MONASH University

ETC5523: Communicating with Data

Introduction to web technologies

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📅 Week 2

🌐 cwd.numbat.space

Aim

- Understand the make up of web documents, i.e. HTML, CSS and JS
- Write basic HTML and CSS with valid syntax
- Use CSS selectors to apply new styles
- Integrate CSS and JS to R markdown documents with HTML output

Why

- Basic web development skills are necessary for customising HTML documents
- This hard skill will be necessary later for when you are communicating with web documents and web apps

🌐 World Wide Web (WWW)

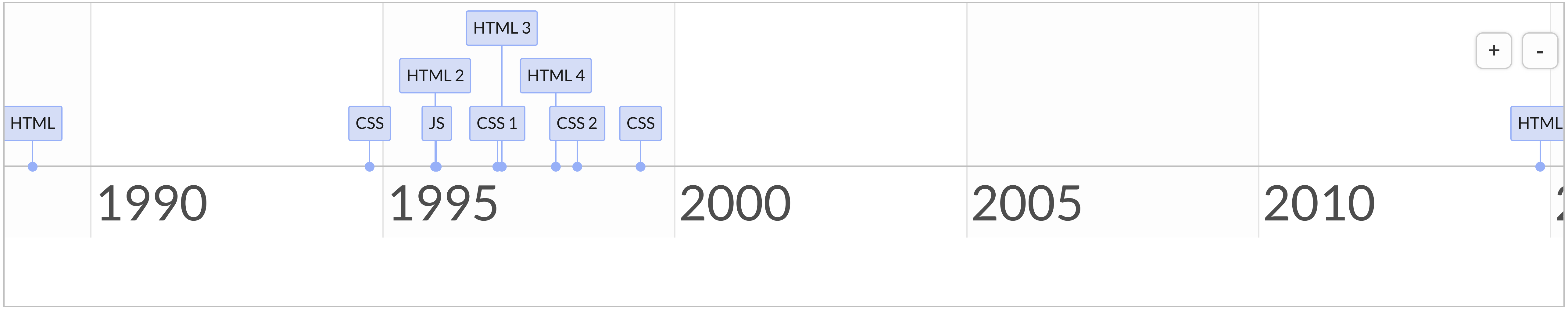
- WWW (or the **Web**) is the information system where documents (web pages) are identified by Uniform Resource Locators (**URL**s)

- A web page consists of:
  - **HTML** provides the basic structure of the web page
  - **CSS** controls the look of the web page (optional)
  - **JS** is a programming language that can modify the behaviour of elements of the web page (optional)

🔨 Web Documents are Handy

- HTML documents are really handy for including interactive elements and supported in almost all computer devices.
- Naturally, this ties in well with interactive data visualisation.

- Below is an interactive timeline visualisation of historical developments of HTML/CSS/JS:



So what exactly is HTML, CSS, and JS?

Hyper Text Markup Language

- HTML files have the extension `.html`.
- HTML files are often rendered using a web browser via an URL.
- HTML files are just text files that follows a special syntax that alerts web browsers how to render it.

Simple HTML example

simple-example.html

```html
<html>
<body>
<h1>ETC5523: Communicating with Data</h1>
<h2>Lecturer</h2>
<ul>
<li>Michael Lydeamore (Chief Examiner)</li>
</ul>
<h2>Tutors</h2>
<ul>
<li>Janith Wanniarachchi</li>
<li>Cynthia Huang</li>
</ul>
</body>
</html>
```

ETC5523: Communicating with Data

Lecturer

- Michael Lydeamore (Chief Examiner)

Tutors

- Janith Wanniarachchi
- Cynthia Huang

HTML Structure

```html
<html>
<!--This is a comment and ignored by web client.-->
<head>
  <!--This section contains web page metadata.-->
  <title>Communicating with Data</title>
  <meta name="author" content="Emi Tanaka">
  <link rel="stylesheet" href="css/styles.css">
</head>

<body>
<!--This section contains what you want to display on your web page.-->
<h1>I'm a first level header</h1>
<p>This is a paragraph.</p>
</body>
</html>
```

