

<image/nation>

Tech Training Series

Exclusive for



# JavaScript Programming

(2023/2024)

## Introduction Level

*by*

Sunny NG

<image/nation>

# 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

# Sunny Ng



- Founder / Master Trainer Image Nation
- Developer Web, Mobile, WeChat & IoT
- Content Creator Video producing / Live streaming
- AWS Solution Architect – Associate
- Alibaba Cloud Professional
- AWS Academy Educator
- Email: [sunny.ng@imagenation.com.hk](mailto:sunny.ng@imagenation.com.hk)
- 🐙 [github.com/ngsanluk](https://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



# 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>`  
`<ul>`, `<ol>`, `<li>`  
`<a>`  
`<strong>`, `<b>`, `<em>`, `<i>`  
`<video>`, `<audio>` and  
`<canvas>`  
`<div>`, `<span>`

# 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



# 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.

JS



# 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**

# 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.

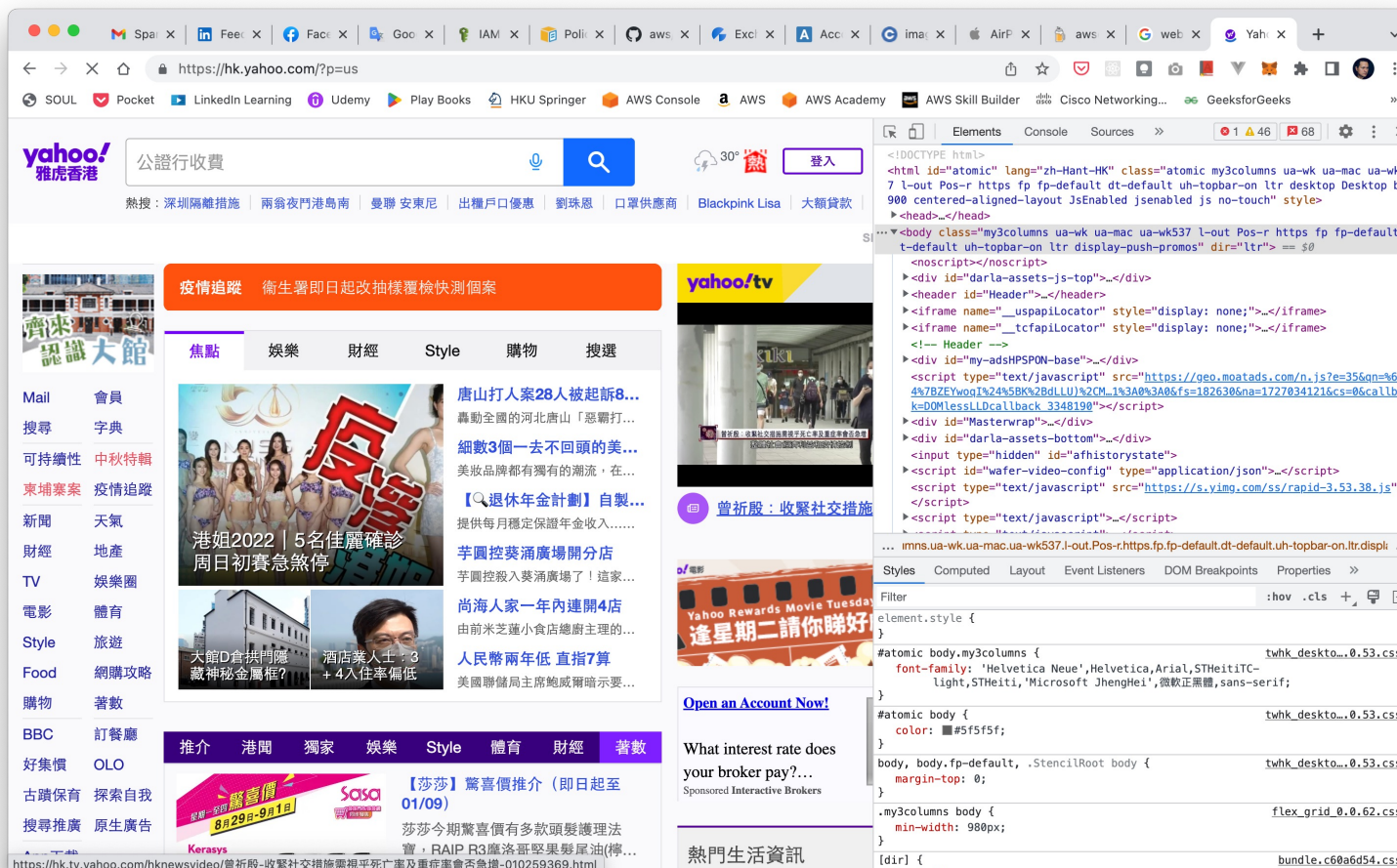
# HTTP Request & Response



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

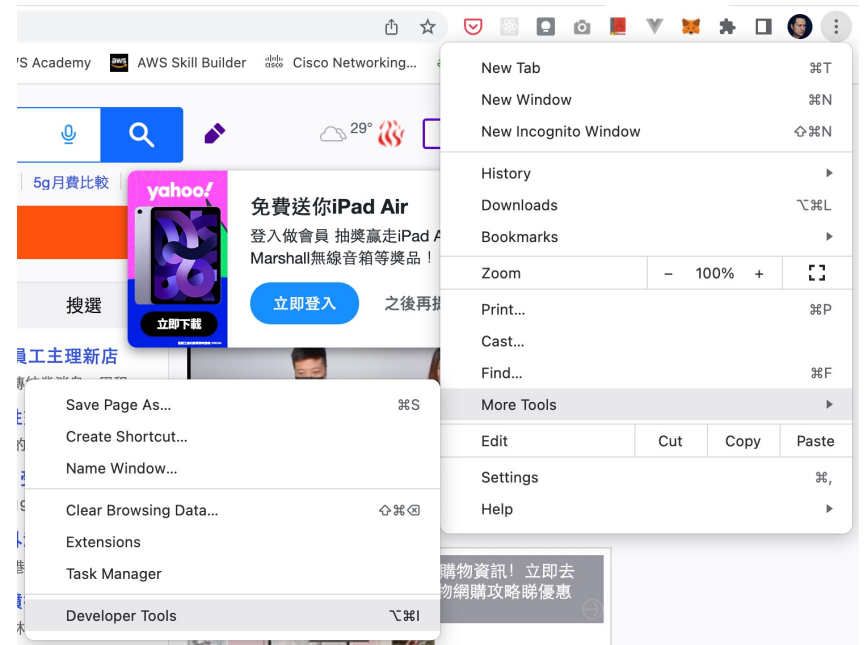


# To Open Chrome Dev Tools

- 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**



```

<!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
    <div data-jjis="cc" id="doc-info"></div>
    <div data-jjis="cc" id="cst">...</div>
    <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>
    <a href="/setprefs?suggon=2&prev=https://www.google.com/search?safe%3Dactive%26...s-
img..1.4.407.3..35i39k1.wbJJPyiShME&sig=0_OeqPsuJXpMfptEdHynfqAyuQ2eA%3D" style=
"left:-1000em;position:absolute">Screen reader users, click here to turn off Google
Instant.</a>
    <noscript>...</noscript>
    <style>...</style>
    <div class="_zjd_GWd" aria-hidden="true">...</div>
    <script>...</script>
    <div id="searchform" class="jsrp big">...</div>
    <div class="sfbqx"></div>
  
