Exclusive for

HKU BUSINESS SCHOOL
港大經管學院

JavaScript Programming

(2023/2024)

Introduction Level

by

Sunny NG

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In this workshop (3 hours)

- Web Triangular
  - HTML
  - CSS
  - JavaScript
- Basic Syntax
  - HTML
  - CSS
  - JavaScript
- Browser Dev Tools
- Online Coding Playground
- Modern Code Editors
- What is JSON?
- Processing JSON Data
- Simple JS Data Visualization with JSON

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- Developer Web, Mobile, WeChat & IoT
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- Alibaba Cloud Professional
- AWS Academy Educator
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github.com/ngsanluk

Web Development Triangular

- HTML
- CSS
- JavaScript (JS)

A web page is a combination of codes in HTML, CSS & JavaScript files that rendered nicely by a browser

Popular browsers include Google Chrome, Firefox, Safari

HTML

- HyperText Markup Language
- The standard markup language for structuring and delivering web contents
- HTML5 is the latest version
- HTML5 is designed mobile friendly
- File name usually ends with **.html** extension (e.g. index.html)

Some frequent used HTML tags

Semantic Tags

Structuring web contents

<main>

<section>

<article>

<header>

<footer>

<aside>

<nav>

<figure>

Other tags

basic formatting function

<h1>, <h2>, <h3>, <h4>, <h5>, <h6>

, <ol>,

<a>

, <b>, , <i>

<video>, <audio> and <canvas>

,

HTML5 sample codes

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Demo</title>
  </head>
  <body>
    <nav>Navigation Menu</nav>
    <section>Main content ...</section>
    <aside>side column</aside>
    <footer>footer navigation menu</footer>
  </body>
</html>
```

CSS

- A style sheet language used for styling the presentation of a web document written in a HTML
- The latest version is **CSS3**
- CSS3 offers rich visual effect including animation and transition
- File name usually ends with **.css** extension (e.g. master.css)

CSS sample codes

```
nav {
  background: #CCCCCC;
}
```

Tag selector

```
#main-content {
  padding: 2em;
}
```

ID selector. Starts with #

```
.product-photo {
  width: 100%;
}
```

Class selector. Starts with .

```
nav ul li a {
  padding: 1em;
}
```

Nested selector.

JavaScript (JS)

- Alongside HTML and CSS, JavaScript is one of the three core technologies of the web content production
- JavaScript handles user interaction and dynamic content loading from server side
- Started as a front-end tool, JavaScript recently is also popular for back-end development (Node.js)
- File name usually ends with **.js** extension (e.g. app.js)

JavaScript sample codes

```
function sum(a, b) {
    return a + b;
}

sum(10, 20);
sum(100, 200);
```

ECMAScript

- ECMAScript (or ES) is a trademarked scripting-language specification standardized by Ecma International (European Computer Manufacturers Association)
- Browser vendors follow ECMAScript's specification to implement JavaScript features for their browsers
- Current browsers vendor widely support **ES5** edition
- Coming version is ES6 (also widely referred as ES2015)
- ES7 is also under early development (also referred as ES2016)

ECMAScript Editions

Year	Name	Description
1997	ECMAScript 1	First Edition.
1998	ECMAScript 2	Editorial changes only.
1999	ECMAScript 3	Added Regular Expressions. Added try/catch.
	ECMAScript 4	Was never released.
2009	ECMAScript 5	Added "strict mode". Added JSON support.
2011	ECMAScript 5.1	Editorial changes.
2015	ECMAScript 6	Added classes and modules.
2016	ECMAScript 7	Added exponential operator (**). Added Array.prototype.includes.

ECMAScript browser support

- ECMAScript 3 is fully supported by all browsers
- ECMAScript 5 is fully supported in all modern browsers
  - When we say modern browsers, we mean the browsers that offer good support to HTML5, CSS3 and ES5
- ECMAScript 6 (ES6) is partially supported in most modern browsers
- ECMAScript 7 is poorly supported in all browsers

ES6 is widely used

- Many web developments support ES6 as development language since ES6 solve many major problems of previous version and therefore benefits development process in great deal.
- Coded in ES6 will however be converted to ES5 by development for better compatibility at run time
- The process of converting is known as transpiling

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TypeScript (TS)

- TypeScript is a free and open-source programming language developed and maintained by Microsoft
- It is a strict superset of JavaScript, and adds optional static typing and class-based object-oriented programming to the language

```
class Person {
    private name: string;
    private age: number;
    private salary: number;

    constructor(name: string, age: number, salary: number) {
        this.name = name;
        this.age = age;
        this.salary = salary;
    }