HTML Syntax

```html
<span style="color:blue;">Author content</span>
```

Author content

The breakdown of this HTML syntax:

start tag:	`<span style=“color:blue;”>`Author content</span>
end tag:	<span style=“color:blue;”>Author content`</span>`
content:	<span style=“color:blue;”>`Author content`</span>
element name:	<`span` style=“color:blue;”>Author content</span>
attribute:	<span `style=“color:blue;”`>Author content</span>
attribute name:	<span `style`=“color:blue;”>Author content</span>
attribute value:	<span style=`“color:blue;”`>Author content</span>

Not all HTML tags have an end tag

```html
<img height="200px" src="https://tinyurl.com/rlogo-svg">
```

Some HTML elements

block element:	`<div>content</div>`
inline element:	`<span>content</span>`
paragraph:	`<p>content</p>`
header level 1:	`<h1>content</h1>`
header level 2:	`<h2>content</h2>` (note: only up to 6 levels)
italic:	`<i>content</i>`
emphasised text:	`<em>content</em>`
bold:	`<b>content</b>`
strong importance:	`<strong>content</strong>`
link:	`<a href=“https://cwd.numbat.space/”>content</a>`
insert new line:	`<br>`

unordered list:	`<ul>`
	`<li>item 1</li>`
	`<li>item 2</li>`
	`</ul>`

How these are rendered to the browser depends on the **browser default style values**, **style attribute** or **CSS**…

Cascading Style Sheet (CSS)

- CSS files have the extension `.css` and styles also XHTML, plain XML, SVG and XUL.
- There are 3 ways to style elements in HTML:
  - **inline** by using the `style` attribute inside HTML start tag:

```
<h1 style="color:blue;">Blue Header</h1>
```

  - **externally** by using the `<link>` element:

```
<link rel="stylesheet" href="styles.css">
```

  - **internally** by defining within `<style>` element:

```
<style type="text/css"> h1 { color: blue; } </style>
```

CSS Syntax

```html
<style type="text/css">
h1 { color: blue; }
</style>

<h1>This is a header</h1>
```

This is a header

The breakdown of the CSS syntax:

selector: `h1 { color: blue; }`

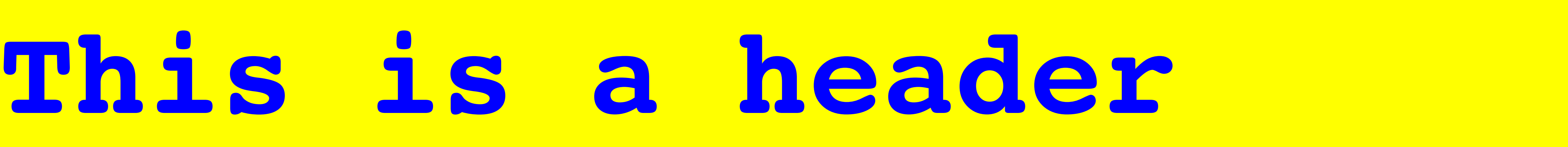
property: `h1 { color: blue; }`

property name: `h1 { color: blue; }`

property value: `h1 { color: blue; }`

You may have multiple properties for a single CSS selector

```
h1 {
  color: blue;
  font-family: monospace;
  background: yellow;
}
```



