

Understanding Web Development

Designed by Open Government Products

Objectives

- Become familiar with the building blocks of websites
- Be unafraid of code and engineers

What to expect

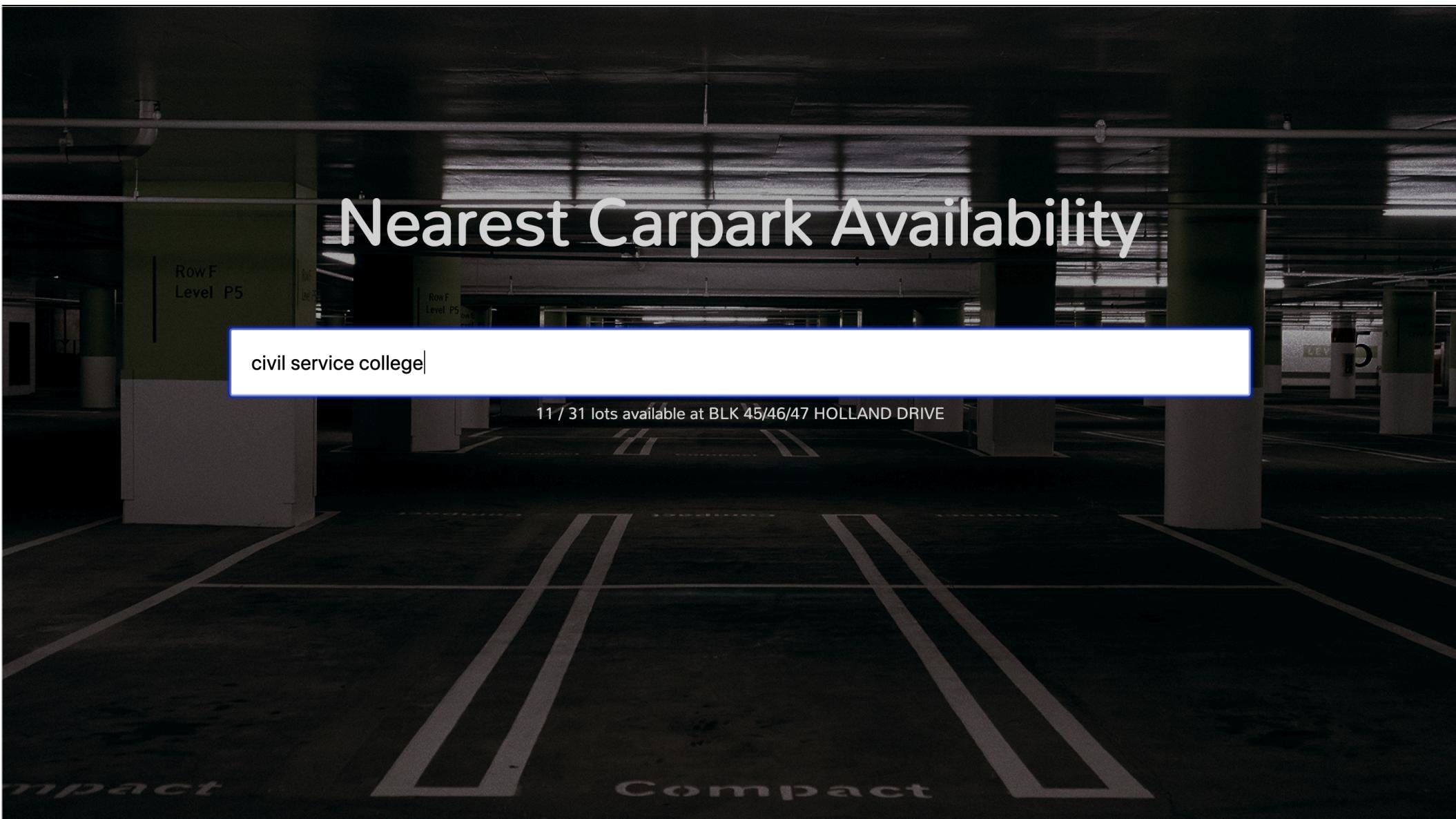
This is a **fast paced introduction** to web technologies that covers a lot of ground in a short time.