    toString(): string {
        return `${this.name} (${this.age}) (${this.salary})`;
    }
}
```

Remember we said?

A web page is a combination of coding in HTML, CSS & JavaScript files that rendered nicely by a browser.

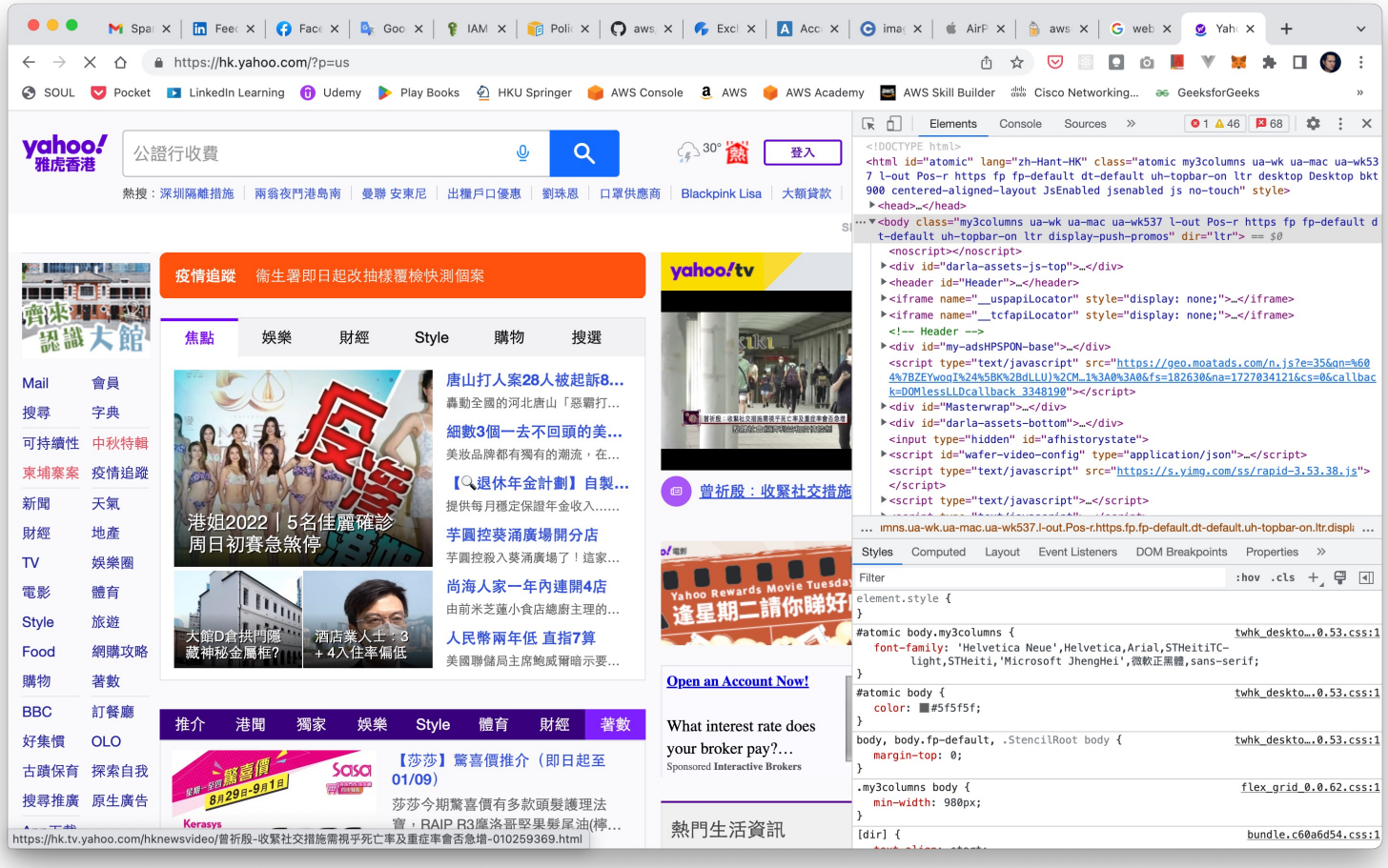
HTTP Request & Response

Response from server is usually a combination of HTML, CSS, JS and images

Let’s do some hacking on HTML, CSS & JavaScript

(Just for fun. Absolutely legal.)

Open yahoo.com in Google Chrome & Use Dev Tools



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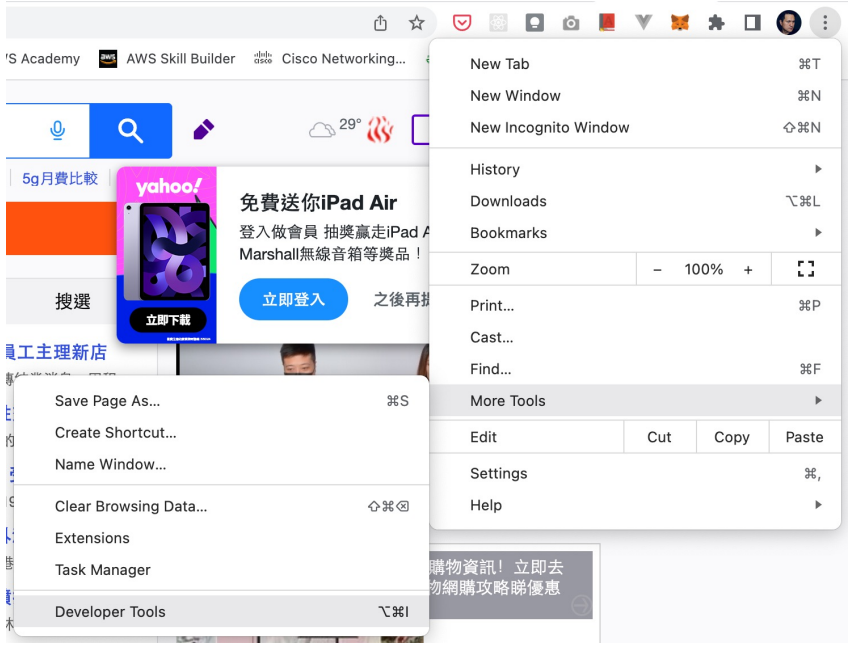
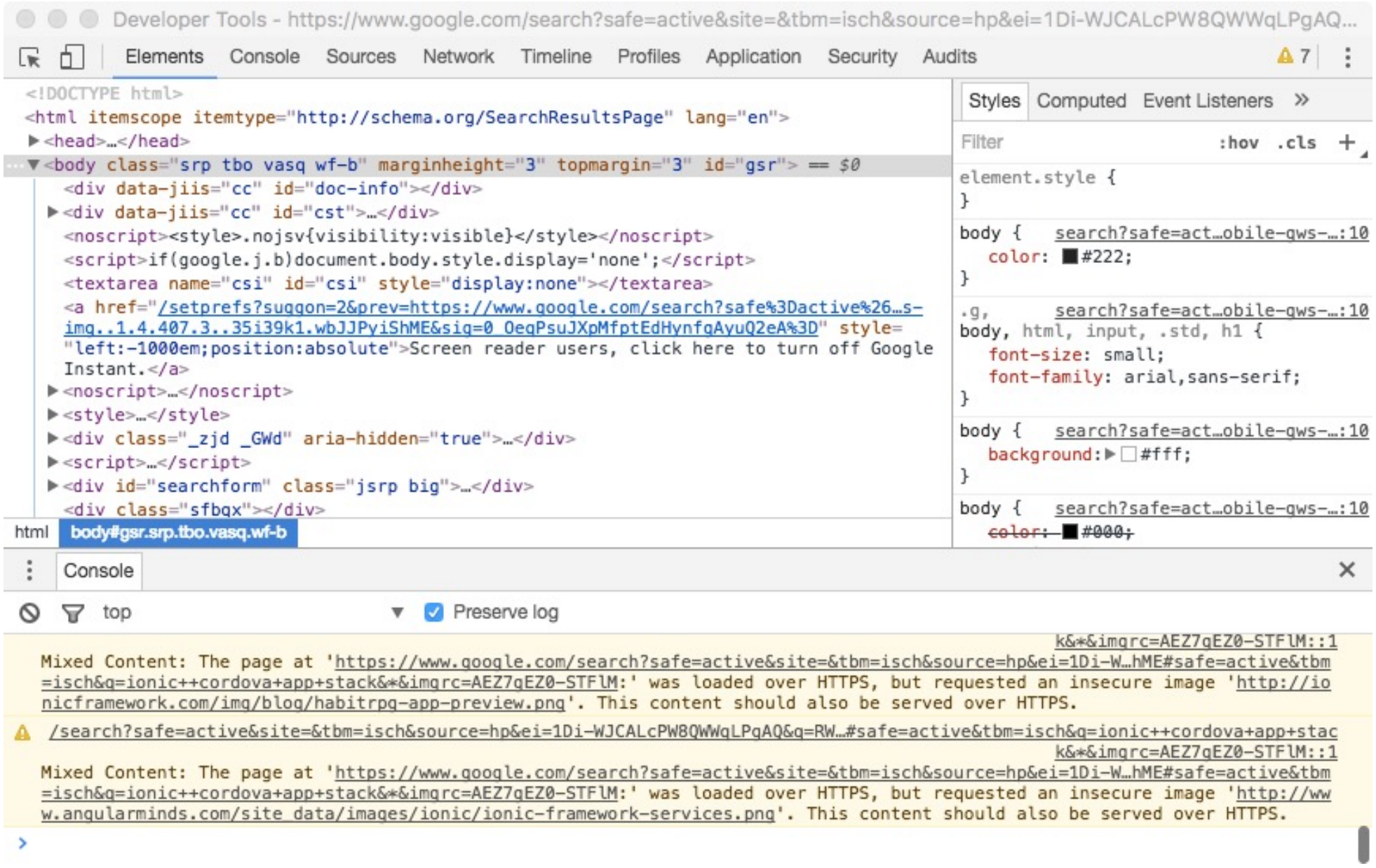
To Open Chrome Dev Tools

- At Google Chrome menu, go to
  View -> Developer -> Developer Tool



- Or use keyboard shortcut
  - Mac: CMD + SHIFT + C
  - Windows: CTRL + SHIFT + C

- Or click at the ⋮ button, chose More Tools -> Developer Tools

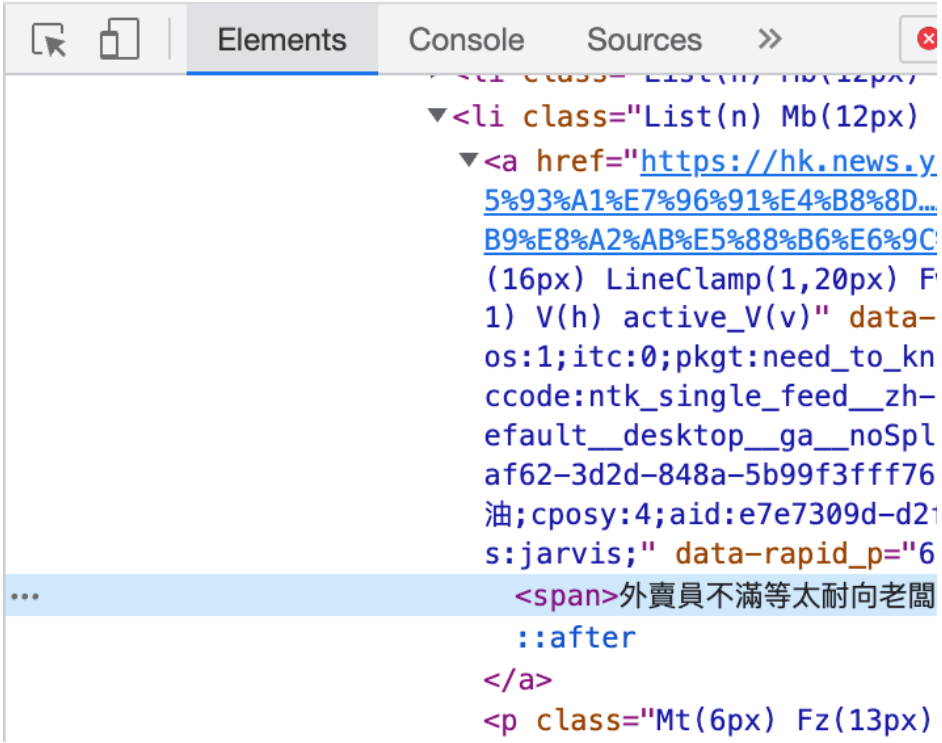

Developer Tools - https://www.google.com/search?safe=active&site=&tbm=isch&source=hp&ei=1Di-WJCALcPW8QWWqLPgAQ...
Elements Console Sources Network Timeline Profiles Application Security Audits
<!DOCTYPE html>
<html itemscope itemtype="http://schema.org/SearchResultsPage" lang="en">
<head>…</head>
<body class="srp tbo vasq wf-b" marginheight="3" topmargin="3" id="gsr"> == $0