This is a header

Some CSS properties

```
<div> Sample text </div>
```

background color:	`div { background-color: yellow; }`	Sample text
text color:	`div { color: purple; }`	Sample text
border:	`div { border: 1px dashed brown; }`	Sample text
left border only:	`div { border-left: 10px solid pink; }`	Sample text
text size:	`div { font-size: 10pt; }`	Sample text

padding:	`div { background-color: yellow;`
	`padding: 10px; }`
		Sample text

margin:	`div { background-color: yellow;`
	`margin: 10px; }`
		Sample text

horizontally center text:	`div { background-color: yellow;`
	`padding-top: 20px;`
	`text-align: center; }`
		Sample text

font family:	`div { font-family: Marker Felt, times; }`	Sample text
strike:	`div { text-decoration: line-through; }`	~~Sample text~~
underline:	`div { text-decoration: underline; }`	Sample text
opacity:	`div { opacity: 0.3 }`	Sample text

CSS Selector

`*`	selects all elements
`div`	selects all `<div>` elements
`div, p`	selects all `<div>` and `<p>` elements
`div p`	selects all `<p>` within `<div>`
`div > p`	selects all `<p>` one level deep in `<div>`
`div + p`	selects all `<p>` immediately after a `<div>`
`div ~ p`	selects all `<p>` preceded by a `<div>`
`.classname`	selects all elements with the attribute `class=“classname”`.
`.c1.c2`	selects all elements with *both* `c1` and `c2` within its class attribute.
`.c1 .c2`	selects all elements with class `c2` that is a descendant of an element with class `c1`.
`#idname`	selects all elements with the attribute `id=“idname”`.

JavaScript (JS)

- JS is a programming language and enable interactive components in HTML documents.
- You can insert JS into a HTML document in two ways:
  - **internally** by defining within `<script>` element:

```
<script>
document.getElementById("p1").innerHTML = "content";
</script>
```

  - **externally** by using the `src` attribute to refer to the external file:

```
<script src="myjava.js"></script>
```

- You are *not* expected to be able to do any JS in this course.

HTML outputs with Rmd documents

```yaml
---
output: html_document
---
```

```yaml
---
output: bookdown::html_document2
---
```

Inserting CSS in Rmd documents Part 1

- There is a `css` engine:

~~~
```{css}
h1 { color: red; }
```
~~~

- This inserts the following output into the document:

```
<style type="text/css">
h1 { color: red; }
</style>
```

- If the output is a HTML document then the defined styles will apply to the output document.

Inserting CSS in Rmd documents Part 2

- If you have an external file, say `styles.css`, that you define the styles, then most HTML outputs will support this with YAML argument `css`

```yaml
---
output:
  html_document:
    css: ["styles.css"]
---
```

or say

```yaml
---
output:
  bookdown::html_document2:
    css: ["styles.css", "custom.css"]
---
```

Inserting JS into Rmd documents Part 1

- There is a `js` engine:

~~~
```{js}
document.getElementById("p1").innerHTML = "content";
```
~~~

which inserts:

```
<script type="text/javascript">
document.getElementById("p1").innerHTML = "content";
</script>
```

- If you have an external file, say `myjava.js`, then you can directly insert this in the body of the Rmd file as:

```
<script src="myjava.js"></script>
```

Inserting JS into Rmd documents Part 2

If you need to insert at a specific location within the document then you can use `includes`:

```
---
output:
  html_document:
    includes:
      in_header: ["header.html"]
      before_body: ["before_body.html"]
      after_body: ["after_body.html"]
---
```

where `header.html`, `before_body.html`, `after_body.html` includes the JS code, e.g.

```
<script src="myjava.js"></script>
<script type="text/javascript">
document.getElementById("p1").innerHTML = "content";
</script>
```

