Data Visualization in Web Browsers with JavaScript APIs

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About the speaker

(Speaker not pictured)

About this session

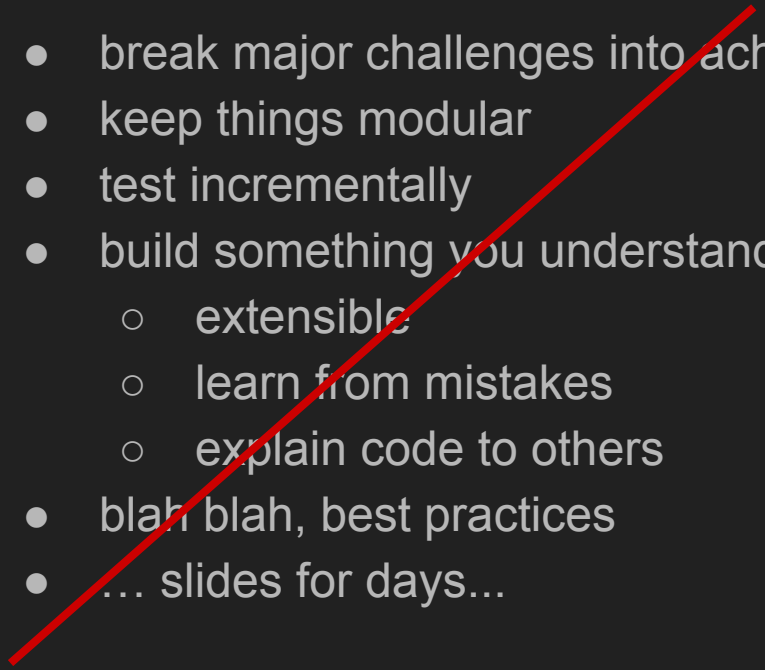
I. Important concepts
II. Overview of (JS) APIs
III. Data considerations
IV. Code 
V. Closing remarks and Q&A

About... YOU!

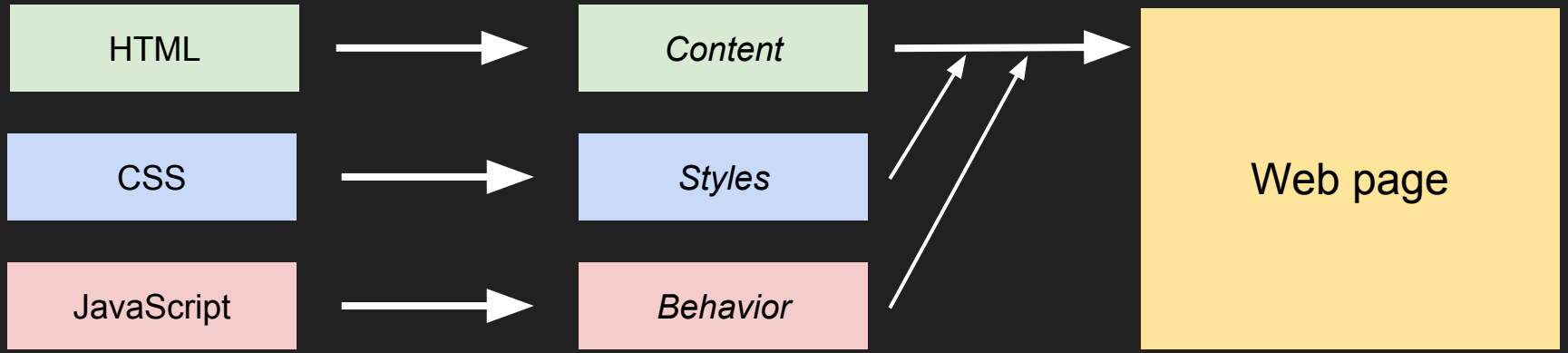
What do you hope to get out of this session?