…
<noscript><style>.nojsv{visibility:visible}</style></noscript>
<script>if(google.j.b)document.body.style.display='none';</script>
<textarea name="csi" id="csi" style="display:none"></textarea>
Screen reader users, click here to turn off Google Instant.
<noscript>…</noscript>
<style>…</style>
…
<script>…</script>
…

html body#gsr.srp.tbo.vasq.wf-b
Styles Computed Event Listeners
Filter :hov .cls
element.style {
}
body { search?safe=act…obile-gws-…:10
color: #222;
}
.g, search?safe=act…obile-gws-…:10
body, html, input, .std, h1 {
font-size: small;
font-family: arial,sans-serif;
}
body { search?safe=act…obile-gws-…:10
background: #fff;
}
body { search?safe=act…obile-gws-…:10
color: #000;
Console
top
Preserve log
Mixed Content: The page at 'https://www.google.com/search?safe=active&site=&tbm=isch&source=hp&ei=1Di-W…hME#safe=active&tbm=isch&q=ionic++cordova+app+stack&*&imgrc=AEZ7gEZ0-STFlM:' was loaded over HTTPS, but requested an insecure image 'http://ionicframework.com/img/blog/habitrpg-app-preview.png'. This content should also be served over HTTPS.
/search?safe=active&site=&tbm=isch&source=hp&ei=1Di-WJCALcPW8QWWqLPgAQ&q=RW…#safe=active&tbm=isch&q=ionic++cordova+app+stack&*&imgrc=AEZ7gEZ0-STFlM::1