- We don't expect you to walk out as proficient coders, only with an appreciation of how websites work
- We encourage you to experiment and to ask questions

Don't need to take photos!

All material is available online at github.com/opengovsg/live-parking-info

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 on the cloud

Install the following to get started

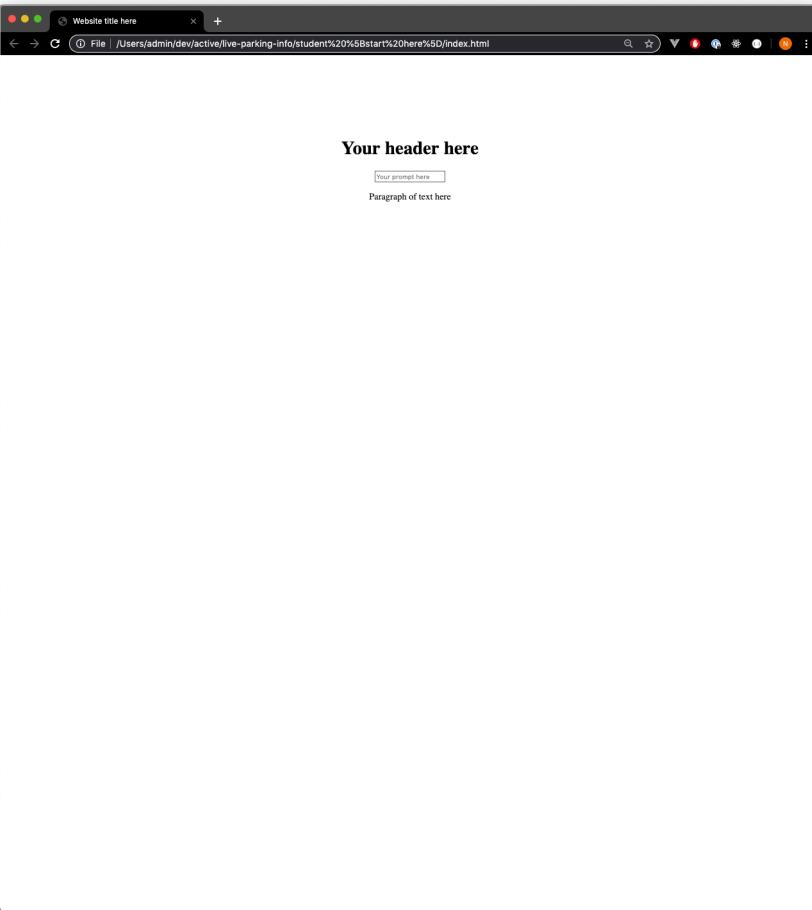
- Visual Studio Code code.visualstudio.com/download
- Google Chrome chrome.com
- The starter code github.com/opengovsg/live-parking-info