```

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;
}
  
```

html body#gsr.srp.tbo.vasq.wf-b

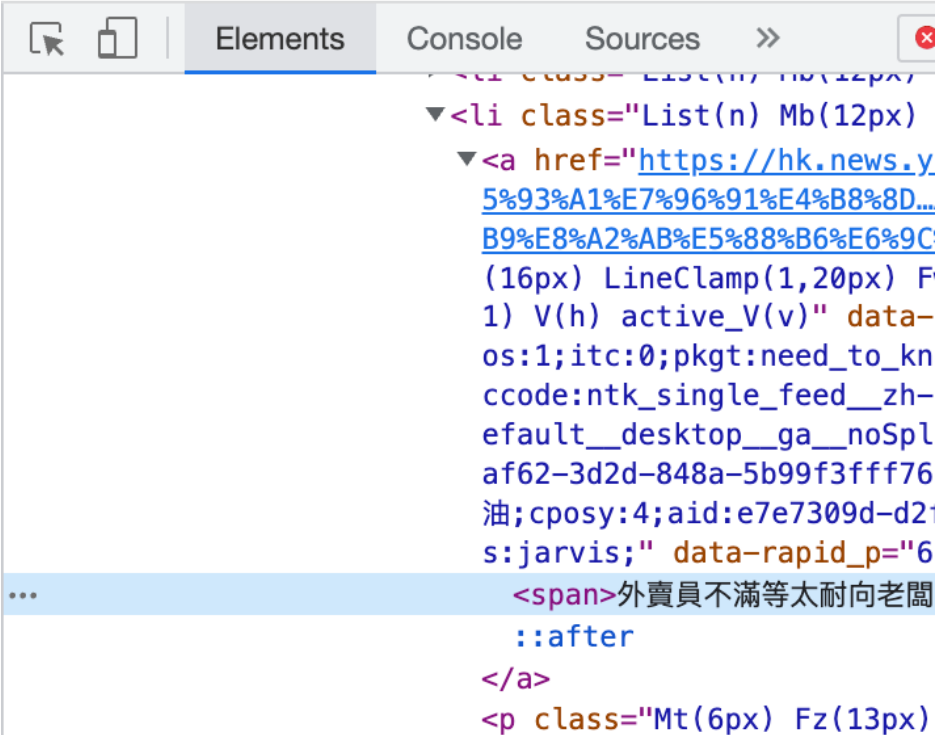
Console top Preserve log

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=AEZ7qEZ0-STFLM:~:1' was loaded over HTTPS, but requested an insecure image 'http://ionicframework.com/img/blog/habitrgq-app-preview.png'. This content should also be served over HTTPS.

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=AEZ7qEZ0-STFLM:~:1' 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

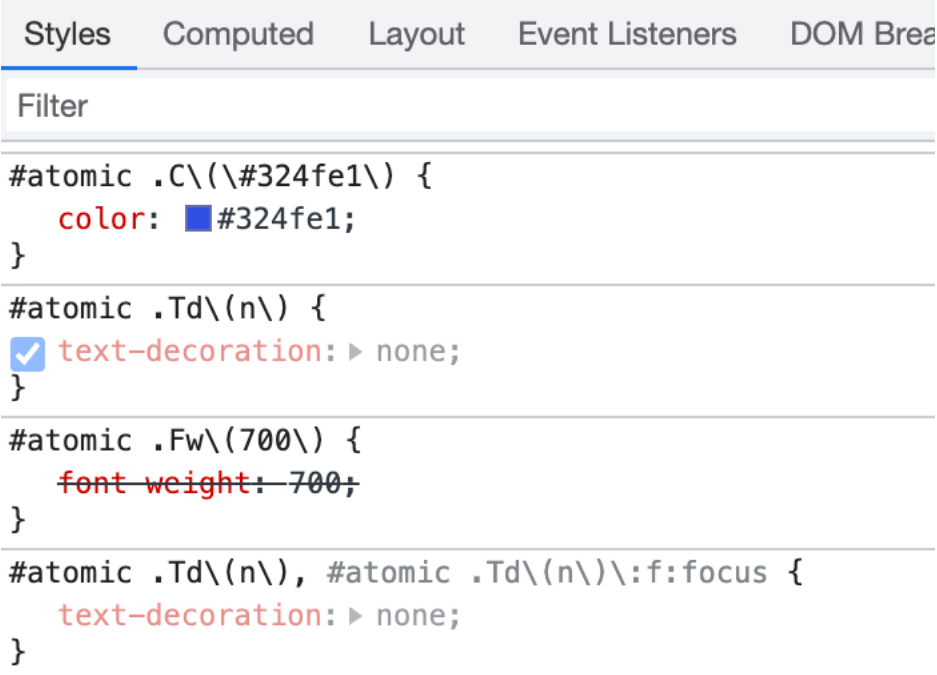
- Choose **Elements** tab
- Double-click any DOM object and make some changes
  - DOM: **D**ocument **O**bject **M**odel
- You will see result on the browser



