CSCI E-33a (Web50)
Section 6

Ref: Lecture 6 (User Interfaces)

Vlad Popil

Mar 22, 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
- Animation/Visualization
- Demo
- Project 3 (recap)
- Project 4 (quick)
- Grading criteria (reminders)
- (maybe) cURL/Postman
- 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 5 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, Project 4 (quick)
- *Section 7 (Testing, CI/CD)* - Project 4, Test Driven Development, DevOps, Pagination
- *Section 8 (Scalability and Security)* - Cryptography, CAs, Attacks, App Deployment (Heroku), Final Project

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

Burning Questions?

Please ask questions, or topics to cover today!

Topics:

- *No questions!*

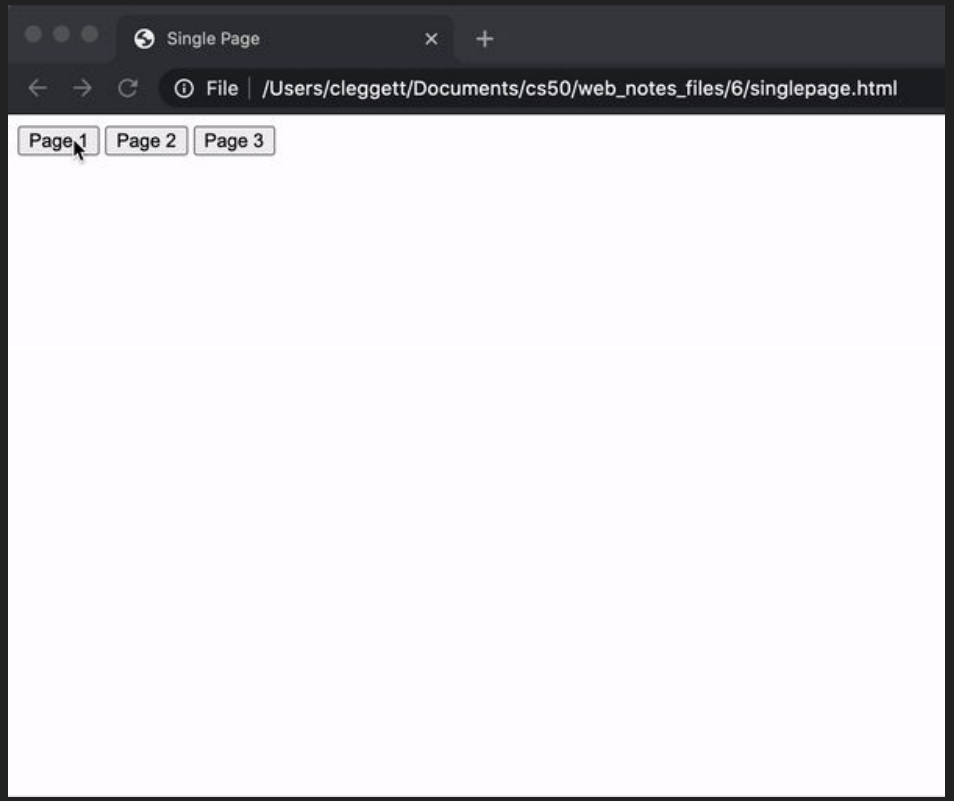
Lecture Recap

5 min

User Interfaces

- We want the User Experience to be as good as possible on our websites.
- There are many methods we can use to improve our interfaces:
  - Visually appealing pages (CSS)
  - Single-Page applications (Javascript)
    - React is one way of doing this
  - Animation (CSS)

Single-Page Applications



Single-Page Applications

Advantages:

- Only need to re-render the parts of the page that are changing.
- Often much faster than switching pages
- Debugging in Google Chrome

Disadvantages:

- A bit more difficult to manage the URL and history if you wish to do so.
- Have to be more careful about security.
- Initial Download could be slower