Setup

- Open the slides in presentation/presentation.pdf

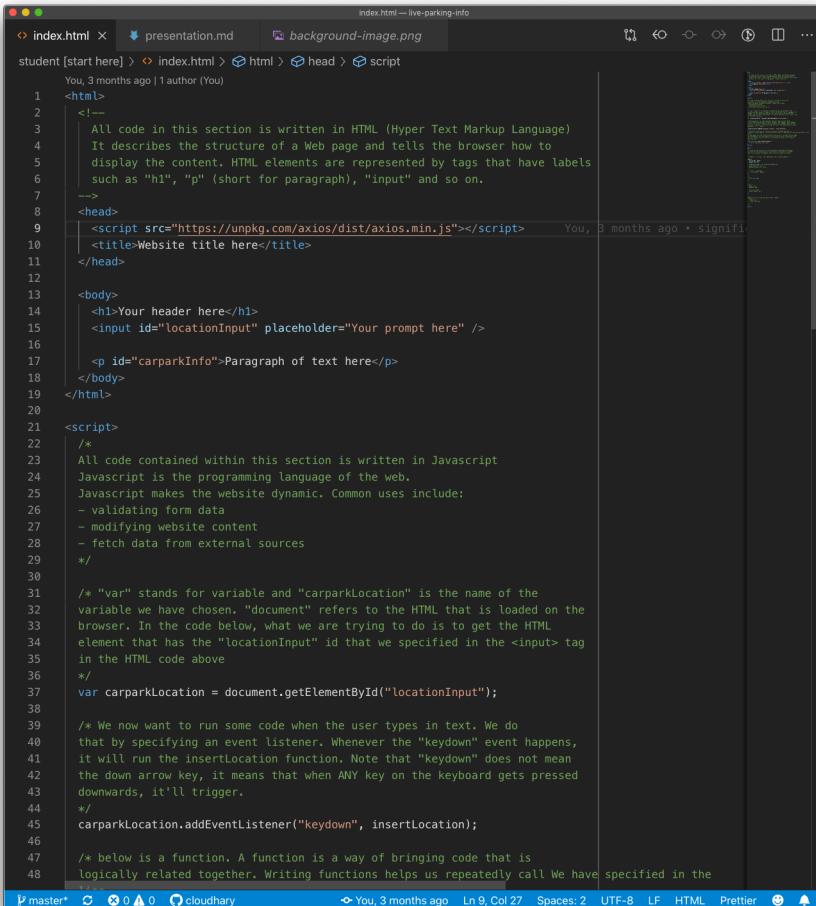
Setup

- Also open index.html in **Google Chrome**



Setup

- Open student [start here]/index.html in **Visual Studio Code**



A screenshot of the Visual Studio Code interface showing the 'index.html' file. The code editor displays an HTML document with a script section containing JavaScript. The status bar at the bottom shows 'master' and other repository details.

```
You, 3 months ago | 1 author (You)
<html>
  <!--
    All code in this section is written in HTML (Hyper Text Markup Language)
    It describes the structure of a Web page and tells the browser how to
    display the content. HTML elements are represented by tags that have labels
    such as "h1", "p" (short for paragraph), "input" and so on.
  -->
  <head>
    <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
    <title>Website title here</title>
  </head>
  <body>
    <h1>Your header here</h1>
    <input id="locationInput" placeholder="Your prompt here" />
    <p id="carparkInfo">Paragraph of text here</p>
  </body>
</html>

<script>
/*
All code contained within this section is written in Javascript
Javascript is the programming language of the web.
Javascript makes the website dynamic. Common uses include:
- validating form data
- modifying website content
- fetch data from external sources
*/
/* "var" stands for variable and "carparkLocation" is the name of the
variable we have chosen. "document" refers to the HTML that is loaded on the
browser. In the code below, what we are trying to do is to get the HTML
element that has the "locationInput" id that we specified in the <input> tag
in the HTML code above
*/
var carparkLocation = document.getElementById("locationInput");
/* We now want to run some code when the user types in text. We do
that by specifying an event listener. Whenever the "keydown" event happens,
it will run the insertLocation function. Note that "keydown" does not mean
the down arrow key, it means that when ANY key on the keyboard gets pressed
downwards, it'll trigger.
*/
carparkLocation.addEventListener("keydown", insertLocation);

/* below is a function. A function is a way of bringing code that is
logically related together. Writing functions helps us repeatedly call We have
specified in the

```

What is Visual Studio Code?

Visual Studio Code is a text editor program (similar to Notepad or Microsoft Word) specifically designed for editing source code of computer programs. Some helpful features that you'll experience as you code today include:

- Suggested autocompletion
- Code highlighting

How does the web work?