```
Elements Console Sources >>
<li class="List(n) Mb(12px)
  <a href="https://hk.news.y
  5%93%A1%E7%96%91%E4%B8%8D...
  B9%E8%A2%AB%E5%88%B6%E6%9C
  (16px) LineClamp(1,20px) F
  1) V(h) active_V(v)" data-
  os:1;itc:0;pkg:need_to_kn
  ccode:ntk_single_feed_zh-
  efault_desktop_ga_noSpl
  af62-3d2d-848a-5b99f3fff76
  油;cposy:4;aid:e7e7309d-d2i
  s:jarvis;" data-rapid_p="6
  ...
  <span>外賣員不滿等太耐向老闆
  ::after
  </a>
  <p class="Mt(6px) Fz(13px)
```

# 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`



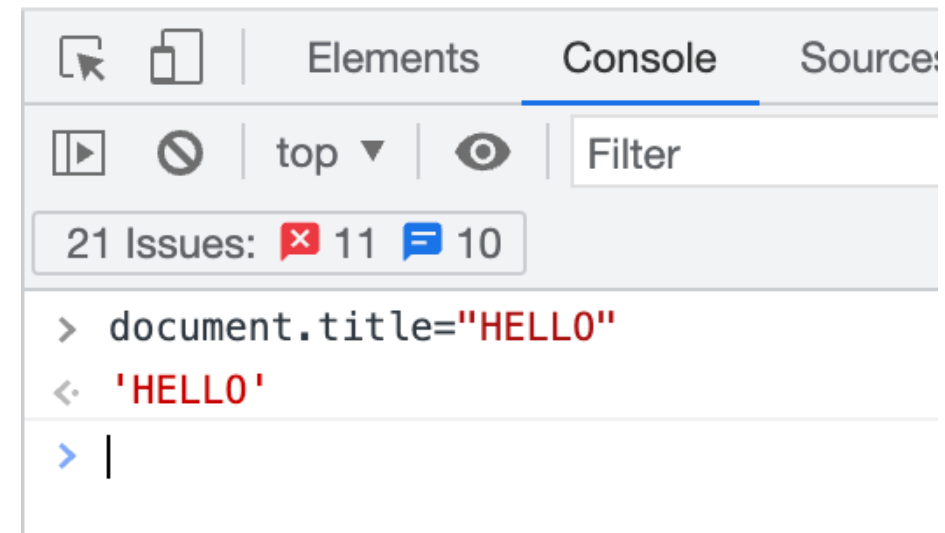
The screenshot shows the browser's developer tools with the 'Styles' tab selected. The 'Filter' input is empty. The following CSS rules are visible:

```
#atomic .C\(\#324fe1\) {  
  color: #324fe1;  
}  
  
#atomic .Td\(\n\) {  
   text-decoration: none;  
}  
  
#atomic .Fw\(\(700\) {  
  font-weight: 700;  
}  
  
#atomic .Td\(\n\), #atomic .Td\(\n\)\:f:focus {  
  text-decoration: none;  
}
```



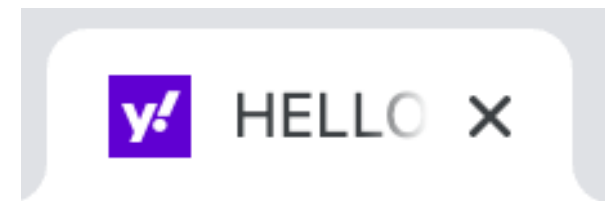
# Hack #3: Code some JavaScript

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



The screenshot shows a browser's developer console with the 'Console' tab selected. The console displays the following code and output:

```
> document.title="HELLO"  
< 'HELLO'
```



# Online Coding Playground

for HTML / CSS / JavaScript quick testing

# JSFiddle

[jsfiddle.net](https://jsfiddle.net)

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

The screenshot shows a JSFiddle editor interface. At the top, there are navigation options: Update, Fork, Set as base, Tidy, Collaborate, and Embed. On the right, there are settings and a user profile for 'Oskar'.

The HTML editor contains the following code:

```
1 <div class="wrapper">
2   <div class="box a">A</div>
3   <div class="box b">B</div>
4   <div class="box c">C</div>
5   <div class="box d">D</div>
6   <div class="box e">E</div>
7   <div class="box f">F</div>
8 </div>
```

The CSS editor contains the following code:

```
1 body {
2   padding: 20px;
3   font-family: Helvetica;
4 }
5
6 .wrapper {
7   display: grid;
8   grid-template-columns: repeat(auto-fit, minmax(200px, 1fr));
9   grid-gap: 10px;
10 }
11
12 .box {
13   background-color: #20262e;
14   color: #fff;
15   border-radius: 3px;
16   padding: 20px;
17   font-size: 14px;
18 }
```

The JavaScript editor is currently empty, showing only a line number '1'.

The preview area at the bottom right shows a 2x3 grid of dark gray boxes with white text labels: A, B, C, D, E, and F.

# Lucky Draw Mini Game

```
HTML ▼
```

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

```
CSS ▼
```

```
1 #lucky-number {
2   font-size: 1200%;
3   color: #CC0000;
4 }
5
6 body {
7   text-align: center;
8 }
```