Mixed Content: The page at 'https://www.google.com/search?safe=active&site=&tbm=isch&source=hp&ei=1Di-W…hME#safe=active&tbm=isch&q=ionic++cordova+app+stack&*&imgrc=AEZ7gEZ0-STFlM:' was loaded over HTTPS, but requested an insecure image 'http://www.angularminds.com/site_data/images/ionic/ionic-framework-services.png'. This content should also be served over HTTPS.

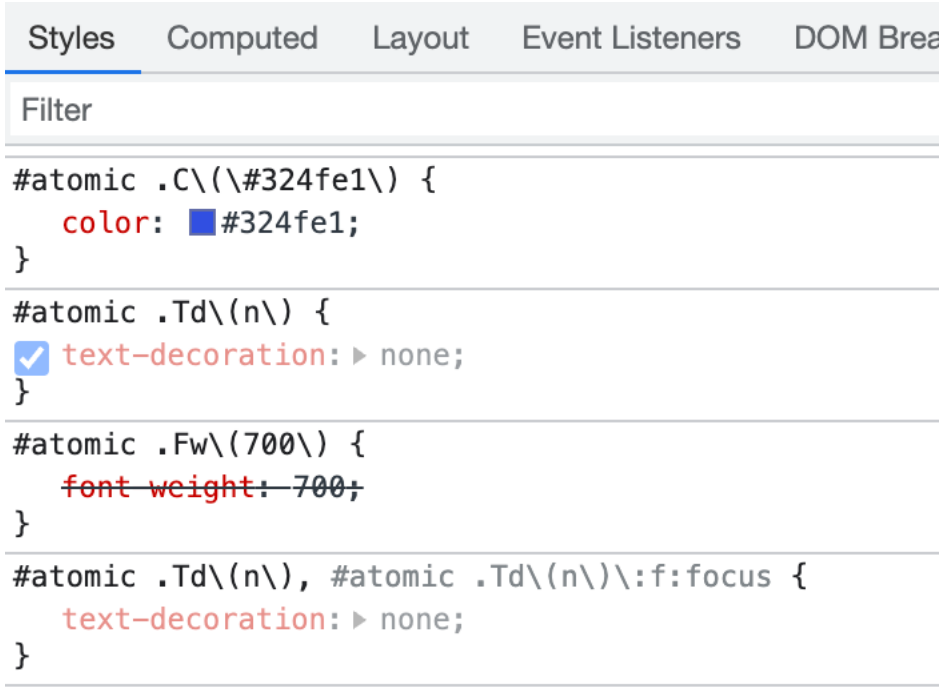
Hack #1: Modify HTML contents

- Choose **Elements** tab
- Double-click any DOM object and make some changes
  - DOM: **D**ocument **O**bject **M**odel
- You will see result on the browser



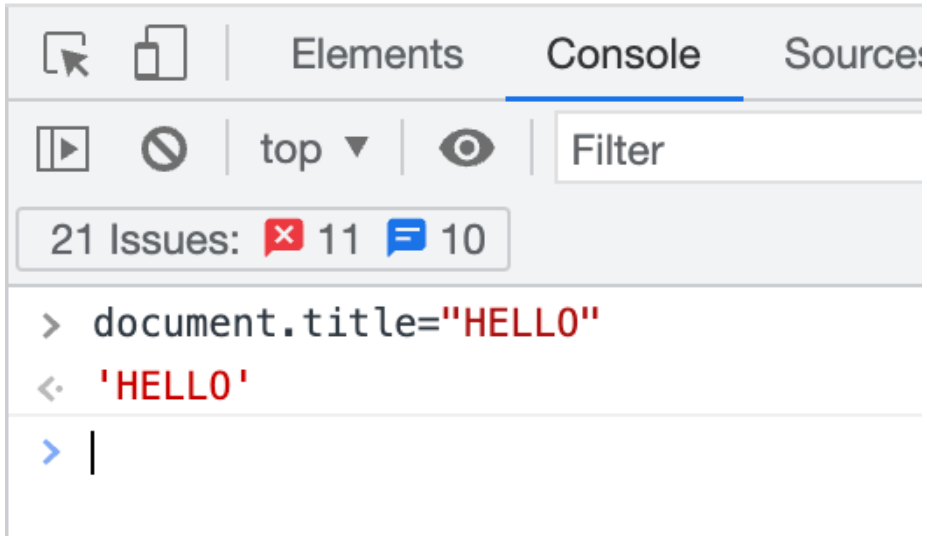
Hack #2: Modify CSS styles

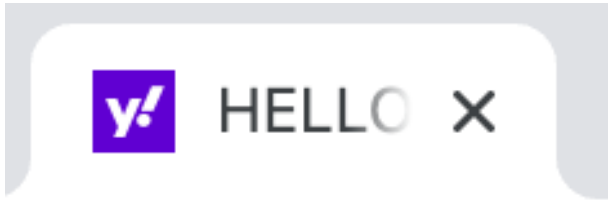
- Right-click at any **news title** on web page content and choose **Inspect**
- Choose **Styles** tab
- In the **Styles** tab, scroll all the way till you see `color` property
- Change the color to `green`



Hack #3: Code some JavaScript

- Choose **Console** tab
- Type the following statement
  - `document.title="HELLO"`
- You will see the title of the browser tab change to “Hello”





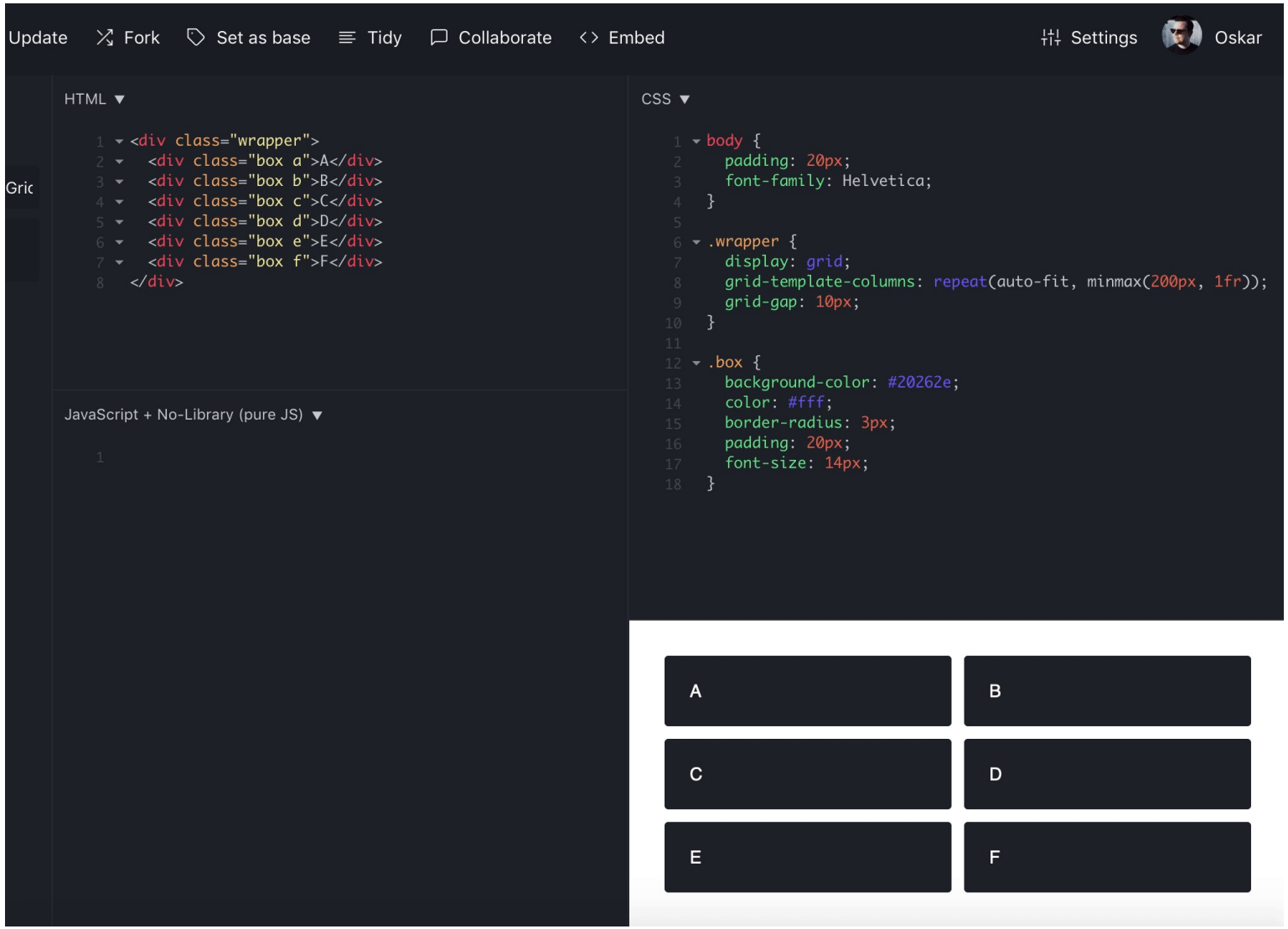
Online Coding Playground

for HTML / CSS / JavaScript quick testing

JSFiddle

jsfiddle.net

Let’s have some fun by building a mini web apps



Lucky Draw Mini Game

HTML

