# Financial Software Engineering
# Lecture 4

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## Today

1. Javascript
2. Document object model
3. Jquery

## Javascript

## Recap

- From the last lecture we know that
- $\rightarrow$ HTML and CSS represent markup languages that allow us to create and typeset content on a webpage
- $\rightarrow$ JavaScript (JS) represents a way to add interactivity and reactivity to our webpages
- $\rightarrow$ JS represents a complete programming language and we therefore have access to all of the programming functionality we learnt about
- $\rightarrow$ Since JS is an OOP language, we can implement many of the principles we learnt about with Python

## Document object model

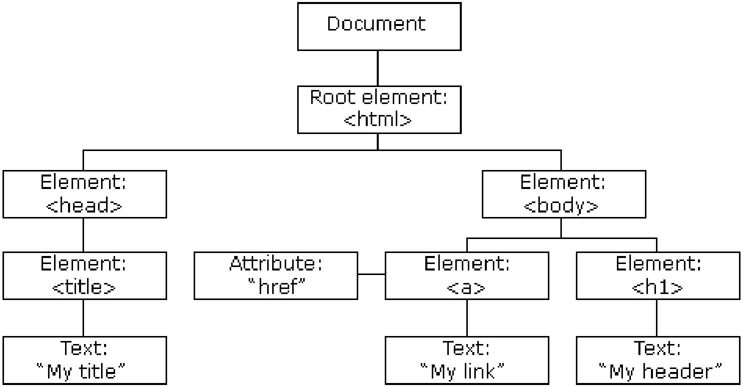
## Document object model

- Up to now, we've used connecting JS to our HTML and CSS and used it to prompt users, take inputs, provide alerts etc.
- Currently however, our JS cannot change our HTML or CSS
- Perhaps we wanted our webpage to react to a user input and change some of it's features accordingly
- To provide this reactive functionality we'll make use of the **Document object model** or DOM
- $\rightarrow$ allows us to use our JS code to <u>interact</u> with HTML and CSS

## Document object model

- When we upload our HTML to the browser, the browser console automatically creates a DOM
- DOM $\rightarrow$ a representation of our HTML code
- Importantly, this representation of our HTML allows us to grab things using JS
- Every box in HTML has a corresponding object in the DOM
- DOM $\rightarrow$ programming interface which converts HTML into a tree structure where each mode represents an object

# Document object model (DOM)



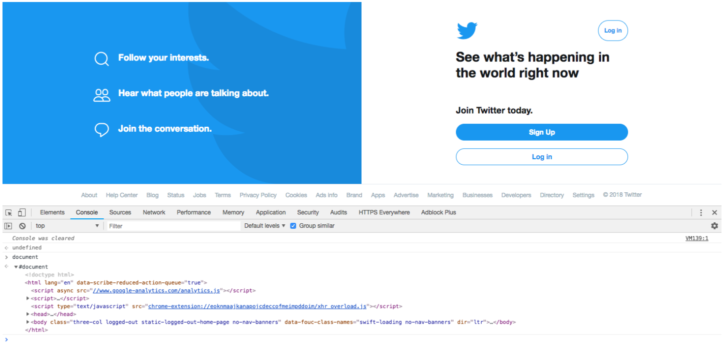
Source: w3schools

## Document object model (DOM)

- By reconstructing HTML tags as JS objects, the DOM allows us to use JS to manipulate HTML and CSS
- JS can now add/change/remove HTML elements, attributes and CSS as well as react to HTML events etc.
- Since we are back in the OOP paradigm, we are now able to work with attributes and objects like before
- The DOM is large; we'll only look at the most commonly used objects and rely on the documentation for everything else