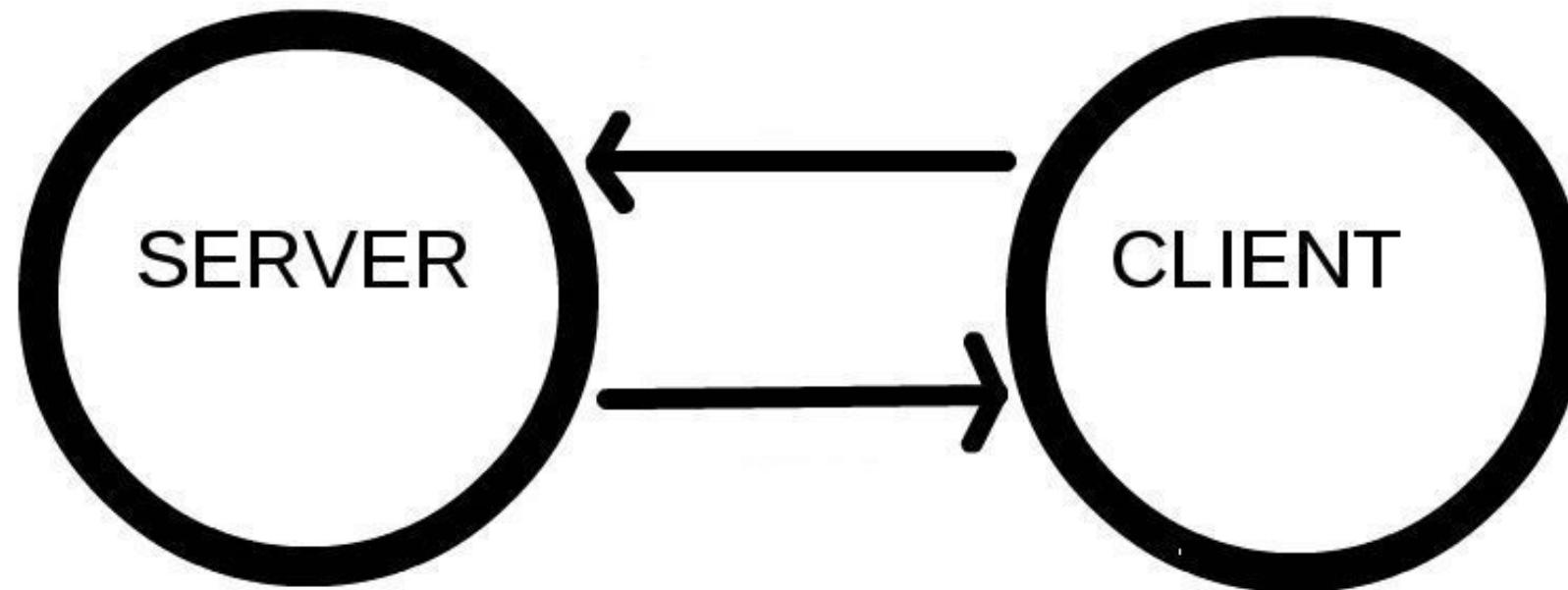
Before writing code, let's provide a simplified view of what happens when you view a webpage in a web browser on your computer or phone.

Clients and servers

- Clients are typically computing devices such as your computer, phone, or tablet that run browsers such as Firefox, Chrome, Safari, Edge, etc.
- Servers are computers that store webpages, sites, or apps.

What happens when I go to a website?

Your client device will download the webpage from the server and display it in the user's web browser.



For more information, go to [How the Web Works](#)

Websites are simply files

- Your website exists only on your client (your computer), so that change is only visible to you.
- The fact that you were able to make changes shows that these are simply text files on your computer

Follow along

- Go to tech.gov.sg or a website of your choice
- Switch your internet connection off
- Right click on the webpage and select "Inspect"
- Type CMD + SHIFT + C or click on "Select element" icon
- Select the hero banner text
- Modify the content of that banner

What does a webpage consist of?