Using APIs

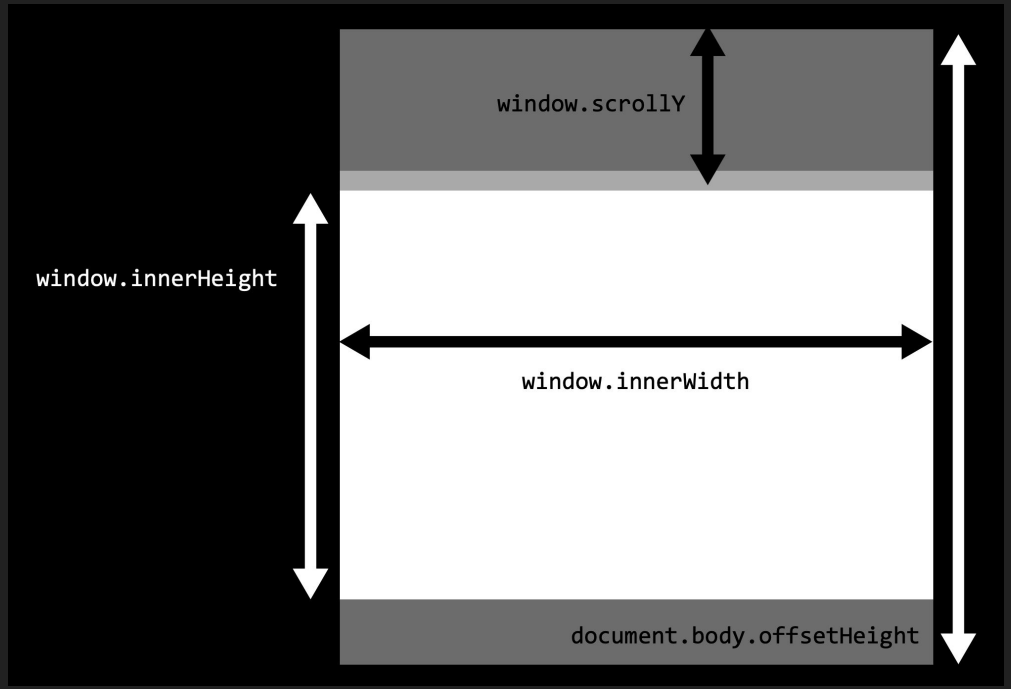
- We can use APIs to update the data associated with our site in JavaScript
- Sometimes, we'll have to write these APIs ourselves

Using History

- Use history.pushState function to add to the browser history, and then set the window.onpopstate attribute to change behavior when back arrow pressed.
- history.pushState(data, title, urlExtension);
  - data: A JavaScript object with any information you would like to associate with the current state
  - title: Title of the state, ignored by most web browsers
  - urlExtension: What should be displayed in the url
- window.onpopstate = myFunction(event);
  - Access data using event.state.parameterName
  - This function will be run whenever the back arrow is pressed

Infinite Scroll

- You can choose to load new data only when the user gets to a certain part of the page.



Animation

- We can use some simple CSS to animate our page!
- First use @keyframes to create an animation
- Then apply animation in CSS

```
@keyframes animation_name {
    0% {
        /* Some styling for the start */
    }

    75% {
        /* Some styling after 3/4 of animation */
    }

    100% {
        /* Some styling for the end */
    }
}
```

```
h1 {
    animation-name: grow;
    animation-duration: 2s;
    animation-fill-mode: forwards;
}
```

React

- Javascript Framework
- Uses Declarative Programming: stating the logic of what we wish to display without worrying about the precise content.
- Uses JSX, which combines HTML and JavaScript
- Some sites built with React:





Including React

- Include within HTML:
  - Link to React, React-DOM, and Babel in HTML page

```
<script src="https://unpkg.com/react@16/umd/react.development.js" crossorigin></script>
<script src="https://unpkg.com/react-dom@16/umd/react-dom.development.js" crossorigin></script>
<script src="https://unpkg.com/babel-standalone@6/babel.min.js"></script>
```

  - Write your components in a script tag.
  - Render component:

```
ReactDOM.render(<App />, document.querySelector("#app"));
```

  - A bit slow, as we need to load these libraries each time
- create-react-app
  - Created by Facebook for React Developers
  - Automatically generates baseline react app

Components

- Individual parts of a website like a nav-bar, a post, or even a page.
- Can be passed props (a bit like arguments) when rendered
- They can also store information in their state
    - When you wish to do this, you should include a constructor method to be run when the component is first created.
- Must include a render function that returns some HTML to render

Components: Syntax

```
class App extends React.Component {
    constructor(props) {
        super(props);
        // Initialize the state
        this.state = {key: value; ...}
    }
    render() {
        // You should only return one thing
        return ( <div> {this.state.key} </div> );
    }
}
```

Components: Changing State

```
class App extends React.Component {
     constructor(props) {
          super(props);
          this.state = {key: “value”;}
     }

     render() {
          return ( <input onChange={this.updateKey} value={this.state.key}> </input> );
     }

     updateKey = (event) => {
          this.setState({
               key: event.target.value
          });
     }
}
```

Using createreactapp

1. Install Node.js.
2. In your terminal, run `npm create-react-app [app_name]`
3. cd into new app name folder
4. Edit App.js to change what is displayed
5. Run `npm start` in the terminal to run your application

Questions?

Demo

Animation quick review

A few examples...

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= `\n \n \n ---------- \n 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) - admitted students
- Chrome Tabs
- Marvelous Suspender (Chrome extension)
- 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 6

Ref: Lecture 6 (User Interfaces)

Vlad Popil

Mar 22, 2022