Normally... I wax programmer

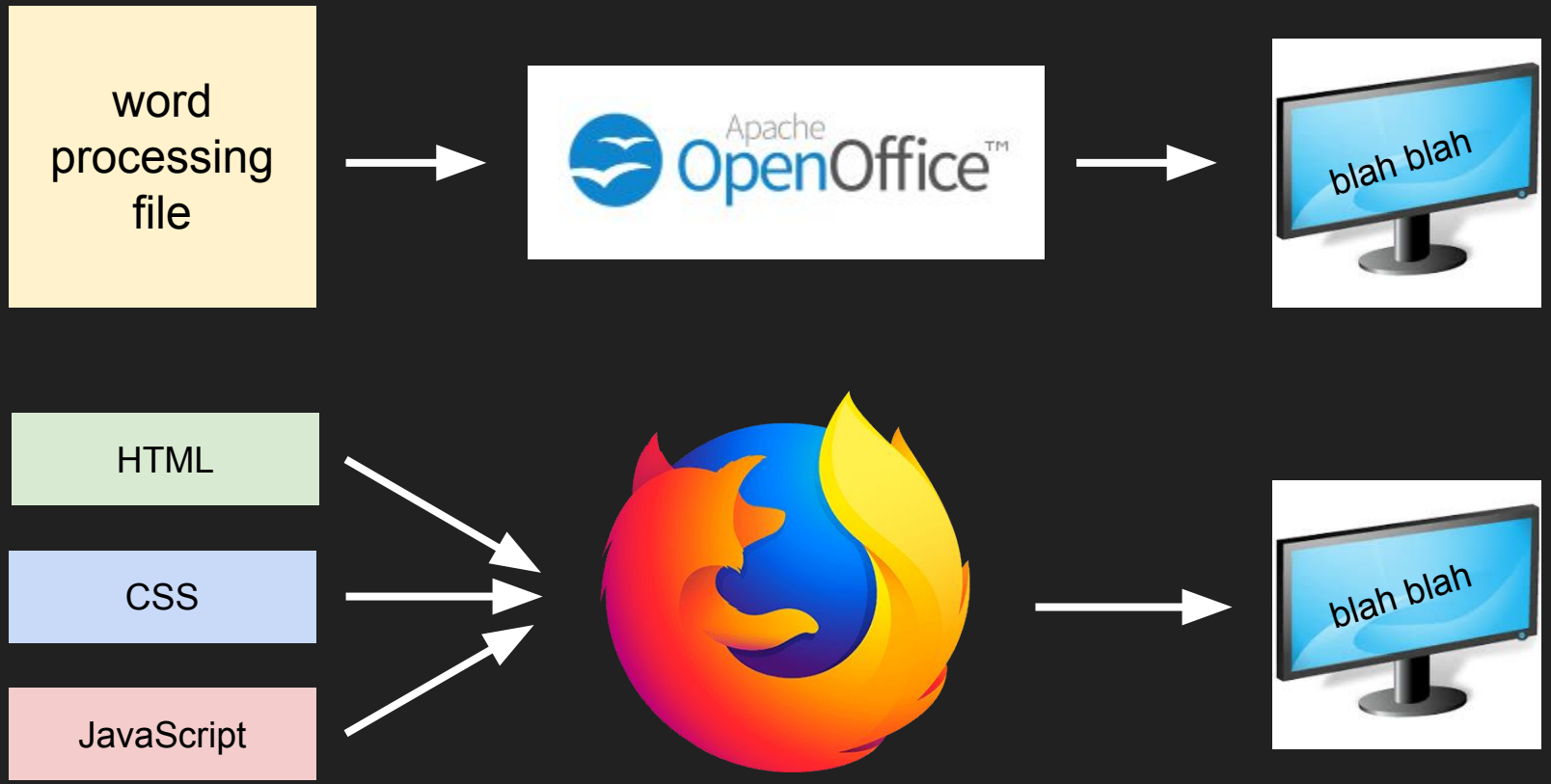
- break major challenges into achievable tasks
- keep things modular
- test incrementally
- build something you understand
  - extensible
  - learn from mistakes
  - explain code to others
- blah blah, best practices
- … slides for days...