```
JavaScript + No-Library (pure JS) ▼
```

```
1 function play() {
2   luckyNumber = document.getElementById("lucky-number");
3   luckyNumber.innerHTML = Math.floor(Math.random() * 11 + 10);
4
5 }
```

**Lucky Draw**

---

?

---

PLAY

# Completed Codes

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

**Lucky Draw**

---



PLAY

# Other Popular Online Coding Playground

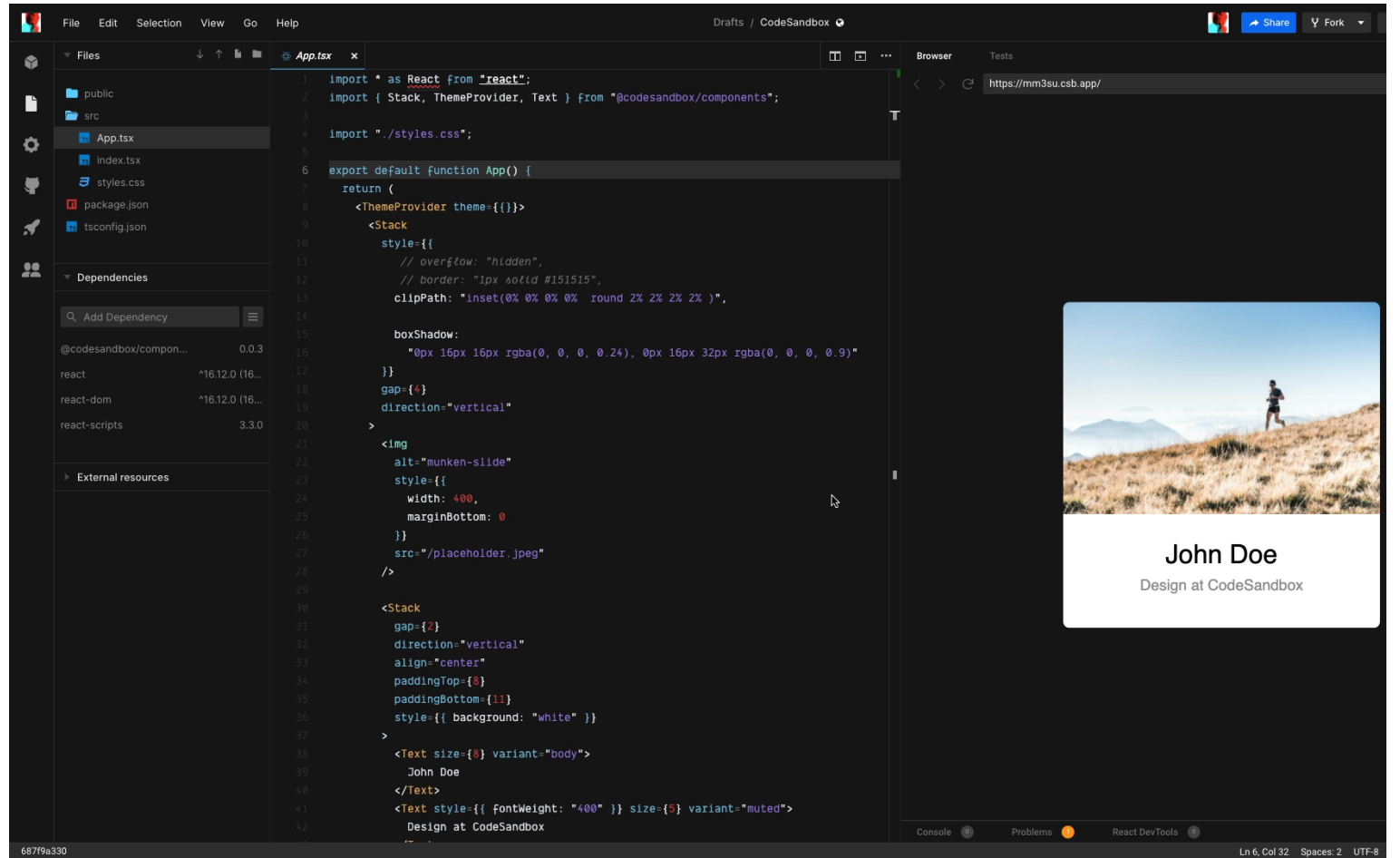
# CodePen

codepen.io

The screenshot shows the CodePen website interface. On the left is a dark sidebar with navigation links: Search, Create, YOUR (Activity, Pins, Dashboard, Profile), EXPLORE (Pens, Projects, Posts, Collections), Spark, Jobs, Challenges, Blog, Documentation, and Support. The main content area has a search bar containing 'icon set'. Below the search bar are filters for 'Pens', 'Projects', 'Posts', and 'Collections'. Further down are dropdowns for 'ORDER RESULTS BY' (set to 'Relevance & Popularity') and 'SEARCH DEPTH' (set to 'Everything'), along with a checkbox for 'Include forks'. The search results are displayed in a grid of six cards. Each card shows a preview of the icon set, the author's name and profile picture, and statistics for views, comments, and likes. The cards are: 1. 'Pure CSS Iconex Flat Icon Set' by Alireza Attari (16,768 views, 3 comments, 75 likes). 2. 'Zurb Foundicon Cheat Sheet' by tylersnyder (13,397 views, 1 comment, 113 likes). 