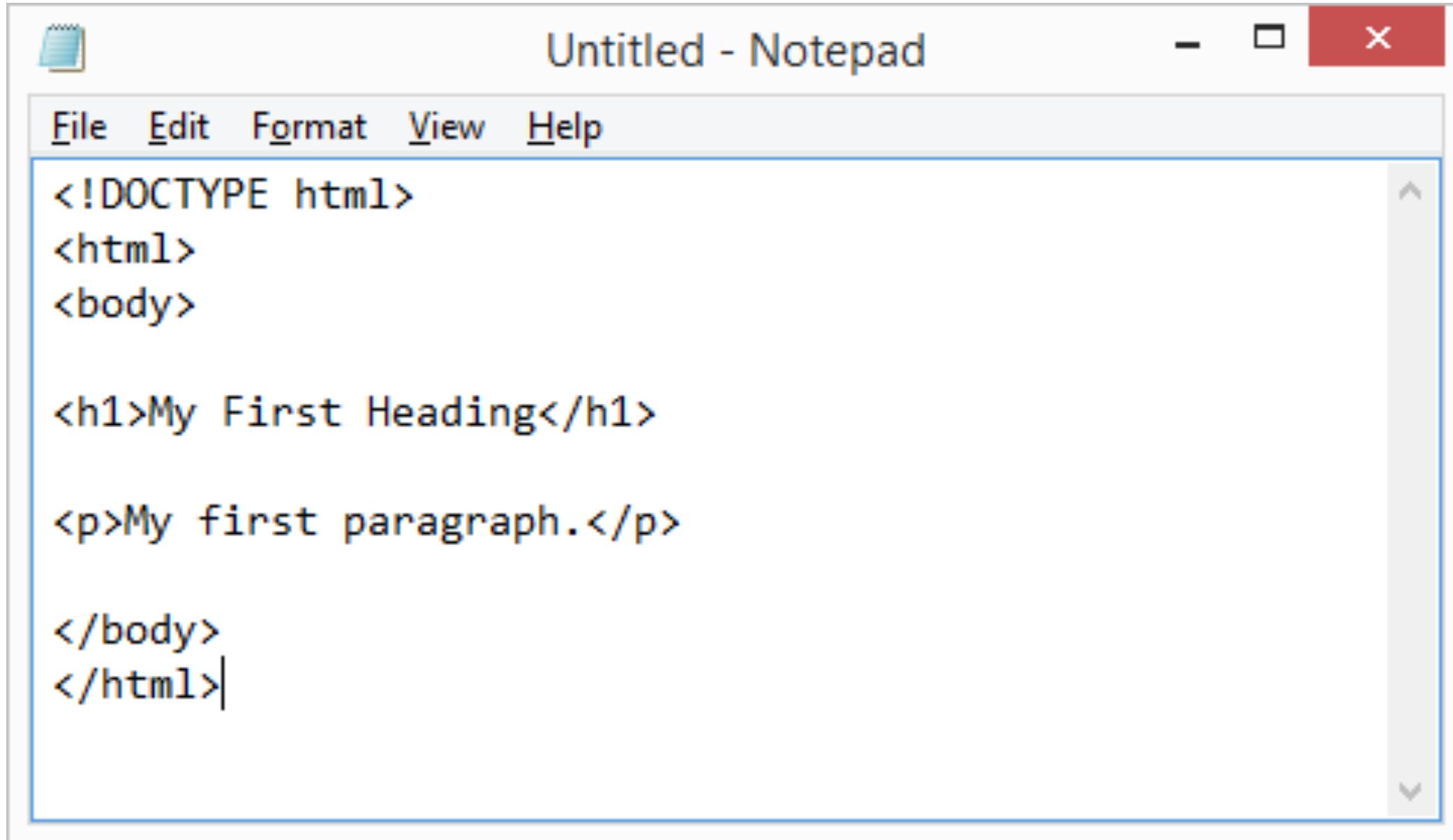
Term	Metaphor	Function
HTML	Skeleton	Structure
CSS	Skin / Clothes	Styling, formatting
Javascript	Brain	Behaviour/actions

HTML

What is HTML?