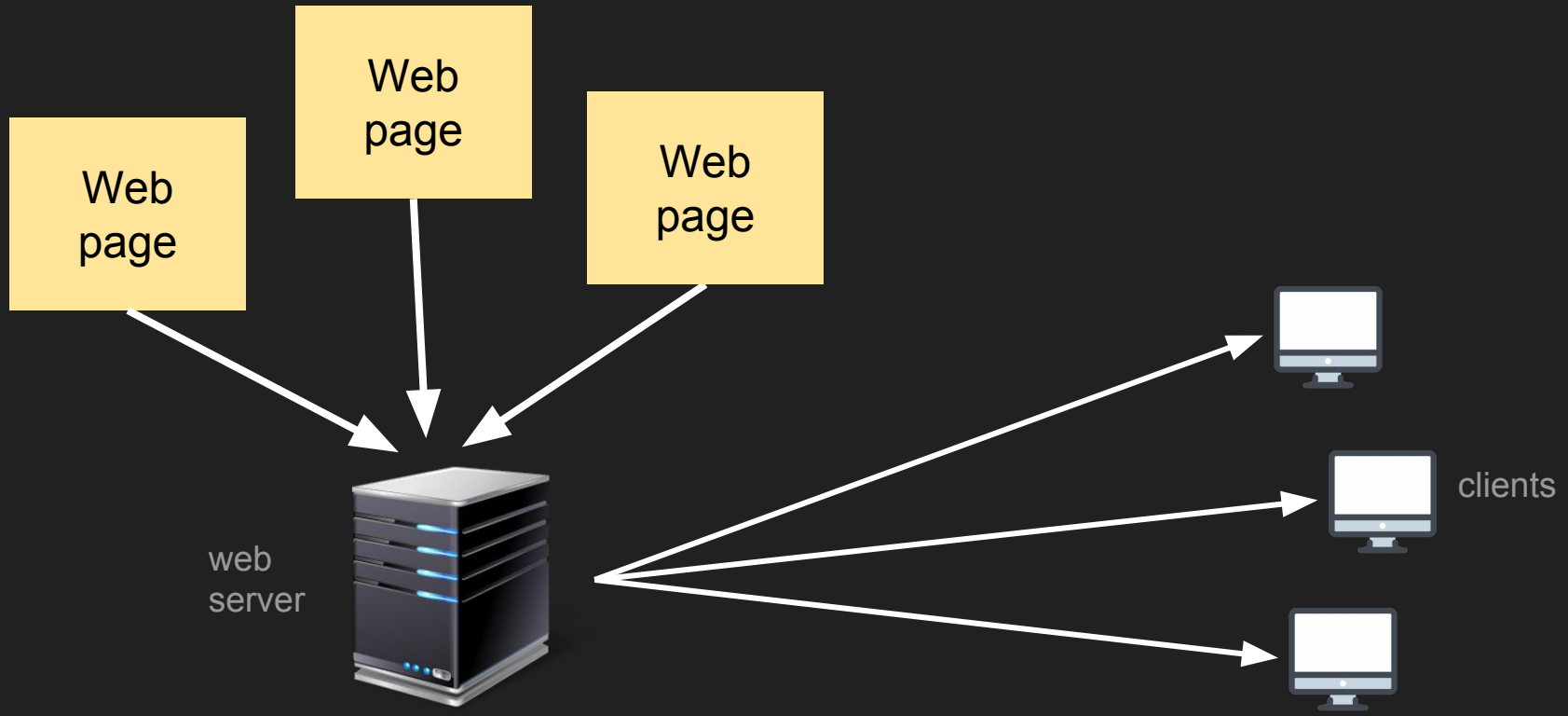
"Web page"



Web browsers



"Website"



Accessing your site

https://<domain>

Web page

web server

client

file:///<local_path>

Web page

Major modern web browsers

"Modern" JavaScript (ECMAScript)

Arrow Functions ("lambda")

```
function(x) {
    return x + 5
}
```

```
x => x + 5
```

Sets and Maps

```
if (myArr.indexOf(myVal) === -1) {
    myArr.push(myVal)
}
```