## Document object model (DOM)

- DOM can accessed by going to any website console and typing `document`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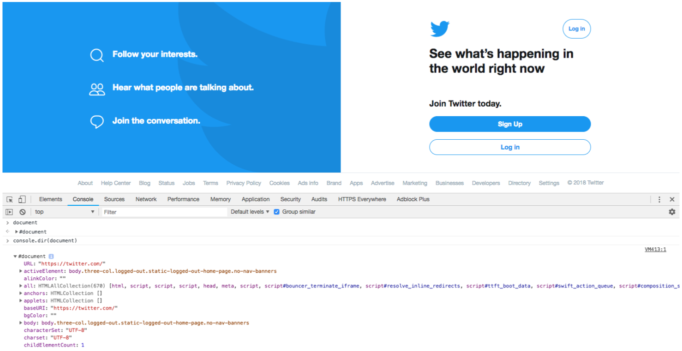
Elements Console Sources Network Performance Memory Application Security Audits HTTPS Everywhere Adblock Plus
top
Filter
Default levels
Group similar
VM139:1

```
Console was cleared
<· undefined
> document
<· ▾#document
      <!doctype html>
      <html lang="en" data-scribe-reduced-action-queue="true">
        <script async src="//www.google-analytics.com/analytics.js"></script>
       ▸<script>…</script>
        <script type="text/javascript" src="chrome-extension://eoknmaajkanapojcdeccofmeimpddoim/xhr_overload.js"></script>
       ▸<head>…</head>
       ▸<body class="three-col logged-out static-logged-out-home-page no-nav-banners" data-fouc-class-names="swift-loading no-nav-banners" dir="ltr">…</body>
      </html>
>
```

Twitter DOM in the browser console

## Document object model (DOM)

- Then, by typing `console.dir(document)`, we get the DOM as a JS object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Elements Console Sources Network Performance Memory Application Security Audits HTTPS Everywhere Adblock Plus
top
Filter
Default levels
Group similar

```
> document
<· ▸#document
> console.dir(document)
                                                                                                  VM413:1
  ▾#document
     URL: "https://twitter.com/"
    ▸activeElement: body.three-col.logged-out.static-logged-out-home-page.no-nav-banners
     alinkColor: ""
    ▸all: HTMLAllCollection(670) [html, script, script, script, head, meta, script, script#bouncer_terminate_iframe, script#resolve_inline_redirects, script#ttft_boot_data, script#swift_action_queue, script#composition_s
    ▸anchors: HTMLCollection []
    ▸applets: HTMLCollection []
     baseURI: "https://twitter.com/"
     bgColor: ""
    ▸body: body.three-col.logged-out.static-logged-out-home-page.no-nav-banners
     characterSet: "UTF-8"
     charset: "UTF-8"
     childElementCount: 1
```

Twitter DOM JS object in the browser console

## Document object model (DOM)

- Then, by typing `console.dir(document)`, we get the DOM as a JS object
- Now, we can access attributes like
  - `document.URL`
  - `document.body`
  - `document.links`
- and methods like
  - `document.getElementByID()`
  - `document.getElementByClassName()`
  - `document.querySelector()`

## Methods

- As was the case with HTML, CSS and Bootstrap, a range of functionality exists → documentation is your friend
- We'll look at two specific methods, which you'll likely use most frequently
- getElementByID → allows to select objects based on their HTML id
- querySelector → allows us to select objects based on their CSS style

## Events and event handling

- At this point we're able to use JS to interact with the DOM
- We do this by specifying how this happens <u>beforehand</u>
- As such we've enabled interactivity
- We however are still unable to trigger <u>reactivity</u>
- $\rightarrow$ trigger certain actions, when certain events happen
- These events could be clicks, double clicks, hovers etc.

## Events and event handling

- We are able to implement these event based actions using one of JS's main methods, an **event listener**
- $\rightarrow$ method belonging to the DOM which checks if a specific event has occurred
- Using an event listener, we can now execute certain actions conditional on an event occurring

```
myvariable.addEventListener(event, func)
```

- These events could be clicks, double clicks, hover, drags etc.
- In the event of a click for example

```
head.addEventListener("click", changeColour)
```

## JS, the DOM and event listeners

Let’s look at some examples

## Jquery

## jQuery

- Like other programming languages, JS has a range of libraries
- Up to now we've used base JS, but a range of libraries exist which provide useful functionality
- We'll focus on one, **jQuery**
- $\rightarrow$ a range of methods and objects that simplify interaction with the DOM
- To get jQuery
- $\rightarrow$ link a CDN (just like bootstrap)
- $\rightarrow$ download .js file from the jQuery website

## jQuery vs base JS

- Major advantage of jQuery is it’s use of $ which gives us a convenient implementation of the querySelector method
- Base JS - return all `h1` elements

```
var headers = document.querySelectorAll('h1');
```

- Using jQuery - return all `h1` elements

```
var headers = $('h1');
```

## jQuery events

Let's look at some examples