file

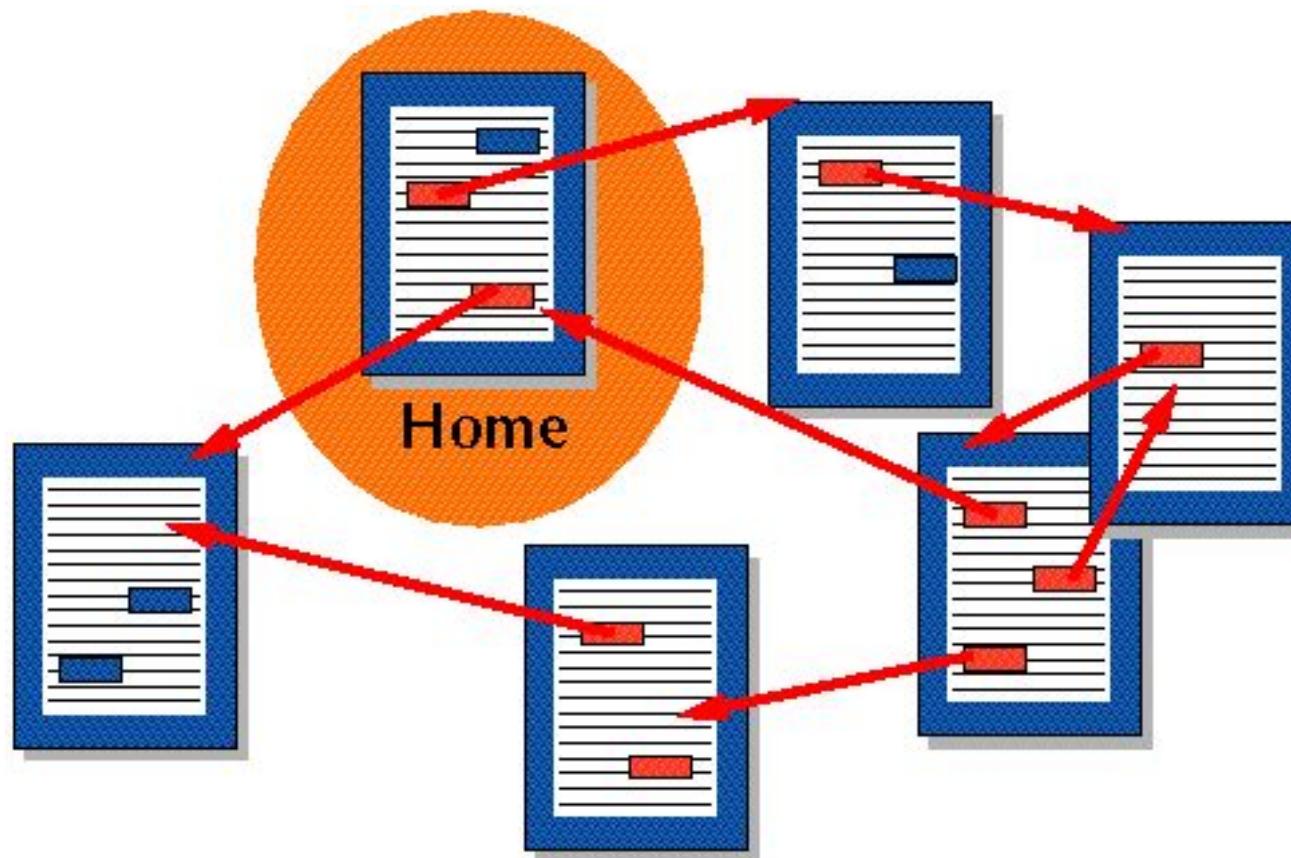


# What is HTML?

Hypertext Markup Language (HTML) is the standard **markup language** for documents designed to be displayed in a web browser.

# Hypertext

Text with references (usually called hyperlinks) to other text that the reader can immediately access.



# Markup Language

A system for annotating a document in a way that is syntactically distinguishable from the text.