```
<h1>Lucky Draw</h1>
<hr>
<div id="lucky-number">?</div>
<hr>
<button onclick="play()">PLAY</button>
```

CSS

```
#lucky-number {
  font-size: 1200%;
  color: #CC0000;
}

body {
  text-align: center;
}
```

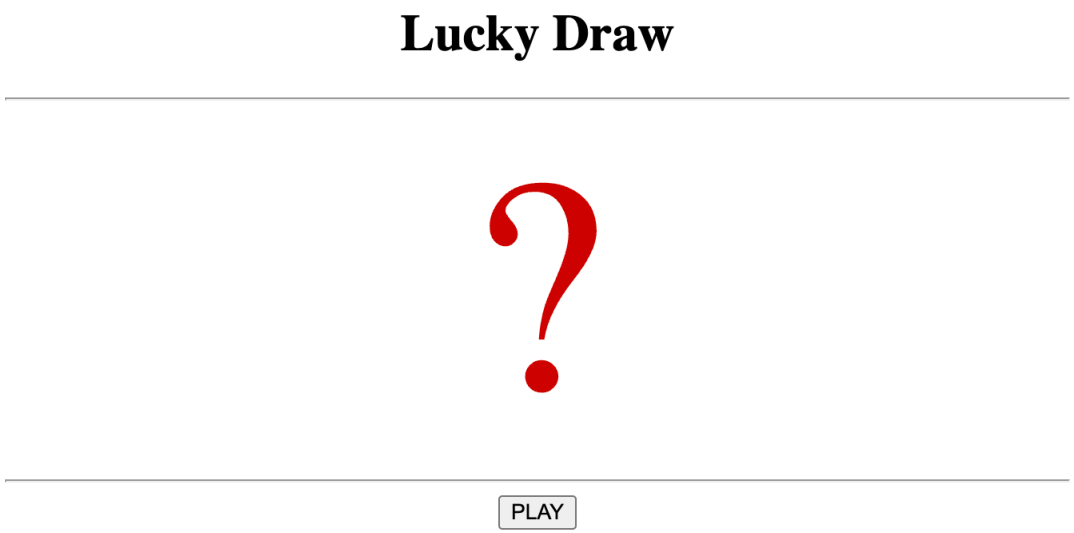
JavaScript + No-Library (pure JS)

```
function play() {
  luckyNumber = document.getElementById("lucky-number");
  luckyNumber.innerHTML = Math.floor(Math.random() * 11 + 10);

