CSCI E-33a (Web50)
Section 5

Ref: Lecture 5 (JavaScript)

Vlad Popil

Mar 8, 2022

About me

Vlad Popil 🇺🇦

- Master's (ALM) in Software Engineering
- Software Engineer at Google

Email: vlad@cs50.harvard.edu

Sections: Tue 8:30-10:00 pm ET
Office Hours: Thu 9:00-10:30 pm ET

Agenda

- Logistics
- Lecture review
- JS / Ajax
- Project 3
- Grading criteria (not exhaustive)
- Chrome Debugging - Javascript
- (maybe) cURL/Postman
- jshint
- `pycodestyle` , `pylint` (recap)
- Q&A

Logistics

Intro

- Refer to website: https://cs50.harvard.edu/extension/web/2022/spring/
- Sections and office hours schedule on website sections
- Get comfortable with command line
- Text editor is usually sufficient to write code, BUT IDEs is faster!
- Zoom:
  - Use zoom features like raise hand, chat and other
  - Video presence is STRONGLY encouraged
  - Mute your line when not speaking (enable temporary unmute)
- 6 Projects
  - Start early (or even better RIGHT AWAY!!!)
  - Post **and answer** questions on Ed platform
  - Remember: bugs can take time to fix
  - Grade -> 3 × Correctness (5/5) + 2 × Design [code] (5/5) + 1 × Style [code] (5/5) (Project 0 is an exception)
    E.g. 15+10+5=30/30 | e.g. Correctness can be 15, 12, 9, 6, 3, 0
  - Lateness policy - 0.1per minute => **16hrs 40 min**, plus one time 3-day extension
  - Set a reminder to submit the Google Form for each project
  - Project 3 - Due Sunday, Mar 27th at 11:59pm ET **<< ONLY 19 FULL DAYS LEFT >>**

Reminders

- Sections/Office Hours:
  - Sections are recorded (published 72hrs), office hours are not
  - Real-time attendance is required of at least one section
  - Video and participation encouraged even more
- Section prep:
  - Watch lecture
  - Review project requirements
- Office hours prep:
  - Write down your questions as you go, TODO, etc.
  - Come with particular questions

10,000 foot overview

- *Section 0 - SKIPPED*
- *Section 1+2 (Git + Python)* - Chrome Dev Tools (Inspector), CDT (Network), Project 0, Grading aspects
- *Section 3 (Django)* - Env Config, Markdown, RegEx, IDEs, pycodestyle, Debugging, Project 1
- *Section 4 (SQL, Models, Migrations)* - VSCode, linting, DB modeling, Project 2
- *Section 5 (JavaScript)* - cURL/Postman, jshint, CDT + IDE's Debugging, Project 3
- *Section 6 (User Interfaces)* - Animations, DB modeling, Pagination, Project 4
- *Section 7 (Testing, CI/CD)* - Test Driven Development, DevOps, Final Project
- *Section 8 (Scalability and Security)* - Cryptography, CAs, Attacks, App Deployment (Heroku)

Most sections: material review, logistics, project criteria review, reminders, hints, etc.

Burning Questions?

Please ask questions, or topics to cover today!

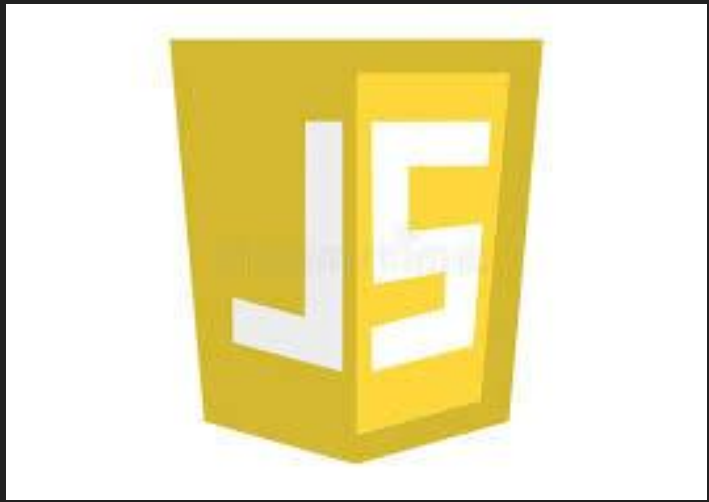
Topics:

- *Final - (usually) Web App, use Django + DB + JS, responsive UI.*
- *Functional Programming*
- *Gradescope ~~RAR~~ - should be ZIP offline*

JavaScript

JavaScript

- Programming Language used for running client-side code.
- Useful for manipulating the Document Object Model (DOM)
- Employs Event-Driven Programming



Include JavaScript in page

- Write code between <script> tags in HTML

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <title>Hello</title>
        <script>
            alert('Hello, world!');
        </script>
    </head>
    <body>
        <h1>Hello!</h1>
    </body>
</html>
```

- Link to separate JavaScript file (preferred)

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

Functions

- Regular notation
- Arrow Notation
- Anonymous Functions