TODO: Show real html code and the corresponding render

```
<body>
```

```
    hello
```

```
</body>
```

- Write the above text in the Visual Studio Code text editor
- Save the file and refresh the page in Chrome
- HTML uses tags to differentiate between different parts of the page
- <body> - opening tag for the page's content and </body> is the closing tag

```
<body>  
    hello there!  
</body>
```

```
<body>
```

```
    hello
```

```
    there!
```

```
</body>
```

- HTML has a specific way of formatting content
- What you see is not necessarily what you get

```
<body>  
  <h1>hello</h1>
```

there!

```
</body>
```

- The h1 tag makes the content inside become a **header**
- Try using h2 instead and see the difference

```
<body>
  <title>Carparks!</title>
  <h1>hello</h1>
```

there!

```
</body>
```

- Optional: try using the `<title>` tag

```
<body>
  <h1>Nearest Carpark Availability</h1>
</body>
```

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input>
</body>
```

- input creates an input box
- input tags aren't designed to contain text or other elements, so there is *no* corresponding closing tag

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">
</body>
```

- HTML tags can have extra **attributes** given to them
- These **attributes** can change the behaviour and appearance of the element

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

  <div>Hello!</div>
</body>
```

divs are containers that are used to organise and arrange content

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

  <div>123 / 456 lots available at Blk 789</div>
</body>
```

# A short detour

Adding styles to your page!

```
<body style="background-color: lightskyblue">
```

```
.
```

```
.
```

```
.
```

```
</body>
```

What colors can I use? Find the at [https://developer.mozilla.org/en-US/docs/Web/CSS/color\\_value](https://developer.mozilla.org/en-US/docs/Web/CSS/color_value)

## Work so far:

```
<body style="background-color: lightskyblue">
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

    <div style="color:red">123 / 456 lots available at Blk 789</div>
</body>
```

- Future code will not have style attributes for simplicity

# Step 1 - A quick recap

- Webpages all require HTML files in your browser
- HTML tells the browser what to display
- Using HTML tags and attributes

What's next:

Adding interaction to our page!

# Metaphor - the human body

Term	Metaphor	Function
HTML	Skeleton	Structure
CSS (styles)	Skin / Clothes	Styling, formatting
Javascript	Brain	Behaviour/actions

# What is Javascript?

- Programming language for the Web
- Update and change both HTML and CSS
- Calculate, manipulate and validate data

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

  <div>123 / 456 lots available at Blk 789</div>
</body>
```

```
<script> alert("Hello!") </script>
```

script content is javascript code that the browser will execute

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

  <div>123 / 456 lots available at Blk 789</div>
</body>

<script src="carpark-logic.js"></script>
```

We will split up Javascript and HTML code by writing Javascript in carpark-logic.js

## carpark-logic.js

```
alert(3 + 10)
```

- Open up carpark-logic.js file in your text editor
- Write the code above in that file and save it
- What do you see?

Note: For subsequent slides, the slide title is the file you should be editing

# What's next

- We need to be able to replace the address and parking lot information dynamically based on what the user searches
- We can do that by using Javascript to:
  1. Find the div with carpark info
  2. Change the text inside the div
- To find the correct div for Step 1, we need to give the div an identifier!

## index.html

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location">

  <div id="carparkInfo"></div>
</body>

<script src="carpark-logic.js"></script>
```

- Change the `div` tag to remove the text and add an `id`
- Save the file and refresh the page - the address should have disappeared

## carpark-logic.js

```
document.getElementById("carparkInfo").innerText = "No lots available at Blk 789"
```

- `document.getElementById` gets the `carparkInfo` div in our HTML
- Changing `innerText` changes the HTML displayed inside the `carparkInfo`'s div
- Be precise with your spelling and casing - computers are quite unforgiving!
- Save this file and refresh the page and your text should reappear

# Introducing functions

- Functions are like recipes - they're a way to group some instructions together