}
```

Completed Codes

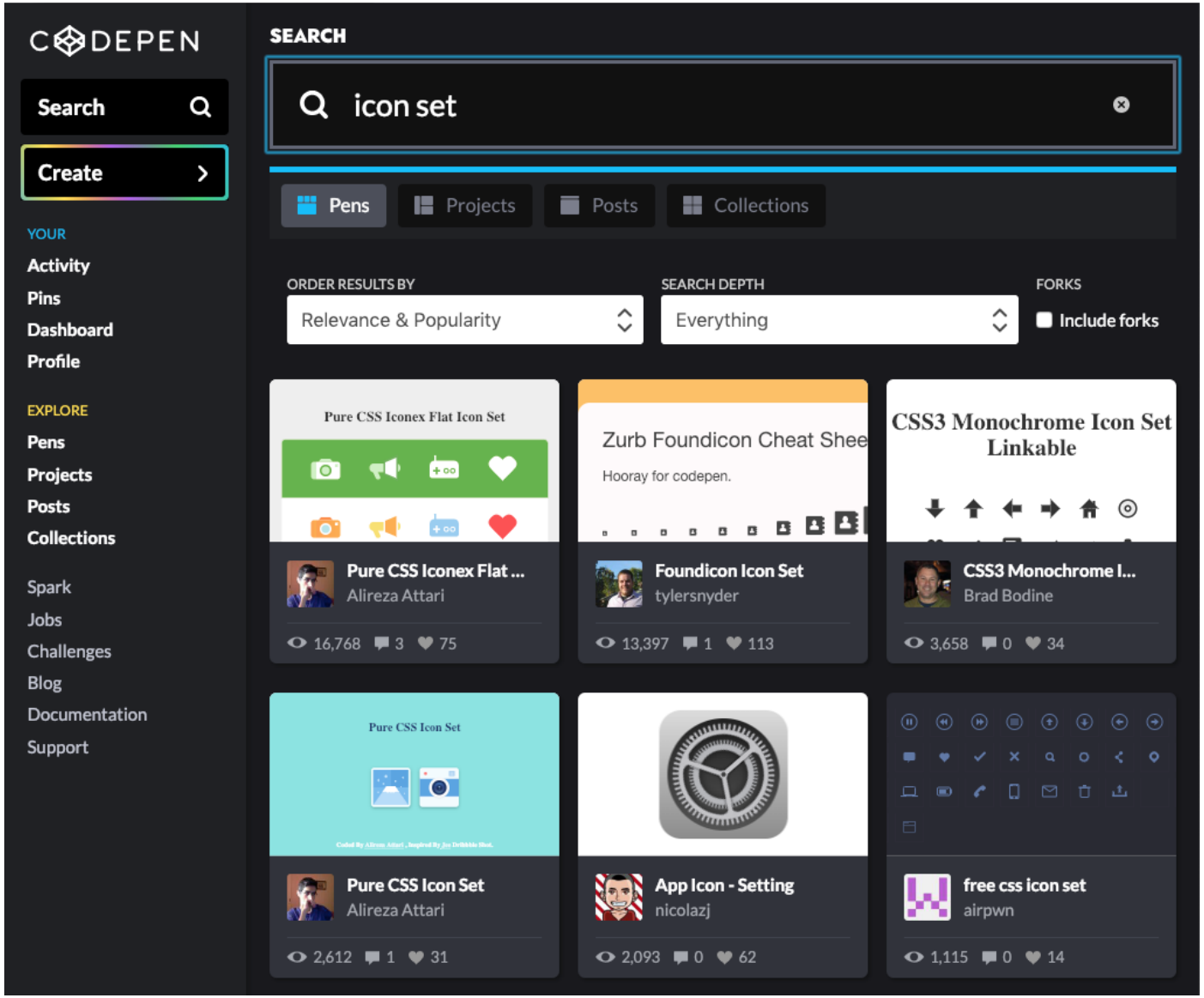
- https://jsfiddle.net/sunnyng/trsa271m/25/



Other Popular Online Coding Playground

CodePen

codepen.io



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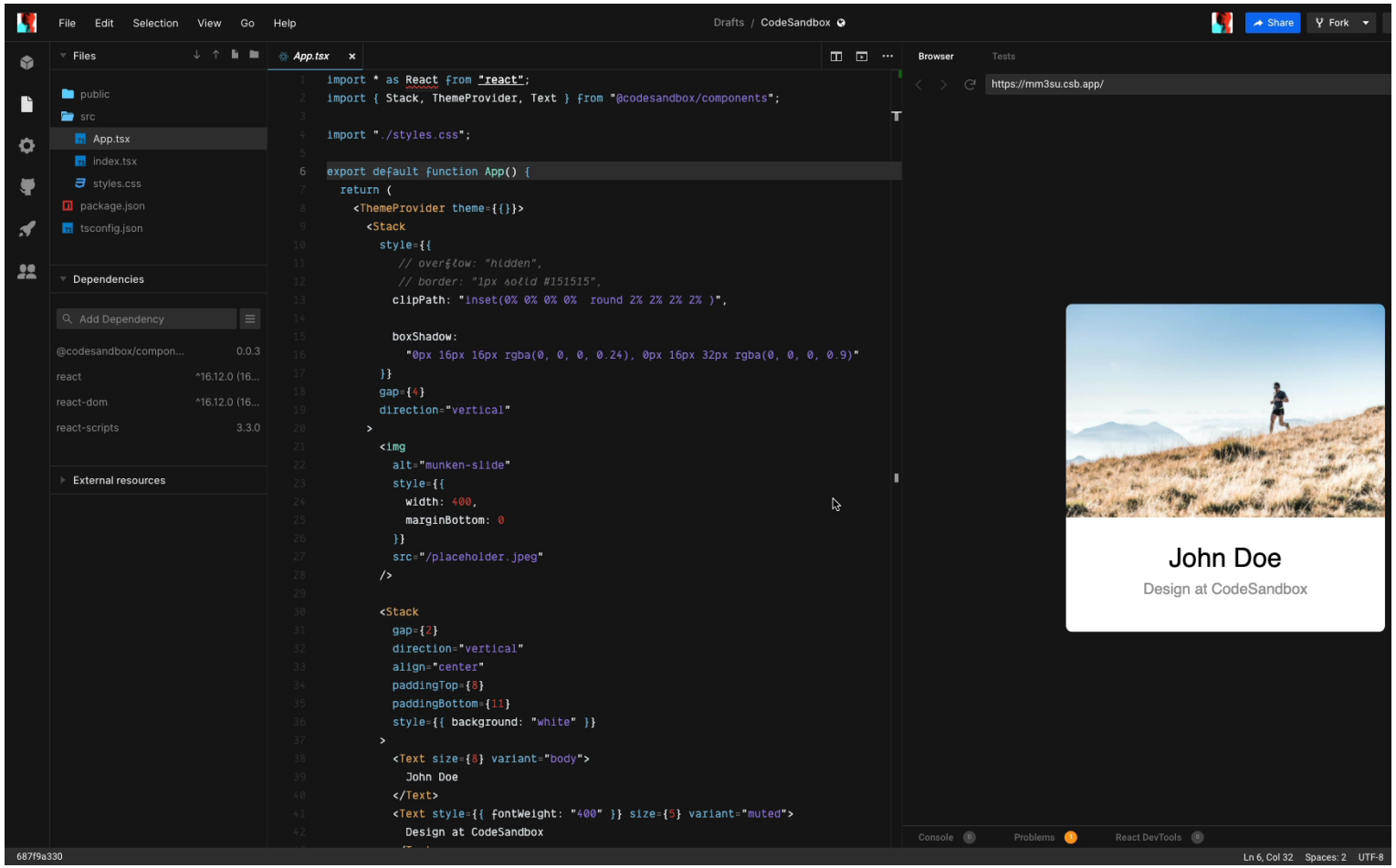
CodeSandbox

codesandbox.io



Web Dev Tools

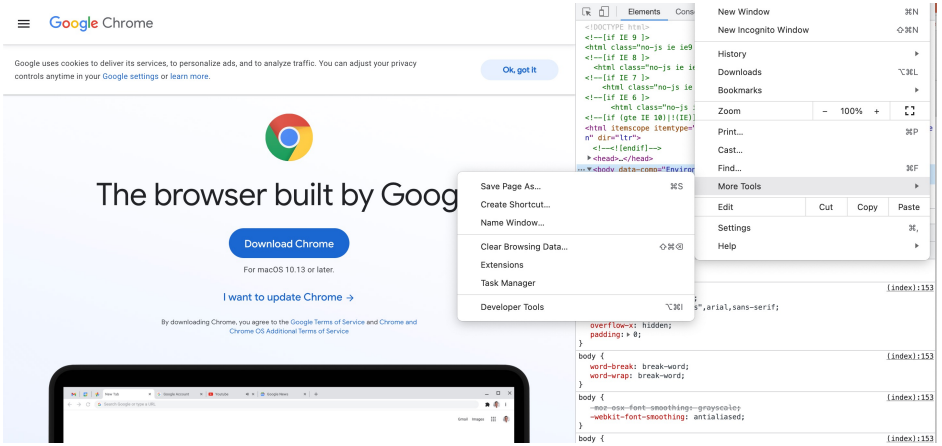
Web Dev Tools

- Modern Web Browsers
  - Chrome, Firefox, Safari, Edge
- Modern Code Editors
  - VS Code, Atom
- Node.js

<image/nation>

Google Chrome Browser

- Rich Web Development Features
- Download link
  - https://www.google.com/intl/en_hk/chrome/



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Modern code editors

A modern code editor should provide the following features

- Opens **project folder** instead of individual file
- Supports many programming languages
- Provides codes completion
- Code colored / highlighted
  - for better readability and more visible errors prompts
- Rich keyboard shortcuts to speed up coding in great deal
- Multiple lines editing
- Rich extension / add-ons / packages to extend code editor’s capability

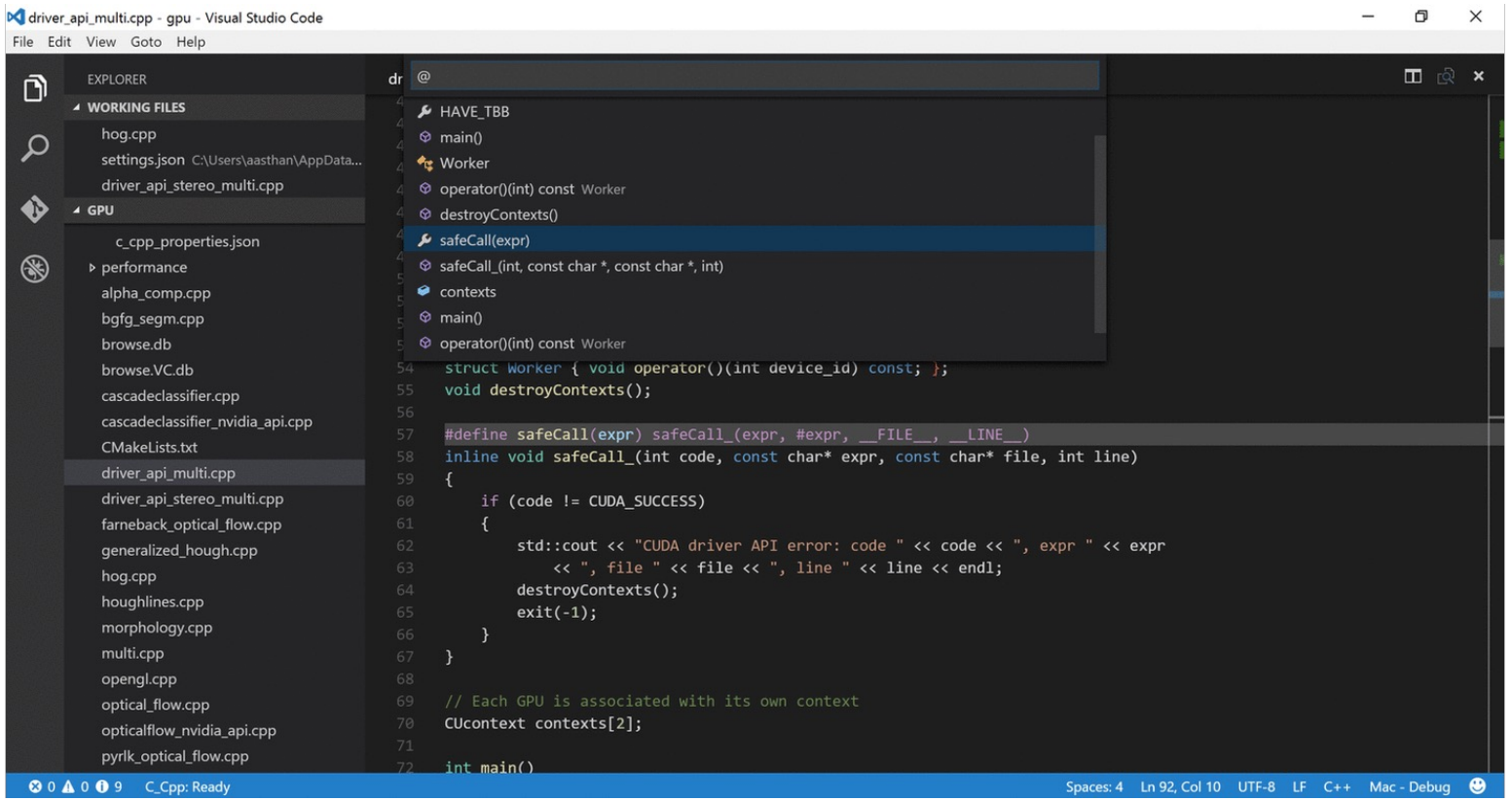
Popular code editors

- Visual Studio Code (a free code editor from Microsoft)
- Atom (a free code editor from Github)
- Sublime (commercial)
- WebStorm (commercial)

<image/nation>

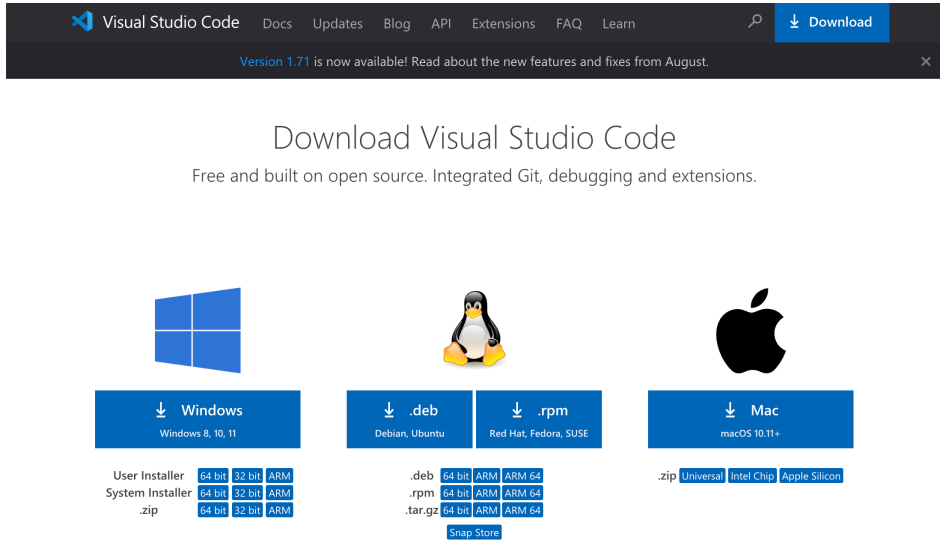
Visual Studio Code

https://code.visualstudio.com/



Visual Studio Code Download

- Visual Studio Code is one of the most popular modern code editor