Community Web Enhancements

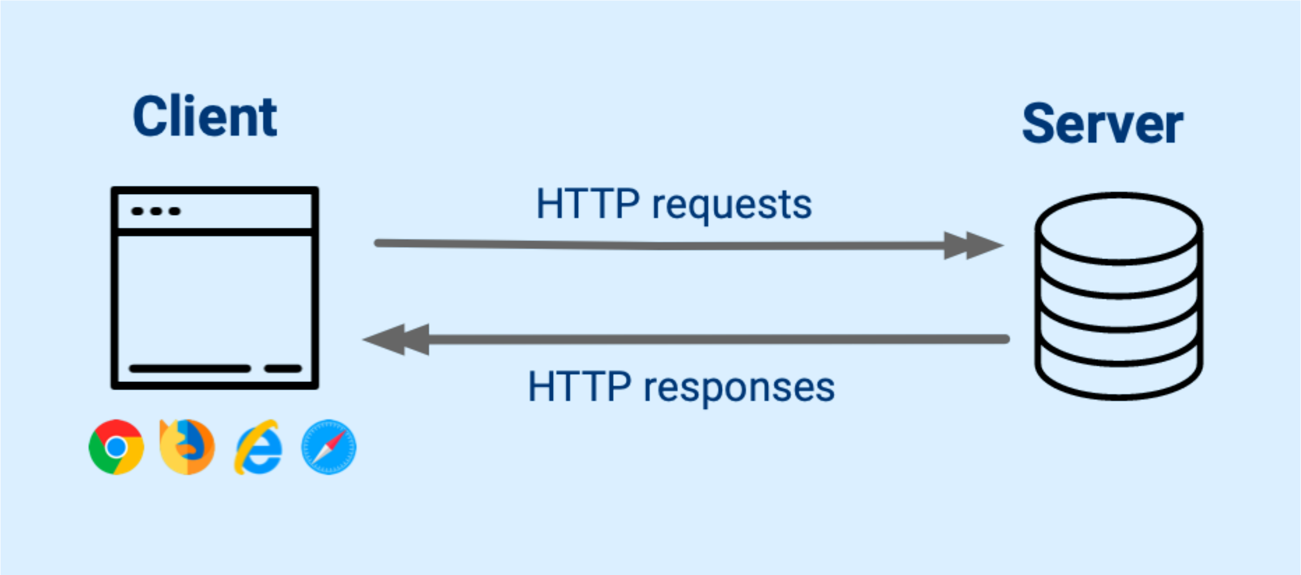
- Bootstrap is a free open-source CSS and JS that is widely adopted.[1]
- jQuery is a widely used JS library for object selection and manipulation.[1]
- MathJax is a JS library for displaying mathematics.[1]
- Font Awesome inserts icons to web using their CSS.[2]
- D3.js is one of the most popular JS library for interactive data visualisation.

[1] Included in the default `rmarkdown::html_document`.

[2] Sometimes included in certain Rmd HTML documents.

☁️ Communication in the Web

- Hypertext Transfer Protocol (**HTTP**) functions as the communicator in the Web
- HTTPS is the secure version of HTTP where communications are encrypted



⚠ **Warning**

Different clients may work differently! E.g. Internet Explorer and Chrome may render the same web page differently.

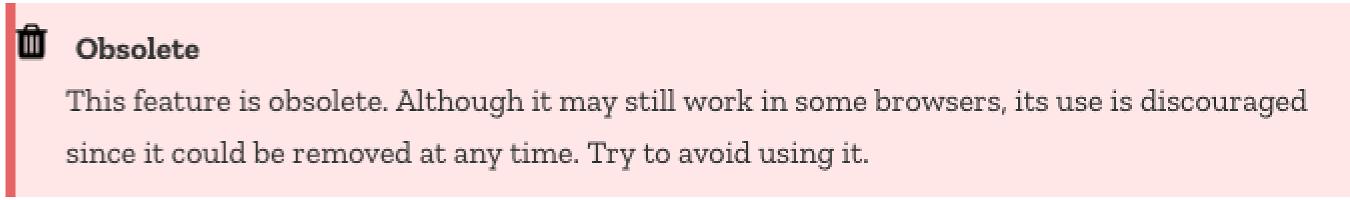
📋 Web Standard

- There are 3 major groups that govern the standard for the Web:
  - World Wide Web Consortium (**W3C**) formed in 1994 maintains the CSS specifications
  - Web Hypertext Application Technology Working Group (**WHATWG**) formed in 2004 and is the publisher of the HTML and DOM standards
  - **TC39 technical committee** of Ecma International, renamed from European Computer Manufacturers Association (ECMA) in 1994, maintains the standards for JS
- These groups consist of Mozilla, Apple, Google, Microsoft and other invited members.

