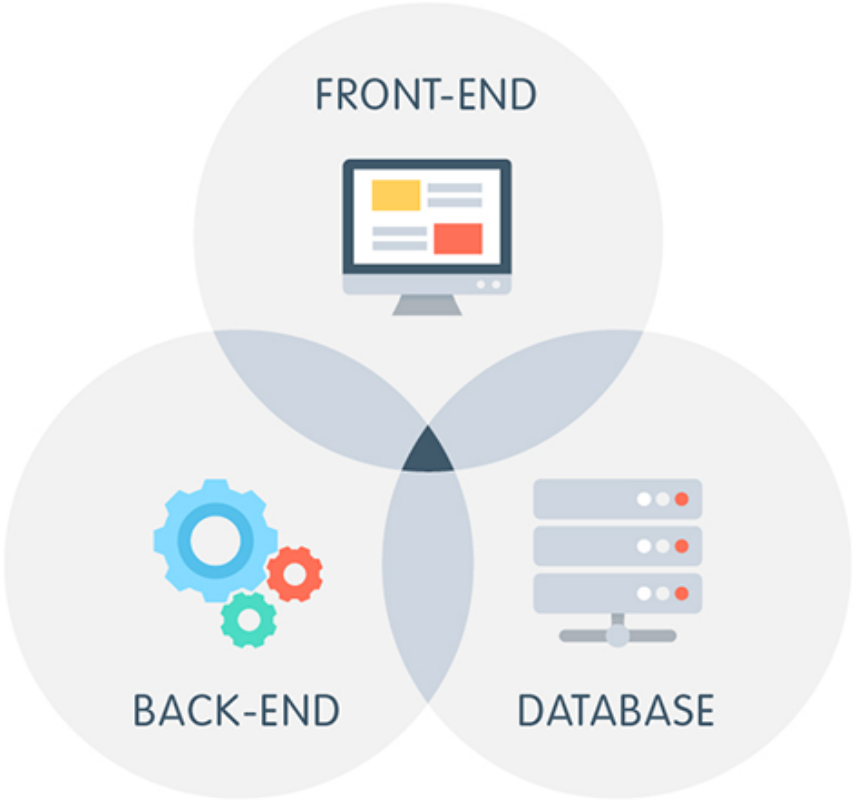
Full-stack Web Development

Aaron Zhang

FULL-STACK DEVELOPMENT



Front-end

- HTML + CSS + JS
- UI / UX
- Web (HTTP / HTTPS)

Back-end

- Java / Python / Node.js
- Database
- APIs

Rank	Job Title	Mean Annual Salary (Above 2021 Nat'l Avg: $58,260 or higher)	Jobs Per 1M, Period ending 2023-01-01	% change in job share, Period ending 2020-01-01 vs Period ending 2023-01-01	% containing remote + hybrid phrases, Period ending 2023-01-01
1	full stack developer	129,637	1,398	56	51
2	data engineer	135,260	879	80	44
3	cloud engineer	133,114	678	65	42
4	psychiatric nurse	109,739	537	45	18
5	senior product manager	147,135	532	44	45
6	back end developer	148,827	429	81	60
7	site reliability engineer	153,134	377	121	55
8	machine learning engineer	153,252	246	53	37
9	psychiatric mental health nurse practitioner	134,011	230	180	20
10	product designer	121,363	213	39	48

Training Overview

- Instructors: Aaron Zhang & Alex Chen
- Content & Schedule
- Assignments & Quiz
- Projects
- Assessment & Grading

How to succeed in this training

- Be curious
- Be proactive
- Be persistent
- **Be collaborative**

Preparation prior to courses

set up the development environment

- Browser: **Chrome** / Firefox
- Code editor / IDE: **Visual Studio Code**, WebStorm
- Git / GitHub
- Set up Node.js env (optional for now)
- ~~*AI coding assistant: Copilot*~~

What is Javascript

- a programming language
- a scripting language
- a dynamic language
- a weakly typed language
- a prototype-based language
- a multi-paradigm language
- a single-threaded language

...

```
const pluckDeep = (key) => (obj) =>
  key.split('.').reduce((accum, key) => accum[key], obj)

const compose =
  (...fns) =>
  (res) =>
    fns.reduce((accum, next) => next(accum), res)

const unfold = (f, seed) => {
  const go = (f, seed, acc) => {
    const res = f(seed)
    return res ? go(f, res[1], acc.concat([res[0]])) :
acc}
  return go(f, seed, [])
}
```

Client-side Javascript vs Server-side Javascript

- Client-side Javascript
  - run in browser
  - manipulate DOM
  - make HTTP requests
  - ...
- Server-side Javascript
  - run in Node.js
  - manipulate files
  - make HTTP requests
  - ...