- We will use VS Code for HTML, CSS and JS coding
- Download link
  - https://code.visualstudio.com/download



Atom

- Download at
  - http://www.atom.io/
- Download the right version for your operation system
- Follow the installer suggested setting and complete the installation

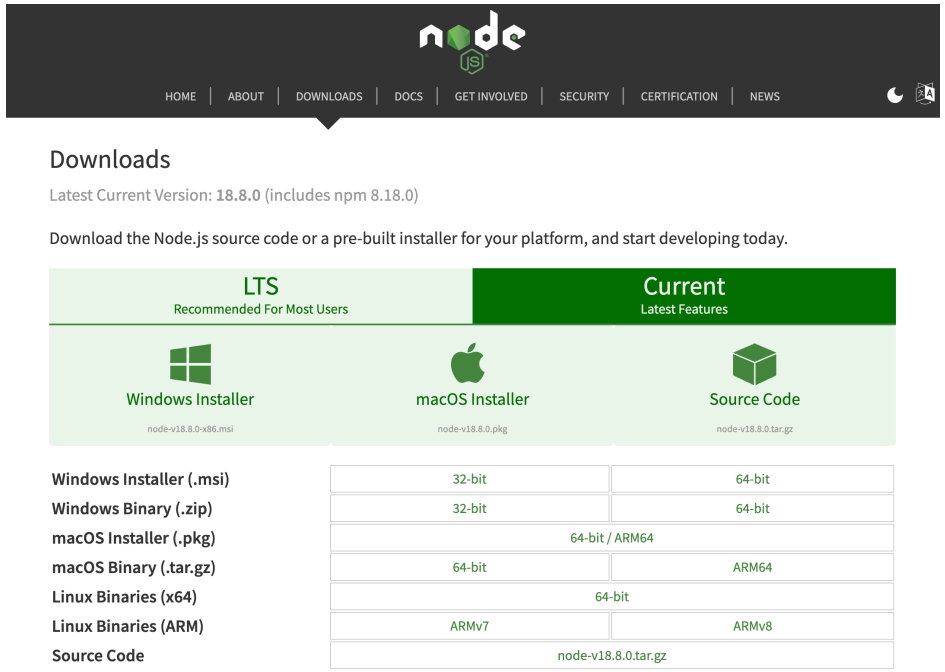
<image/nation>

Node.js

- https://nodejs.org/
- Node.js is an open-source, cross-platform JavaScript runtime environment for developing a diverse variety of server tools and applications
- A lot time, Node.js is running **behind the scene** when working on web development

Node.js Download

- Download link
  - https://nodejs.org/en/download/



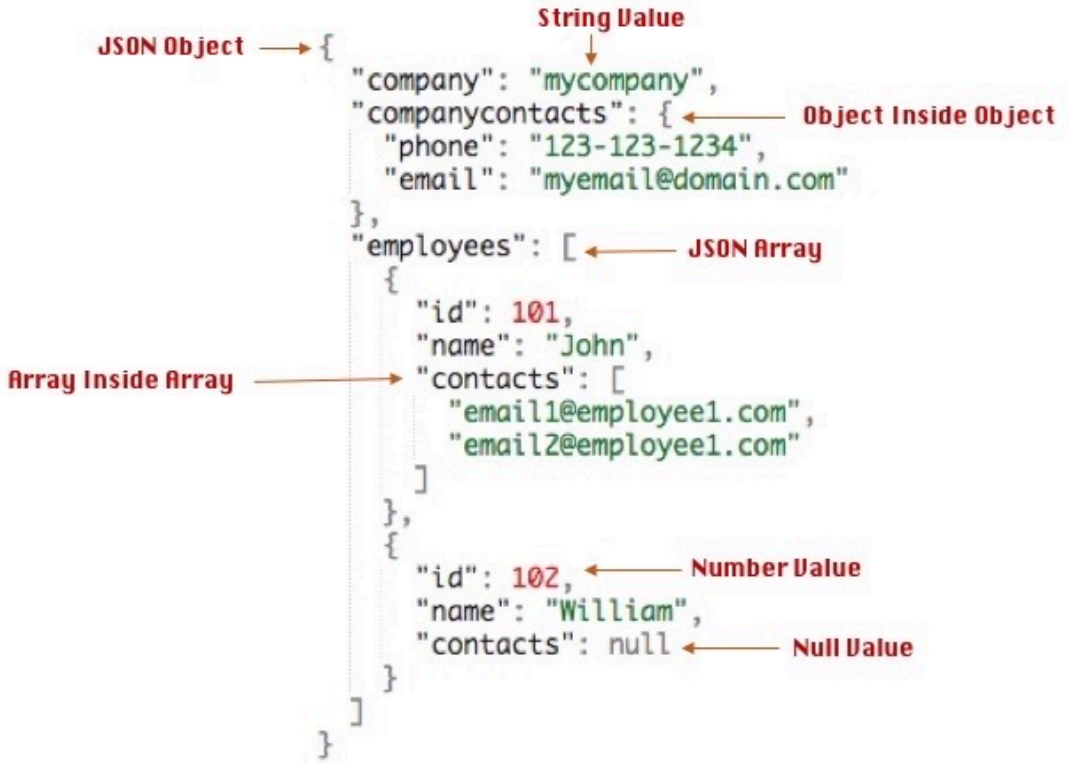
JSON

JavaScript Object Notation

<image/nation>

JSON

- JSON (JavaScript Object Notation) is an open standard file format and **data interchange format** that are user friendly
- JSON is just some plain text that follow certain format
- Programming language-independent
- It was derived from JavaScript, but many modern programming languages include code to generate and parse JSON-format data.
- JSON filenames use the extension **.json**



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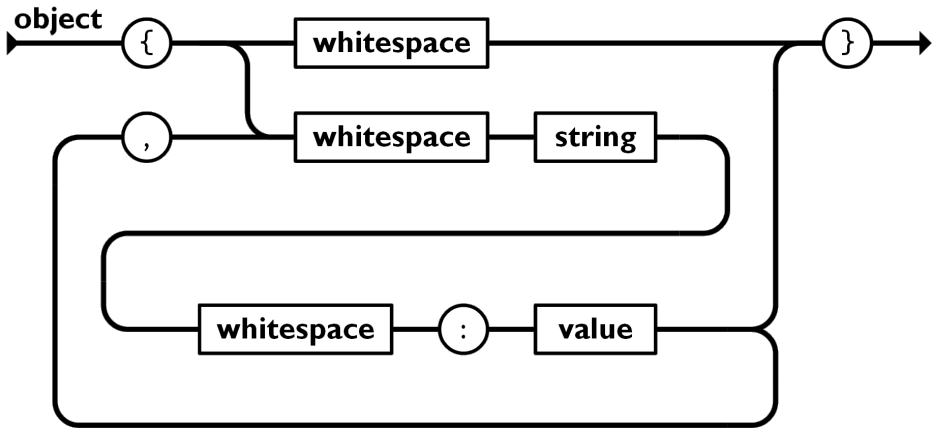
JSON Syntax

https://www.json.org/json-en.html

- { }
  - Object
- [ ]
  - Array of objects
- JSON is nested, one can have
  - An object that contains array
  - An array that contains objects



JavaScript Object ≠ JSON

JavaScript object