- Hyper Text Markup Language
- It describes the structure of a Web page and tells the browser how to display the content.
- HTML elements are represented by tags
 - `<h1>` for header
 - `<p>` for paragraphs
 - `<input>` for user input

<h1> What is Markup Language? </h1>



A screenshot of the Microsoft Notepad application window titled "Untitled - Notepad". The window contains an HTML document with the following code:

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Heading</h1>

<p>My first paragraph.</p>

</body>
</html>
```

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

- `<title>` is the opening tag for the page's content and `</title>` is the closing tag
- Modify the website title

```
<body>
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</body>
```

Change your header, placeholder, and paragraph text

```
<body>
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</body>
```

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

```
<body>
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</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>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</body>
```

- HTML tags can have extra **attributes** given to them
- The placeholder **attribute** will specify the grey shadow text that prompts the user

```
<body>
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</body>
```

- <p> tags stand for paragraph

A short detour

Adding styles to your page!

```
<body style="background-color: lightskyblue">
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo">Paragraph of text here</p>
</body>
```

What colors can I use? Find out [here](#)

More color

```
<body style="background-color: lightskyblue">
  <h1>Your header here</h1>
  <input id="locationInput" placeholder="Your prompt here" />

  <p id="carparkInfo" style="color:red">Paragraph of text here</p>
</body>
```

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!

Javascript

What is Javascript?

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

Move on to the section that starts with the script tag

```
async function insertLocation(event) {  
    alert("You typed something!");  
}
```

alert creates a pop up on your screen. Refresh the page and try to make it run

When does it run?

The pop up runs when the user types in something to the text box.
Lets review the existing code to understand why

Current code

```
var carparkLocation = document.getElementById("locationInput");  
  
carparkLocation.addEventListener("keydown", insertLocation);
```

```
var carparkLocation = document.getElementById("locationInput");
```

- var stands for variable
- a variable is a way to store information, like saving a word document
- We chose to name the variable carparkLocation
- document refers to the HTML that is loaded on the browser.

We're trying to connect to the HTML <input> tag by using getElementById

```
carparkLocation.addEventListener("keydown", insertLocation);
```

- Whenever a "keydown" happens, go and insertLocation
- "keydown" does not mean the down arrow key, it means that when ANY key on the keyboard goes down

```
async function insertLocation(event) {  
    alert(1 + 2);  
}
```

Javascript can do computation, unlike HTML

Introducing functions

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

```
function makeBreakfast() {  
    makeMilo();  
    makeKayaToast();  
}
```

- `makeBreakfast` is the function name
- `{` is used to denote the start of function and `}` to denote end

Introducing functions

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

```
function makeBreakfast(miloPowder, kayaJam, bread) {  
    makeMilo(miloPowder);  
    makeKayaToast(kayaJam, bread);  
}
```

- miloPowder, kayaJam and bread are the function inputs
- (denotes the start of function inputs and) denotes the end

Why use functions?

```
function makeBreakfast(miloPowder, kayaJam, bread) {  
    makeMilo(miloPowder);  
    makeKayaToast(kayaJam, bread);  
}
```

- Functions are a way to remember code and make it easily repeated
- Monday morning, all you have to do is makeBreakfast()
- Tuesday morning, once again, all you have to do is makeBreakfast()

Functions

```
async function insertLocation(event) {  
    alert("You typed something!");  
}
```

- write the function keyword
- name it (in this example insertLocation)
- write your code between the { and } brackets

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    alert("You hit enter!");  
  }  
}
```

- we are using a conditional here, the `if` statement
- we use `==` to indicate that we're checking if they are equal because `=` was used to assign variables (see earlier)