3. 'CSS3 Monochrome Icon Set Linkable' by Brad Bodine (3,658 views, 0 comments, 34 likes). 4. 'Pure CSS Icon Set' by Alireza Attari (2,612 views, 1 comment, 31 likes). 5. 'App Icon - Setting' by nicolazj (2,093 views, 0 comments, 62 likes). 6. 'free css icon set' by airpwn (1,115 views, 0 comments, 14 likes).

# CodeSandbox

codesandbox.io





# Web Dev Tools

# Web Dev Tools

## ■ Modern Web Browsers

- Chrome, Firefox, Safari, Edge

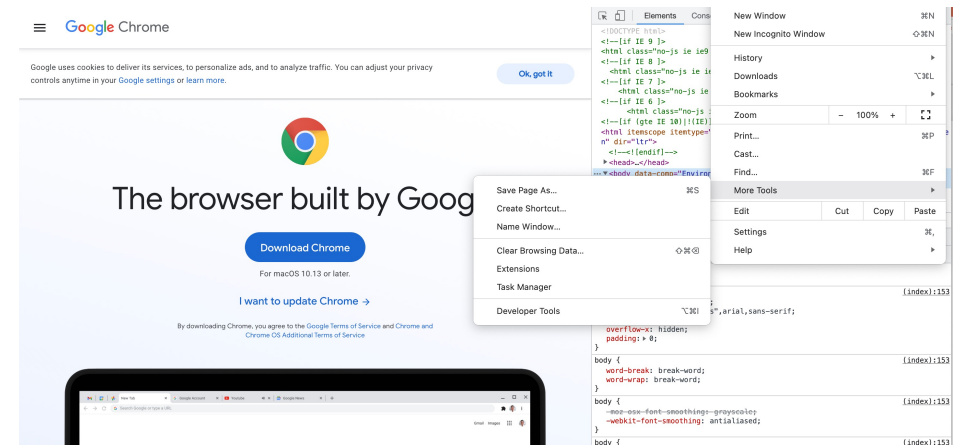
## ■ Modern Code Editors

- VS Code, Atom

## ■ Node.js

# Google Chrome Browser

- Rich Web Development Features
- Download link
- [https://www.google.com/intl/en\\_hk/chrome/](https://www.google.com/intl/en_hk/chrome/)



# Modern code editors

**A modern code editor should provide the following features**

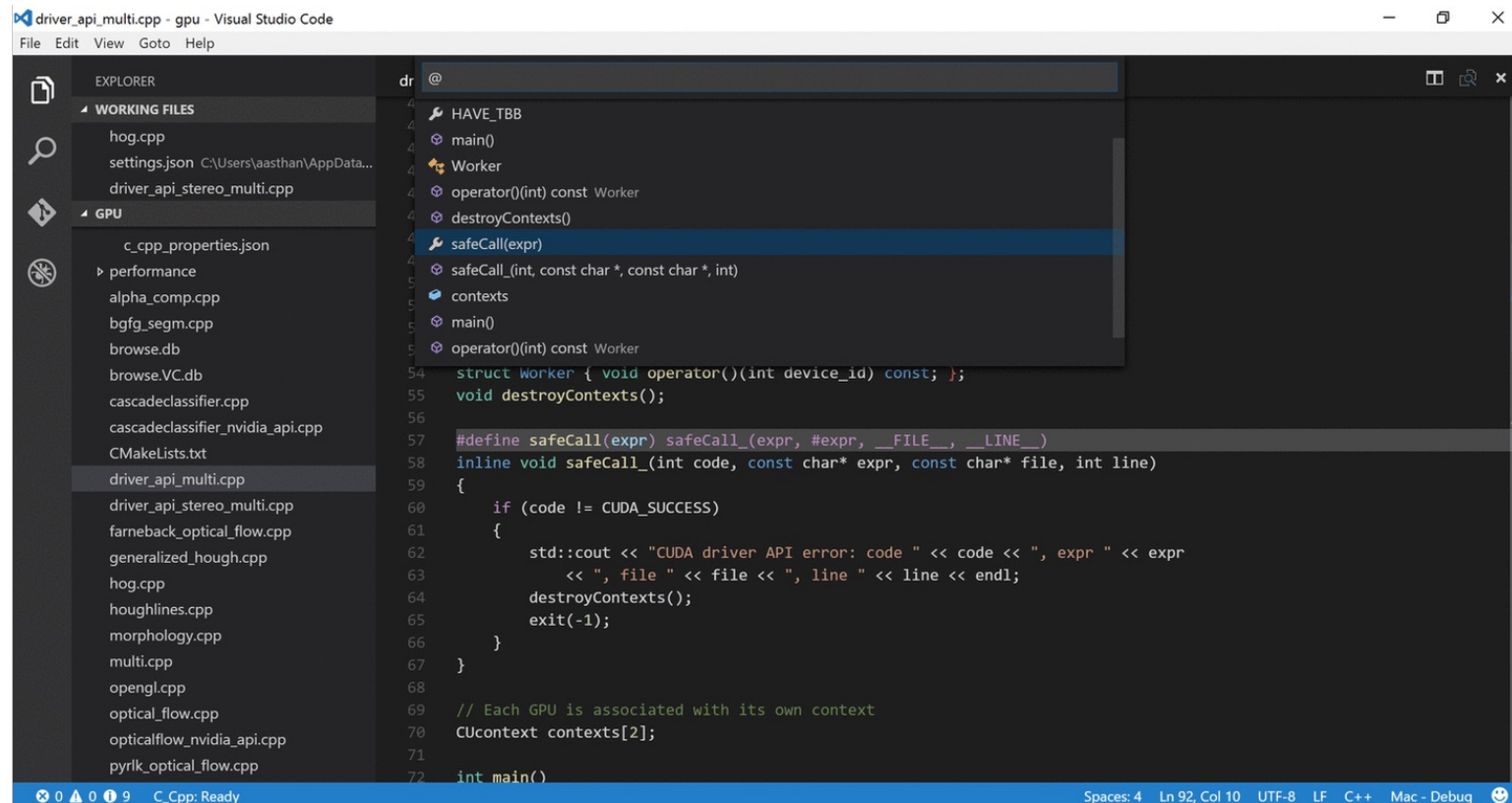
- Opens **project folder** instead of individual file
- Supports many programming languages
- Provides codes completion
- Code colored / highlighted
  - for better readability and more visible errors prompts
- Rich keyboard shortcuts to speed up coding in great deal
- Multiple lines editing
- Rich extension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

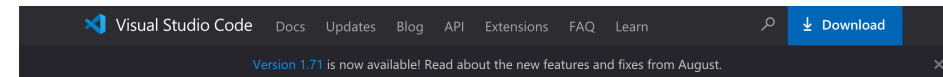
# Visual Studio Code

<https://code.visualstudio.com/>

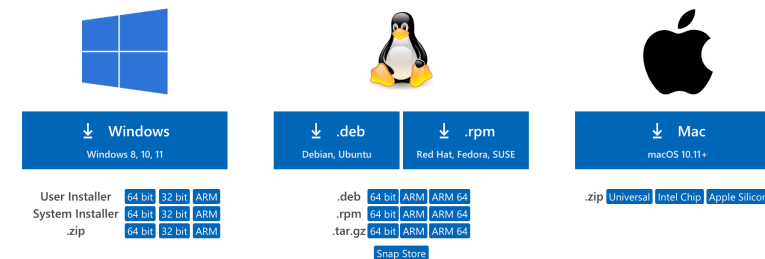


# Visual Studio Code Download

- 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>