```
{firstname : "Sam",
 lastname : "Fernandes"}
```

Key

(Need not be enclosed within double quotes)

Value

JSON object

```
{"firstname" : "Sam",
 "lastname" : "Fernandes"}
```

Key

(Must be enclosed within double quotes)

Value

https://jsonlint.com/

a good place to practicing JSON

<image/nation>

A place to practice JSON

https://jsonlint.com/

```
{
    "id": 1001,
    "name": "Jack"
}
```

Validate JSON | Clear | Support JSONLint for $2/Month

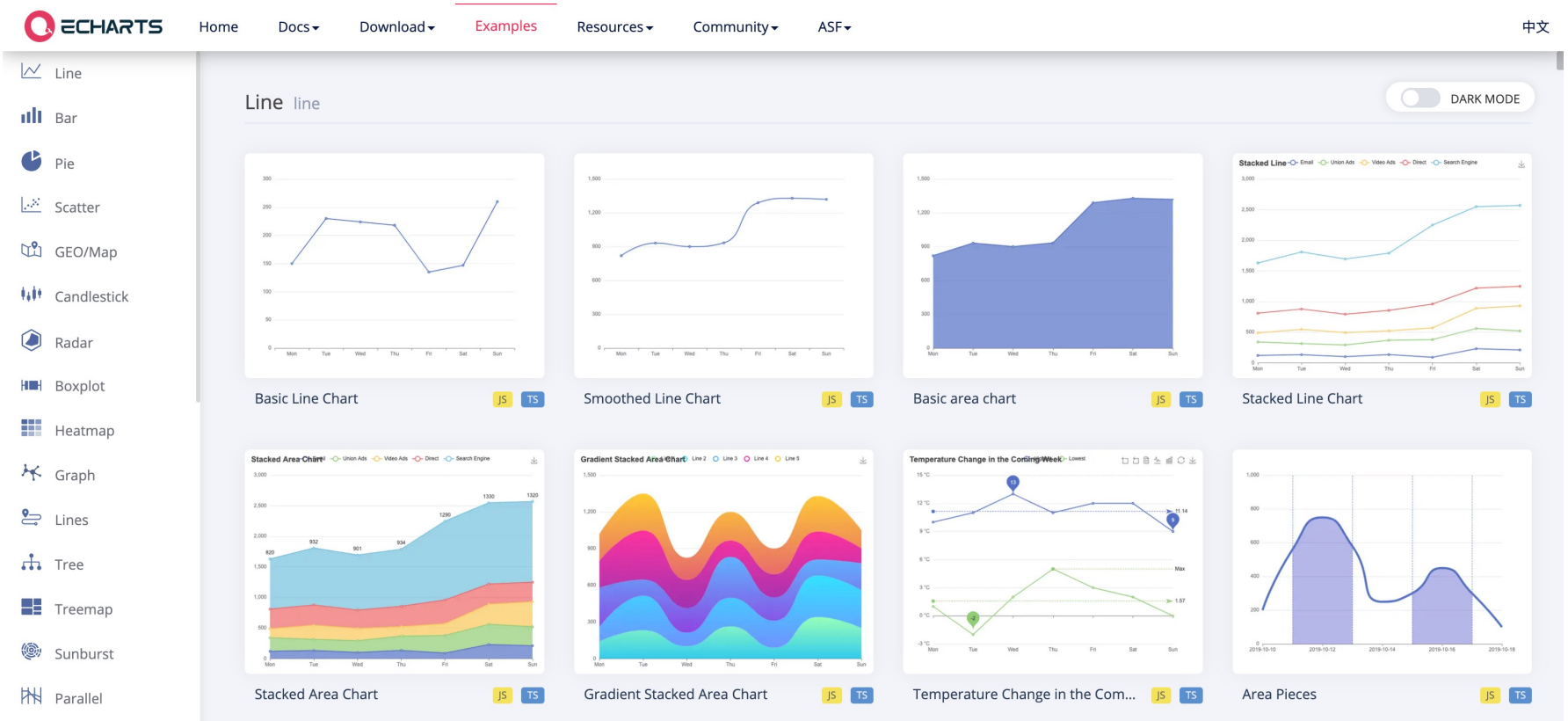
APACHE ECHARTS

Experience JS Data Visualization with JSON

<image/nation>

ECHARTS Examples

https://echarts.apache.org/examples/en/



ECHARTS Getting Started

https://echarts.apache.org/handbook/en/get-started/

Including ECharts

Create a new `index.html` file in the directory where you just saved `echarts.js`, with the following content:

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
    <!-- Include the ECharts file you just downloaded -->
    <script src="echarts.js"></script>
  </head>
</html>
```

Build an ECHARTS from Scratch

Follow the instructions on the page below

https://echarts.apache.org/handbook/en/get-started/

What's Next?

JS Intermediate Level

Coming Soon …

JS Intermediate Level (3 hours)

- JavaScript Syntax
  - Variables
  - Operators
  - Arithmetic
  - Data Types
  - Functions
  - Objects
  - Array
- Fetch API
- JSON Processing
- JS Data Visualization
  - Apache eCharts
  - Google Charts
  - D3.js
  - Observable HQ