```
function bakeCake() {  
    preheatOven()  
    mixIngredients()  
    putInOven()  
}
```

- `bakeCake` is the function name
- `{` is used to denote the start of function, `}` to denote end

# Introducing functions

- Functions are like recipes - they're a way to group some instructions together

```
function bakeCake(flour, eggs) {  
    preheatOven()  
    mixIngredients(flour, eggs)  
    putInOven()  
}
```

- flour and eggs are the function inputs
- ( denotes the start of function inputs and ) denotes the end

## carpark-logic.js

```
function addCarparkToPage() {  
  document.getElementById("carparkInfo").innerText = "No lots available at Blk 789"  
}
```

- Wrap your existing code into a function (by adding the first and last line)
- addCarparkToPage is the name of this function
- The function does not take in any inputs
- When you refresh your page, the text disappears. Why?

## carpark-logic.js

```
function addCarparkToPage() {  
  document.getElementById("carparkInfo").innerText = "No lots available at Blk 789"  
}
```

addCarparkToPage()

- Creating a function does not run the code inside yet
- We need to call the function to run the code inside
- Analogy - writing a recipe is different from making a recipe

## carpark-logic.js

```
function addCarparkToPage(address) {  
  document.getElementById("carparkInfo").innerText = "No lots available at " + address  
}  
  
addCarparkToPage("Blk 000")
```

- Add one function input to take in an address
- Try changing function inputs and refresh the page

# carpark-logic.js

```
function addCarparkToPage(availableLots, totalLots, address) {  
    document.getElementById("carparkInfo").innerText = availableLots + " / " + totalLots + " lots available at " + address  
}  
  
addCarparkToPage("123", "456", "Blk 789")
```

- Add function inputs so that we can easily change the address and parking lot information displayed
- Try changing function inputs and refresh the page

# Recap

- Javascript adds interaction
- Javascript connects to HTML using getElementById
- A function is a bunch of code that's grouped together
- Calling a function runs the code in it

# What's next?

## Reacting to user input

## index.html

```
<body>
  <h1>Nearest Carpark Availability</h1>
  <input placeholder="Enter a location" id="locationInput">

  <div id="carparkInfo"></div>
</body>

<script src="carpark-logic.js"></script>
```

Give the input element the locationInput identifier

## carpark-logic.js

```
function addCarparkToPage(address, totalLots, availableLots) {  
    .  
    .  
}  
addCarparkToPage("123", "456", "Blk 789")
```

```
document.getElementById("locationInput")
```

Retrieve the input element using its ID

## carpark-logic.js

```
function addCarparkToPage(address, totalLots, availableLots) {
```

```
.
```

```
.
```

```
}
```

```
addCarparkToPage("123", "456", "Blk 789")
```

```
var parkingLocation = document.getElementById("locationInput")
```

- var is short for variable
- We're saving the element into the parkingLocation variable
- Analogy - saving your word document into Document.docx

## carpark-logic.js

```
function addCarparkToPage(address, totalLots, availableLots) {  
    .  
    .  
}  
  
var parkingLocation = document.getElementById("locationInput")  
  
parkingLocation.addEventListener("keydown", addCarparkToPage)
```

- Remove the `addCarparkToPage("123", "456", "Blk 789")` and add the event listener

## carpark-logic.js

```
function addCarparkToPage(address, totalLots, availableLots) {  
    .  
    .  
}  
  
var parkingLocation = document.getElementById("locationInput")  
  
parkingLocation.addEventListener("keydown", insertLocation)  
  
function insertLocation(event) {  
    addCarparkToPage("123", "456", "Blk 789")  
}
```

## insertLocation in carpark-logic.js

```
function insertLocation(event) {  
  if (event.key === "Enter") {  
    addCarparkToPage("123", "456", "Blk 789")  
  }  
}
```

- We only want to care about when the Enter key is pressed
- === is an equality check
- { once again signifies start of the conditional and } denotes the end

## insertLocation in carpark-logic.js