History of Javascript

- 1995: Brendan Eich, Netscape
- 1996: ECMAScript 1
- 1997: ECMAScript 2
- 1999: ECMAScript 3
- 2009: ECMAScript 5
- **2015: ECMAScript 6**
- 2016: ECMAScript 7

  ...

First Javascript Program

```
console.log('Hello World');
```

- run in browser console
- run in Node.js
- run in VS Code

Lexical Structure

- case sensitive
- whitespace
- Unicode

```
'café' === 'caf\u00e9';
```

- comments

- identifiers
  - an identifier == a name
  - start with a letter, underscore `_`, or dollar sign `$`
- reserved words
  - `break`, `case`, `catch`, `class`, `const`, `continue`, `debugger`, ...

Lexical Structure (cont'd)

- literals - a data value that appears directly in a program
  - 123, 12.34, 'abc', "abc", true, false, null, undefined, /abc/, ...
- optional semicolons
  - `;` is optional, but it is required when multiple statements appear in a single line
  - In general, if a statement begins with `(`, `[`, `/`, `+`, or `-`, it could be interpreted as a continuation of the statement before.

```
var x = 0; // Semicolon omitted here
[x, x + 1, x + 2].forEach(console.log);
```

Data Types

Primitive Types

- **number**
- **string**
- **boolean**
- **null**
- **undefined**
- symbol
- *bigint (ES2020)*

object / complex

- Object
- Array
- Function
- Date
- Regexp
- ...

Number

- integer
- floating-point
- `NaN`
- `Infinity` / `-Infinity` => `Number.POSITIVE_INFINITY` / `Number.NEGATIVE_INFINITY`
- `Number.MAX_VALUE` / `Number.MIN_VALUE`

String

- single quote `'` / double quote `"` (*no character type in Javascript*)
- backtick quote `` ` ``
- escape character `\`
- string length - maximum length is 2^53 - 1, but it depends on the browser
  - In V8: 2^29 - 24 (~1GiB), 2^28 - 16 (~512MiB) on 32-bit system.
  - In Firefox, 2^30 - 2 (~2GiB). Before Firefox 65, the maximum length was 2^28 - 1 (~512MiB).
  - In Safari, 2^31 - 1 (~4GiB).

Boolean

- `true` / `false`
- `Boolean()` function

Null & Undefined

- `null` - a special value that indicates a deliberate non-value
- `undefined` - a special value that indicates an uninitialized value

Symbol

- a new primitive type in ES6
- a unique and immutable data type
- used as the key of an object property

could be used to replace constants

```
const COLOR_RED = Symbol('red');
const COLOR_GREEN = Symbol('green');
const COLOR_BLUE = Symbol('blue');
```

Type Conversion / Coercion

- difference between conversion and coercion: coercion is implicit, conversion is either implicit or explicit
- `Number()` function
- `String()` function
- `Boolean()` function
- `parseInt()` / `parseFloat` function

Dynamic Typing

- a variable can hold a value of any type
- a variable can hold different types of values at different times
- a variable can be reassigned to a value of a different type

Variable Declaration

- `var` keyword
- `let` keyword
- `const` keyword
- naming convention
  - camelCase
  - snake_case
  - PascalCase

Variable Scope

- global scope
- function scope
- block scope (ES6)

Hoisting

```
console.log(x); // undefined
var x = 1;
```

Operators

- arithmetic operators
- assignment operators
- comparison operators
- logical operators
- string operators
- conditional (ternary) operator
- unary operators
- bitwise operators
- comma operator
- `typeof` operator
- `delete` operator
- `in` operator
- `instanceof` operator
- `void` operator