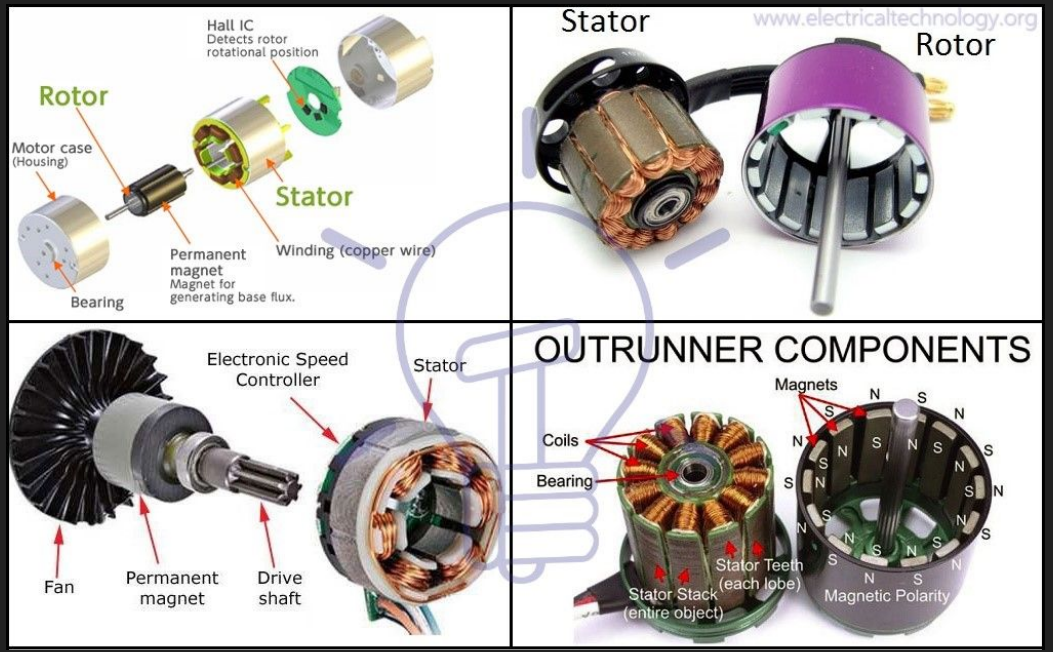
```
mySet.add(myVal)
```

Canvas API, Fetch API, Array.find, etc...

Application Programming Interface (API)

API

"roll your own"