📜 MDN Web Docs LIVE DEMO

https://developer.mozilla.org/

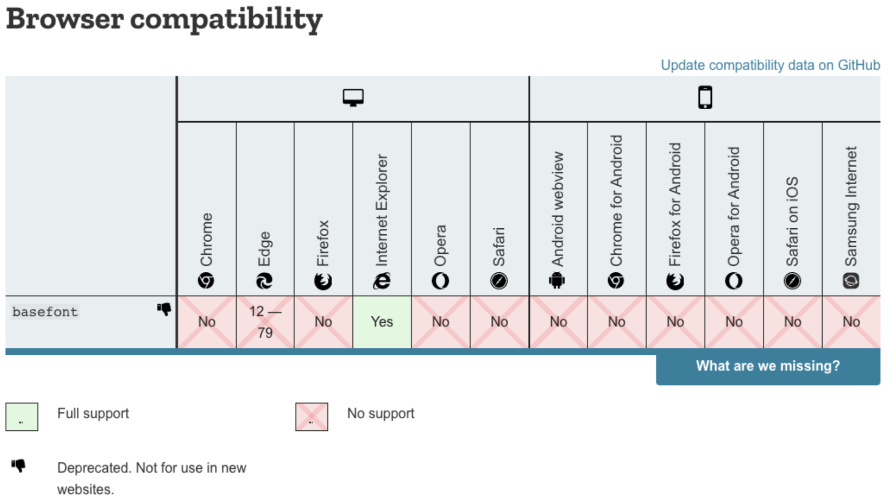
- Documentation of web standards maintained by the community.
- Includes status of use:



Obsolete

This feature is obsolete. Although it may still work in some browsers, its use is discouraged since it could be removed at any time. Try to avoid using it.

- As well as its compatibility with web clients:



Browser compatibility

Update compatibility data on GitHub

	🖥						📱					
	Chrome	Edge	Firefox	Internet Explorer	Opera	Safari	Android webview	Chrome for Android	Firefox for Android	Opera for Android	Safari on iOS	Samsung Internet
basefont 👎	No	12 — 79	No	Yes	No	No	No	No	No	No	No	No