```
function insertLocation(event) {  
    console.log(event.key)  
    if (event.key === "Enter") {  
        addCarparkToPage("123", "456", "Blk 789")  
    }  
}
```

- What if you wanted to use some other key?
- On your Chrome Browser, right click, select Inspect, and see the output when you type into the input box

# What's next

Now we need to get the location that we typed in.

We can do that in a similar way to how we injected the text.

Find the input element, and extract its content.

## insertLocation in carpark-logic.js

```
function insertLocation(event) {  
  if (event.key === "Enter") {  
    var searchLocation = parkingLocation.value  
    addCarparkToPage(searchLocation, "456", "78")  
  }  
}
```

- `parkingLocation.value` gets the text that has been typed into the input box
- pass that on to the `addCarparkToPage` function as the first variable

# Recap

- React to user input by registering **event listeners**
- Only react to Enter key press
- Get the text that the user has typed in

# What's next?

- 1 Grab user input location
- 2 Get X and Y coordinates of given location
- 3 Get carpark closest to X and Y coordinates

# What is an API call?

- Way for apps to communicate (over the internet)
- An API call is like a phone call to a wise person who has the answers to your questions
  - "**What time is it now?**"
  - "**Where are all the carparks in Singapore?**"
  - "**What is the current price of Bitcoin?**"

# How do we make an API call?

- We need the help of a request library
- A library is a set of functions that someone else has written
- Like using tools that a wise man created

# Why do we use APIs/Libraries?

- Don't reinvent the wheel
  - Passport: For password authentication
  - OpenCV: For image recognition
- Keeps our app simple!
- Some information can only be provided by certain people/organisations (e.g. price of Bitcoin)

# Demo of OpenCV

- We can stand on the shoulders of giants by using these libraries
- Value adding instead of rebuilding

# Our API call

"What are the X and Y coordinates of this location?"

<https://docs.onemap.sg/#onemap-rest-apis>

Go to [https://developers.onemap.sg/commonapi/search?  
searchVal=revenue&returnGeom=Y&getAddrDetails=Y&pageNum=  
1](https://developers.onemap.sg/commonapi/search?searchVal=revenue&returnGeom=Y&getAddrDetails=Y&pageNum=1)

Try the following:

- In the URL, change jurong to toa payoh
- change the Y to N

Note which parameters are required and which are optional, and which are accepted values for returnGeom and getAddrDetails

# insertLocation in carpark-logic.js

```
function insertLocation(event) {
  if (event.key === "Enter") {
    var searchLocation = locationInput.value
    var url = "https://developers.onemap.sg/commonapi/search?searchVal=" + searchLocation + "&returnGeom=Y&getAddrDetails=N"
    console.log(url)
  }
}
```

- Click on the link in the console. Does it give you the correct information?

# index.html

```
<head>
  <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
</head>

<body>
  .
  .
  .
</body>

<script src="carpark-logic.js"></script>
```

- axios is how we tell the browser to retrieve the information we want
- Use the script tag to add the axios library to your code

# insertLocation in carpark-logic.js

```
async function insertLocation(event) {
  if (event.key === "Enter") {
    var searchLocation = locationInput.value
    var url = "https://developers.onemap.sg/commonapi/search?searchVal=" + searchLocation + "&returnGeom=Y&getAddrDetails=N"
    var response = await axios.get(url)
    console.log(response)
  }
}
```

- We await for the response from the API, cause that takes time
- Where is the information within the object?

# insertLocation in carpark-logic.js

```
async function insertLocation(event) {
  if (event.key === "Enter") {
    var searchLocation = locationInput.value
    var url = "https://developers.onemap.sg/commonapi/search?searchVal=" + searchLocation + "&returnGeom=Y&getAddrDetails=N"
    var response = await axios.get(url)
    console.log(response.data.results[0])
  }
}
```

# What's next

- Now we want to get the nearest carpark to that X and Y value
- Slightly too complicated for now, so we've written a library to help with that

## index.html

```
<head>
  <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
</head>

<body>
  ...
</body>

<script src="carpark-logic.js"></script>
<script src="carpark-library.js"></script>
```

Add carpark-library.js to your code

# insertLocation in carpark-logic.js