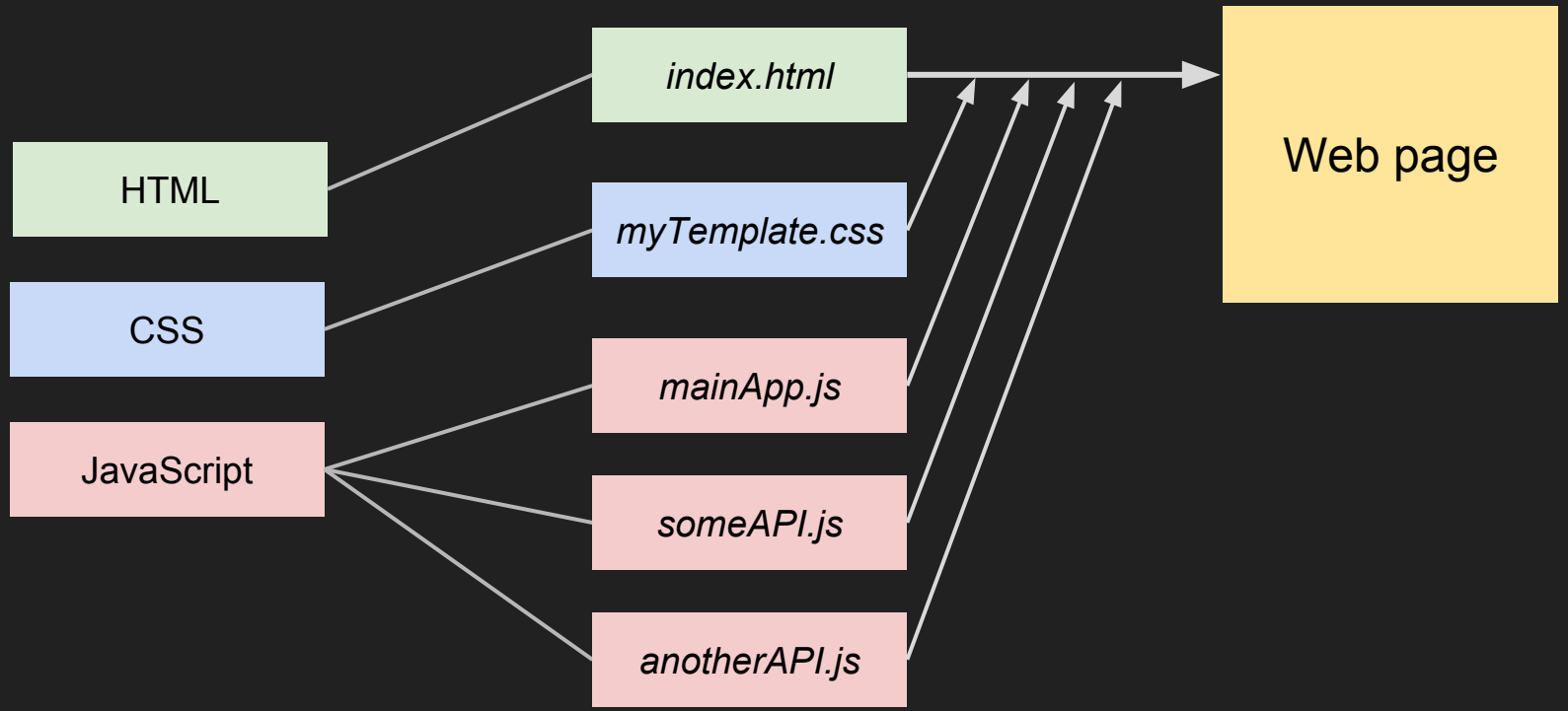


Application Programming Interface (API)

API

≠ application

JS APIs in the browser



Selecting appropriate APIs

Representation of the API ecosystem

… API overload!

https://developer.mozilla.org/en-US/docs/Web/API

JS Graphics APIs

d3.js

plotly.js

Canvas

Google Charts

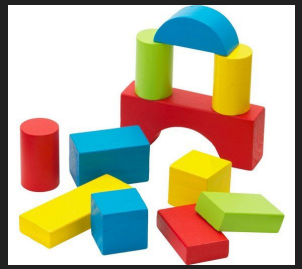
charts.js

Canvas

- low-level
- open-ended
- very powerful

Google Charts

- easy to use
- simple syntax
- limited functionality



charts.js

- robust
- fairly simple syntax
- built on Canvas API (fast!)

d3.js

- immersive
- non-traditional
- powerful and complex
- built on HTML, CSS, and SVG

plotly.js

- simple
- graph-oriented
- robust (built with d3)
- good out-of-the-box features