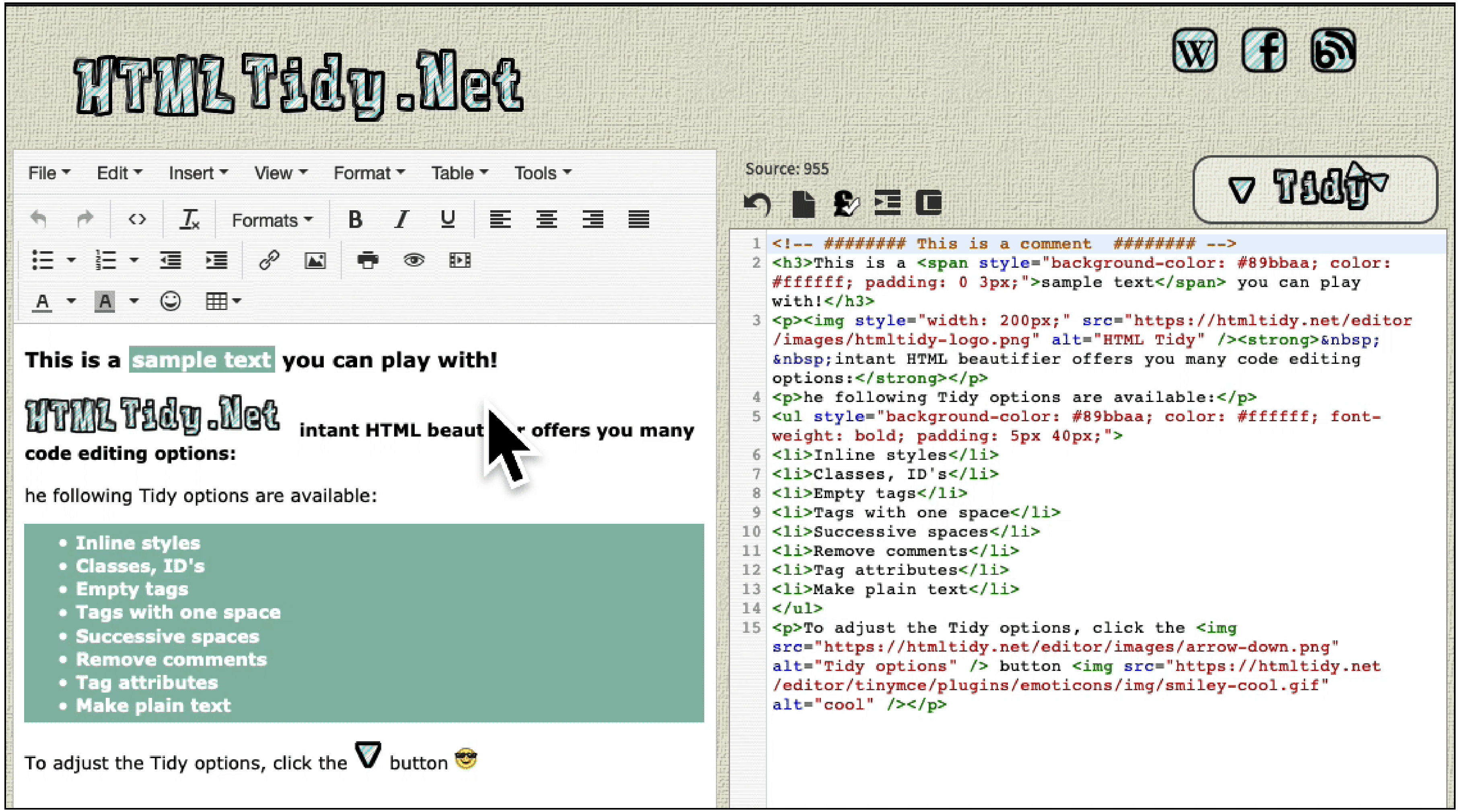
🟩 Full support

🟥 No support

👎 Deprecated. Not for use in new websites.

Writing HTML

You can play at https://htmltidy.net/



This is a sample text you can play with!

intant HTML beaut r offers you many code editing options:

he following Tidy options are available:

- **Inline styles**
- **Classes, ID's**
- **Empty tags**
- **Tags with one space**
- **Successive spaces**
- **Remove comments**
- **Tag attributes**
- **Make plain text**

To adjust the Tidy options, click the ▽ button 😎

```
<!-- ######## This is a comment  ######## -->
<h3>This is a <span style="background-color: #89bbaa; color: #ffffff; padding: 0 3px;">sample text</span> you can play with!</h3>
<p><img style="width: 200px;" src="https://htmltidy.net/editor/images/htmltidy-logo.png" alt="HTML Tidy" /><strong>&nbsp;&nbsp;intant HTML beautifier offers you many code editing options:</strong></p>
<p>he following Tidy options are available:</p>
<ul style="background-color: #89bbaa; color: #ffffff; font-weight: bold; padding: 5px 40px;">
<li>Inline styles</li>
<li>Classes, ID's</li>
<li>Empty tags</li>
<li>Tags with one space</li>
<li>Successive spaces</li>
<li>Remove comments</li>
<li>Tag attributes</li>
<li>Make plain text</li>
</ul>
<p>To adjust the Tidy options, click the <img src="https://htmltidy.net/editor/images/arrow-down.png" alt="Tidy options" /> button <img src="https://htmltidy.net/editor/tinymce/plugins/emoticons/img/smiley-cool.gif" alt="cool" /></p>
```