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    alert(carparkLocation.value);  
  }  
}
```

carparkLocation.value gets the text that the user has typed into the input box

Recap

- We have extracted information that the user has typed
- We can display that information back to the user

How do we fetch the information?

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?**"

Instructor Demo

- See how to make a credit card charge with Stripe
- See the latest weather on data.gov.sg

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 and libraries?

Less work for you. Why reinvent the wheel if there already is a good solution out there?

Why do we use APIs and libraries?

Open source libraries are generally more secure and perform better than their proprietary equivalents

- Many people would have scrutinized the code to identify bugs, loopholes and vulnerabilities and fix them
- Over time, these libraries will be "battle-tested" and prove that they can withstand load and usage

Why do we use APIs and libraries?

Organizations and communities that build and maintain APIs and libraries have many resources to do them well

Why do we use APIs and libraries?

Some information or actions can only be provided by certain people/organisations

- NEA collects weather data in Singapore and they host the data on data.gov.sg
- MAS provides authoritative exchange rates of SGD against other currencies

By using APIs and libraries, you can keep your app simple and focus on adding value

Instructor Demo

- run `python demo.py` to see the facial recognition software

Axios library

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

- We'll be using the axios library to retrieve information
- Click on the link to see the code that we're using

Explore the API

Go to <https://opengovsg.github.io/carparks-near-me>

- Click on "Try it out" and type a location of your choice
- Copy the Request URL and paste it into the browser

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    var carparkResponse = await axios.get("https://carparks-near-me.herokuapp.com?location=jurong")  
  }  
}
```

- Let's make the API call that will provide the data
- We await for the response from the API, cause that takes time
- It's like waiting for an order in a restaurant to be fulfilled

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    var carparkResponse = await axios.get("https://carparks-near-me.herokuapp.com?location=jurong")  
    console.log(carparkResponse)  
  }  
}
```

- In order to see all the info, we need to use the "Console"
- Right click, select "Inspect", and click on the Console tab

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    var carparkResponse = await axios.get("https://carparks-near-me.herokuapp.com?location=" + carparkLocation.value)  
    console.log(carparkResponse.data)  
  }  
}
```

Let's fetch data based on what the user types in

Displaying info to user

- We need to be able to display the address that we get from the API call
- We can do that by using Javascript to:
 1. Find the <p> tag in the document
 2. Change the text inside
- We already gave the <p> tag the carparkInfo id in our HTML code

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    var carparkResponse = await axios.get("https://carparks-near-me.herokuapp.com?location=" + carparkLocation.value)  
    var carpark = carparkResponse.data  
    document.getElementById("carparkInfo").innerText = carpark.address  
  }  
}
```

- We change the text inside the <p> tag that has the carparkInfo id
- getElementById is case sensitive, so be precise with your casing and spelling
- Be precise with your spelling and casing - computers are quite unforgiving!

```
async function insertLocation(event) {  
  if (event.key === "Enter") {  
    var carparkResponse = await axios.get("https://carparks-near-me.herokuapp.com?location=" + carparkLocation.value)  
    var carpark = carparkResponse.data  
    document.getElementById("carparkInfo").innerText = carpark.lots_available + " lots available at " + carpark.address  
  }  
}
```

Structure the text that you want the user to see by choosing between the different fields within

Recap

- 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
- Made API call to get nearest capark

What's next?

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

```
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

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

Style the input search box

```
@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

```
@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

Term

Metaphor

Function

HTML

Skeleton

Structure

CSS

Skin / Clothes

Styling, formatting

Javascript

Brain

Behaviour/actions

Next Step!

- Deploying your app to the internet
- Up till now, your website has only been accessible on your computer
- We will now deploy it to the cloud so everyone can see and use it!

Deployment

1. Go to netlify.com/drop
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!

Cloud deployments do not need to be hard or
expensive

Recap

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

That's all folks!

Any questions?

Challenge Mode

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

- Change the background to another image
- 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?