```
1   // Traditional function notation
2   function add(a, b) {
3       return a + b;
4   }
5
6   // Arrow notation
7   add = (a, b) => {
8       return a + b;
9   }
10
11  // Anonymous function
12  // (We've given it a name here, but no need to)
13  var anon = function(a, b) {
14      return a + b;
15  }
```

Variable Declaration

- var: Declares a function-scoped variable
- let: Declares a limited-scope variable
- const: Declares a constant value

```
// Declaring a Constant
const PI = 3.14;

// Declaring a function-scoped variable
var some_var = "Hello!";

// Declaring a limited scope variable
let i = 1;
```

Selecting DOM Elements

- document.querySelector(query) selects the **first** element matching the query
- document.querySelectorAll(query) selects all elements matching the query

Examples:

Query	**Result**
`...Selector('#header1');`	Selects element with ID header1
`...SelectorAll('.big');`	Selects all elements with class big
`...SelectorAll('image');`	Selects all images
`...Selector('form');`	Selects first form on the page

Manipulating DOM Elements

Attribute/Command	Meaning	Example
`element.innerHTML`	All HTML inside element	header.innerHTML = “Hi!”;
`element.style.property`	The CSS styling of an element	header.style.color = ‘blue’;
`document.createElement(type)`	Creates new DOM element of specified type	const item = document.createElement(“li”);
`element.appendChild(child_name)`	Adds child element nested within parent	listy.appendChild(item);

Conditionals

- Use `===` for strict equality (must be same type) (preferred)
- Use `==` for normal equality (can be different type, must be same value)
- Example:
  - 3 == ‘3’ is True
  - 3 === ‘3’ is False

```
1   // Setting up variable:
2   let x = 4;
3
4   if (x < 0) {
5       console.log("negative");
6   } else if (x === 0) {
7       console.log("zero");
8   } else {
9       console.log("positive");
10  }
```

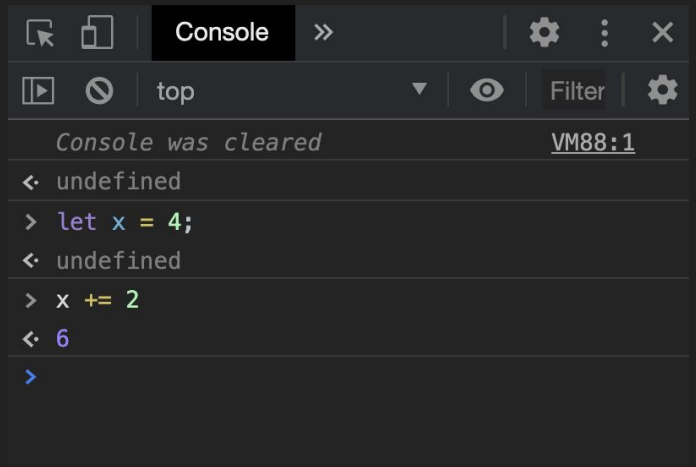
JavaScript Objects

- Stores Key-Value pairs similar to a Python Dictionary

ages

JavaScript Console

- Command-line like tool on web browsers where we can run JavaScript
- Use `console.log(x)` to print x to the console
- In Chrome: Right-Click -> Inspect ->



Timing

- `setInterval(function_name, milliseconds);`
- Ex: `setInterval(count, 1000);`

Local Storage

- Storage within the user’s web browser
- Get item using:
  `localStorage.getItem(“key_name”);`
- Set item using:
  `localStorage.setItem(“key_name”, value);`

Application Programming Interfaces (APIs)

- A set of functions and values that clients can access through requests.
- Data typically transferred as a JSON (JavaScript Object Notation) object
- fetch function makes a web request and returns an HTTP response:

JS api.js > getQuestion

```
1  getQuestion = () => {
2      const url = "https://jservice.io/api/random";
3      fetch(url).then(response => {
4          return response.json();
5      }).then(data => {
6          console.log(data);
7      })
8  }
```

Handle Form Submission

- Use the “submit” event to add a function to be run on submission of a form:
  `object.addEventListener(“submit”, event => myFunction(event));`
- Use the “value” attribute of each HTML element to access user input:
  `let f_name = document.querySelector(“#first”).value;`
- Use the `event.preventDefault()` function in your function to prevent the default action of the form. (Works with any other event as well if using `addEventListener` function).
  `event.preventDefault();`
- Note: `return false;` was used in lecture in place of `event.preventDefault`, but that can be problematic at times.

Style

Major Style/Design Issues

- Keep indentation consistent
- camelCase JS typically used instead of snake_case (Python)
- Keep spacing consistent
- Don’t repeat code!!!
- Use separate functions when it improves readability

Questions?

Demo

Javascript

Demo

AJAX

Demo

Project

Project 3

- Start early!!!
- Google Form
- Make a checklist of requirement and check all before submission
- Make sure there’s no bugs (especially those that don’t happen all time)
- Focus on functionality (NOT PRETTINESS)!!!

Project 3

- Refactor functions to:
  - add email to the mailbox (render email: create element and append)
  - archive current email (and go back to inbox) - takes T/F
  - compose
  - reply email -> compose email and plug in some values
  - view single email
  - send email
- Styling the inbox entry:
  - CSS classes
  - for timestamp
  - CSS child selector

Project 3

- Reading mailbox (inbox/sent/archive)
  - on POST email add ***event.preventDefault();***
  - Style your ‘read’ emails, e.g.:

```
if (email.read) {
    row.classList.add('email-read');
}
```

  - Add event listeners to each email:

```
email.addEventListener('click', function() {
    view_email(email.id);
});
```

  - When loading mailbox make sure to hide the single view as well

Project 3

- Showing single email:
  - You can display button depending on which mailbox you are observing (or by fetching info)
  - Changing visibility →

    myArchiveElement.*style.display = if globalMailbox === 'inbox' ? 'inline-block' : 'none';*
  - When showing single email, flush all values before fetching, in case no data or partial data returned
  - Make sure to mark email as read when landing on the page
  - Breaking `\n` with
: OR? **<pre></pre>**
    - email.body.split('\n').forEach(line => {

      1) insert line

      2) insert

      }

Project 3

- Showing single email HTML:
  - separate entries for : From/To/Subject/Timestamp
  - buttons: reply/(archive|unarchive)
  - Also the div for body

Project 3

- Archiving
  - Simple method that calls backend:
    - No global value you need to pass T/F and email id
- Reply:
  - If subject.slice(0, 4) !== 'Re: ':
    subject += 'Re: '
  - ……element.value= `<br><br><br>------------------------- <br> On ${email.timestamp} ${email.sender} wrote:\n${curEmail.body}`;
  - hi

    On ___ wrote: "Hello”

Design

What can be considered (not exclusively):

- Proper refactoring (copy-paste is usually a no-no)
- Use of constants/vars:
  - 1. const
  - 2. let
  - ~~99999. var~~
- Proper use of functions
- More reasonable solution
- Code/file structure
- fetch(‘/email/’ + id) -> fetch(`/email/${id}`)

Design (continued)

What can be considered (not exclusively):

- Repetitive use of querySelector?
- Proper data structures
- == vs === ?
  - const x = 5
  - const y = ‘5’
  - x == y -> T
  - x === y -> F
- Code repetition

Style

What can be considered (not exclusively):

- *jshint (indentations, line breaks, long lines)*
- COMMENTS!
- Naming for variable, function, files, etc.:
  - getemailbyid -> get_email_by_id (Python convention)
  - getEmailById (JS convention)
- Consistency is the key!

Style (continued)

What can be considered (not exclusively):

- ‘ vs “ consistency
- camelCase(c*, Javascript, Java) vs snake_case (Python)
- == vs ===

jshint

- UI:
  - https://jshint.com/

- CLI:
  - brew update
  - brew doctor
  - brew install node
  - npm install -g jshint
  - In ~/.jshintrc add:
    - {
    - "esversion": 6
    - }

pycodestyle (formerly pep8)

- python -m pip install pycodestyle
- pycodestyle app.py --max-line-length=120

pylint (checks beyond style, but including)

- python -m pip install pylint
- pip install pylint-django
- pylint app.py --load-plugins pylint_django

Chrome Developer Tools (Network)

In Chrome:

1. Right click
2. Inspect
3. → Demo

Extremely powerful! Let’s try...

cURL / Postman

Allows to call API endpoints directly.

Demo...

Grading criteria generic suggestions (not limited to)

- Correctness:
  - All requirements + no bugs
- Design (not limited to):
  - Responsive
  - Simplest solution
  - Avoiding repetition (refactoring)
  - Structure (e.g separate files vs inline styling)
- Style (not limited to):
  - File structure
  - Line breaks
  - Spacing
  - Naming
  - **Comments**

Both Design and Style consider readability but from different perspective.

Random Tips

- Video Speed Controller (Chrome Extension)
  - Spotify + Hulu + Showtime => $5
  - GitHub Education Pack
  - Windows licence (https://harvard.onthehub.com)
  - Chrome Tabs
  - Code in Place 2022 (https://codeinplace.stanford.edu/)
  - DSA:
    - Video by CS50: https://www.youtube.com/watch?v=0DC1lk-SeOI&ab_channel=CS50
    - Leetcode / AlgoExpert / Etc.
    - Stanford Algorithms Specialization (EdX link /Coursera) - more theory (time consuming)
    - e22 seems good!
    - e20 + e124 (combo) - HARD!
  - System Design:
    - Grokking System Design
    - Alex Xu - System Design

Q&A

Please ask any questions. Ideas:

- Anything discussed today
- Anything from lecture material
- About the project
- Logistics
- *Random*

Resources

- https://github.com/vpopil/e33a-sections-spring-2022

CSCI E-33a (Web50)
Section 5

Ref: Lecture 5 (JavaScript)

Vlad Popil

Mar 8, 2022