📝 Interactive Cheatsheets

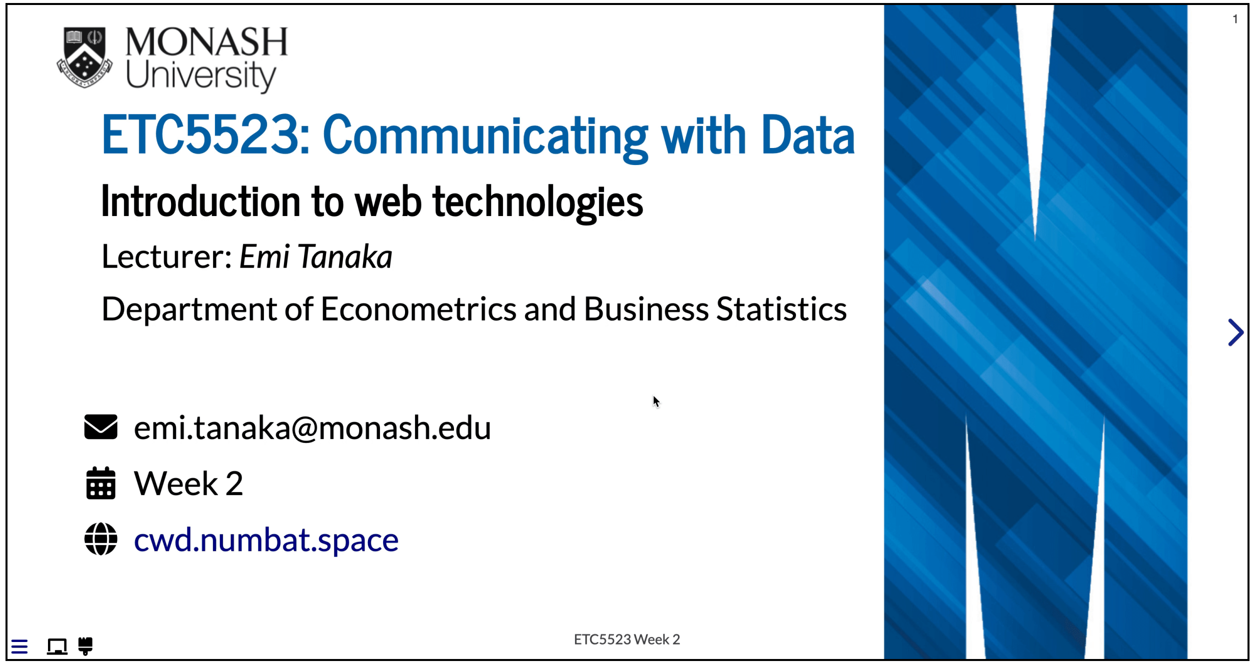
HTML Cheatsheet https://htmlcheatsheet.com/

CSS Cheatsheet https://htmlcheatsheet.com/css/

JS Cheatsheet https://htmlcheatsheet.com/js/

🔎 Inspect Element LIVE DEMO

Below GIF shows interactive use of Inspect Element[1] available from the menu in most web browsers when you right click on the web page[2]:



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📅 Week 2

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ETC5523 Week 2

~

[1] Or called Inspect.

[2] Note: this is for inspection and doesn't actual make changes to the files.

Week 2 Lesson

Summary

- We went through the basics of HTML, CSS and JS
- You should be more comfortable with writing HTML and CSS
- You learnt how to include CSS and JS into HTML documents created from R Markdown
- You know the tools to interactively learn HTML and CSS

Resources

- Introduction to Data Technologies Ch 2-4 by Paul Murrell
- Interactive HTML/CSS/JS cheatsheets
- HTML Tidy .Net