```
async function insertLocation(event) {
  if (event.key === "Enter") {
    var searchLocation = locationInput.value
    var url = "https://developers.onemap.sg/commonapi/search?searchVal=" + searchLocation + "&returnGeom=Y&getAddrDetails=N"
    var response = await axios.get(url)
    var nearestLocation = response.data.results[0]
    var carpark = await getNearestCarparkTo(nearestLocation.X, nearestLocation.Y)
    console.log(carpark)
  }
}
```

- Call the `getNearestCarparkTo(...)` function and provide it with X and Y coordinates
- What does `carpark` hold?

# insertLocation in carpark-logic.js

```
async function insertLocation(event) {
  if (event.key === "Enter") {
    var searchLocation = locationInput.value
    var url = "https://developers.onemap.sg/commonapi/search?searchVal=" + searchLocation + "&returnGeom=Y&getAddrDetails=N"
    var response = await axios.get(url)
    var nearestLocation = response.data.results[0]
    var carpark = await getNearestCarparkTo(nearestLocation.X, nearestLocation.Y)
    addCarparkToPage(carpark.address, carpark.total_lots, carpark.lots_available)
  }
}
```

# Recap

- Made API call to convert location to X and Y
- Used library function to get the nearest carpark

# What's next?

- Content and logic is all done!
- Next - styling your site!

## index.html

```
<head>
  <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
</head>

<body>
  <h1>Nearest Carpark Availability</h1>
  <input id="locationInput" placeholder="Enter a location">

  <div id="carparkInfo"></div>
</body>

<script src="carpark-library.js"></script>
<script src="carpark-logic.js"></script>
<link rel="stylesheet" type="text/css" href="carpark-style.css"></link>
```

## carpark-style.css

```
body {  
    background-image: url("background-image.png");  
    background-size: cover;  
    background-position: center;  
  
    text-align: center;  
    color: #F2F2F2;  
    margin-top: 10%;  
}
```

- Style the body
- Add each line one at a time and see the change

# carpark-style.css

```
h1 {  
    font-size: 64px;  
}
```

Style the h1

## carpark-style.css

```
input {  
    font-size: 20px;  
  
    width: 70%;  
    padding: 12px 20px;  
    margin-bottom: 30px;  
    border-radius: 4px;  
}
```

Style the input (search box)

## carpark-style.css

```
@import url('https://fonts.googleapis.com/css?family=Mandali');

body {
    background-image: url("background-image.png");
    background-size: cover;
    background-position: center;

    text-align: center;
    color: #F2F2F2;
    margin-top: 10%;
    font-family: "Mandali";
}

...
```

Import a font package from fonts.google.com

## carpark-style.css

```
@media only screen  
and (max-device-width: 480px) {  
  
    input {  
        font-size: 32px;  
        width: 95%;  
    }  
}
```

@media query: checking for screen size and then defining a specific style for the element

# Recap

- Use CSS Selectors to style the body, h1, and input
- Use @media queries to set style for mobile devices

# Recap

Term	Metaphor	Function
HTML	Skeleton	Structure
CSS (styles)	Skin / Clothes	Styling, formatting
Javascript	Brain	Behaviour/actions

# Next Step!

- Deploying your app to the internet
- Up to now, your website is just on your computer
- We will now deploy it to the internet so everyone can see and use it!

# Deployment

1. Go to <https://www.bitballoon.com/>
2. Drag and drop the app folder on to the site.
3. Wait for it to process your data
4. Voila! Your site has been hosted!

# Recap

1. What a website consists of
2. HTML + Javascript + CSS
3. API calls - communication over the internet
4. Deploying websites

That's all folks!

Any questions?

# Challenge Mode

If you're done and would like a little more of a challenge, try doing these:

- Loading information takes time. Is there any way we can give the user visual feedback while they're waiting?
- Can we show additional information for the nearest carpark? Can we display an icon based on carpark type?
- Can we show the three nearest carparks instead of only one?