Download Visual Studio Code  
Free and built on open source. Integrated Git, debugging and extensions.



# Atom ATOM

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



# 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/>




**node**

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## Downloads

Latest Current Version: 18.8.0 (includes npm 8.18.0)

Download the Node.js source code or a pre-built installer for your platform, and start developing today.

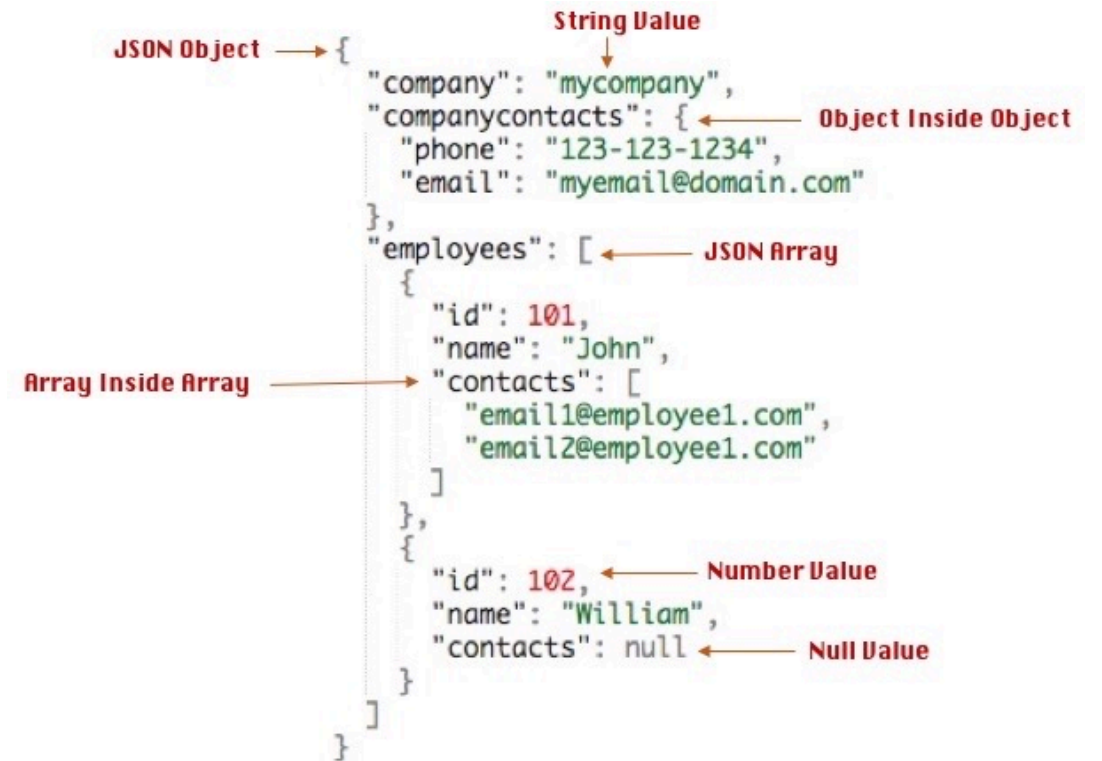
LTS Recommended For Most Users	Current Latest Features	
 Windows Installer node-v18.8.0-x86.msi	 macOS Installer node-v18.8.0.pkg	 Source Code node-v18.8.0.tar.gz
Windows Installer (.msi)	32-bit	64-bit
Windows Binary (.zip)	32-bit	64-bit
macOS Installer (.pkg)	64-bit / ARM64	
macOS Binary (.tar.gz)	64-bit	ARM64
Linux Binaries (x64)	64-bit	
Linux Binaries (ARM)	ARMv7	ARMv8
Source Code	node-v18.8.0.tar.gz	

# JSON

JavaScript Object Notation

# JSON

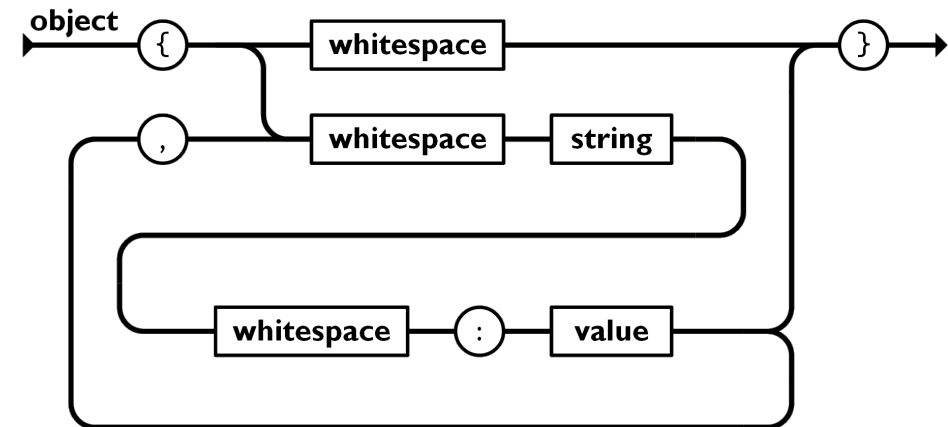
- JSON (JavaScript Object Notation) is an open standard file format and **data interchange format** that are user friendly
- JSON is just some plain text that follow certain format
- Programming language-independent
- It was derived from JavaScript, but many modern programming languages include code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



# 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 $\neq$ JSON

## JavaScript object

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

↑  
Key

↑  
Value

(Need not be enclosed  
within double quotes)

## JSON object

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

↑  
Key

↑  
Value

(Must be enclosed  
within double quotes)

<https://jsonlint.com/>  
a good place to practicing JSON

# A place to practice JSON

<https://jsonlint.com/>

```
1 {  
2   "id": 1001,  
3   "name": "Jack"  
4 }
```

Validate JSON

Clear

Support JSONLint for \$2/Month



# APACHE ECHARTS

Experience JS Data Visualization with JSON

# ECHARTS Examples

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

The screenshot displays the ECharts website's 'Examples' page. The navigation bar includes 'Home', 'Docs', 'Download', 'Examples', 'Resources', 'Community', and 'ASF'. A sidebar on the left lists chart types: Line, Bar, Pie, Scatter, GEO/Map, Candlestick, Radar, Boxplot, Heatmap, Graph, Lines, Tree, Treemap, Sunburst, and Parallel. The main content area features a grid of chart examples, each with a title, a 'DARK MODE' toggle, and 'JS'/'TS' tags. The examples include: Basic Line Chart, Smoothed Line Chart, Basic area chart, Stacked Line Chart, Stacked Area Chart, Gradient Stacked Area Chart, Temperature Change in the Corling Week, and Area Pieces.

# 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