JS Map APIs

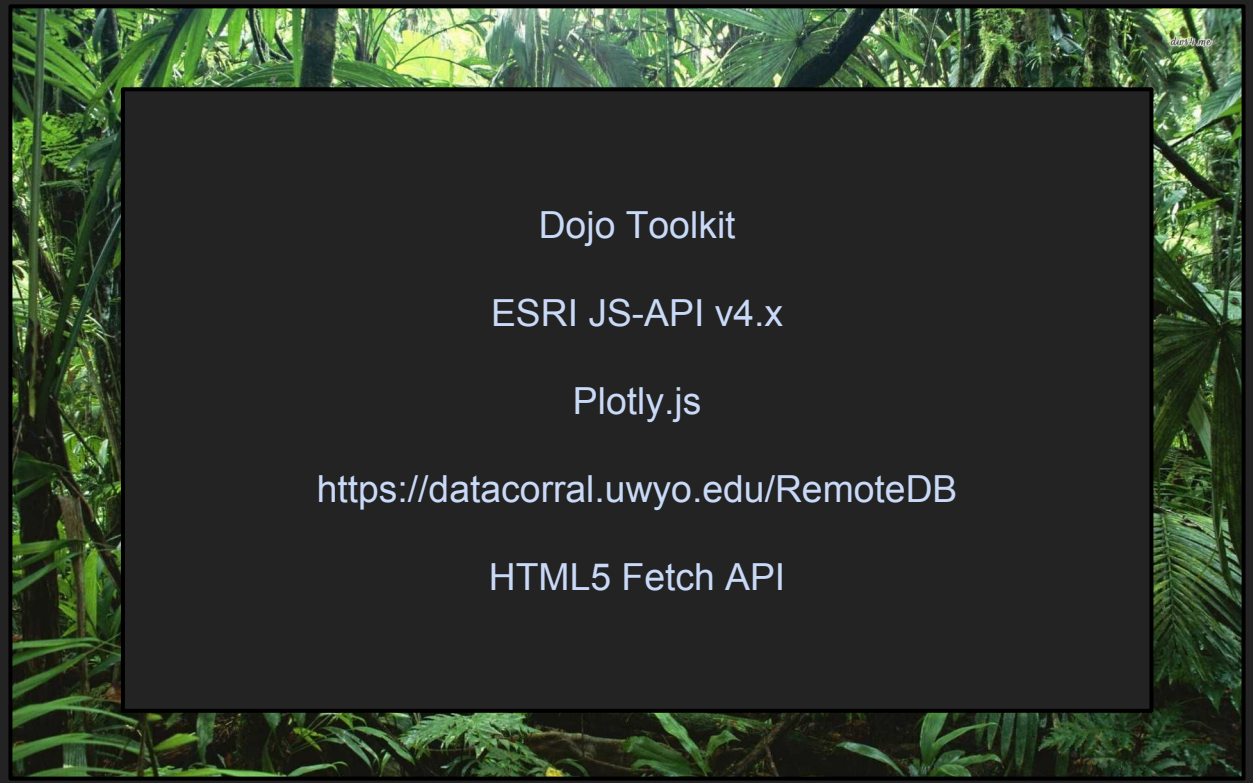
ESRI

MapBox

Google Maps

OpenLayers

Selecting appropriate APIs



Representation of the API ecosystem

APIs + JavaScript + a vision = "Application"

Fetch
request data from a remote source

ESRI JS-API v4.x
interactive map

Dojo Toolkit
control structure, asynchronous module loading

"RemoteDB"
data endpoint API

Plotly.js
graphs / charts / plots

"vanilla" JavaScript
tie it all together, create interactive page elements

CSS + HTML

About your data

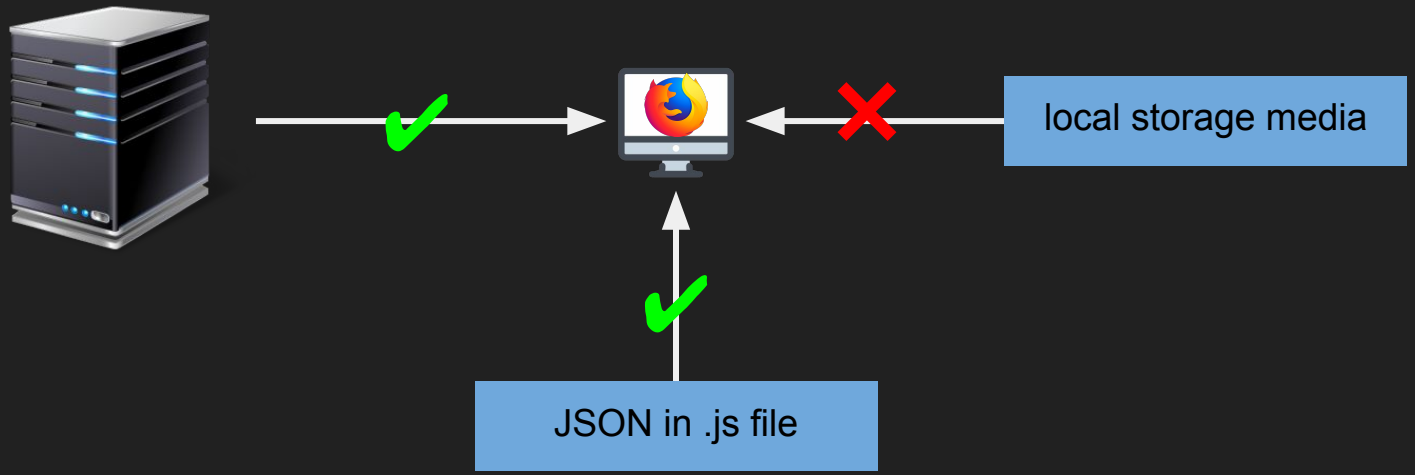
What kind of data are you working with?

"Big" ?

Spatial ?

Ecological ?

Paradigm shift: data and memory in the ephemeral browser!



Publishing Data

- JSON in .js file (local)
- Google Drive API
- github.com
- GeoServer
- host your own
    - REST-ful
    - flat files
    - custom API

Get to the code! Do it!

https://github.com/joshualemli/rmacc2018

Code review

- fetch API and asynchronous control structures
- ploty.js demo with remote data and multiple time series
- ESRI JS-API v4.x basic map demo
- final demo: pulling it all together

Using Web Browsers for Data Visualization

PROS

- publish content
- dynamic (programmatic)
- widely available
- free (mostly)
- make your message heard!

CONS

- slow processing speed
- memory limitations
- requires connectivity or local copy of site
- requires learning additional technologies

Closing remarks

- error checking...
- error checking...
- error checking...
- publishing/accessing your data
- publishing your website with a domain+host
- clear, honest, and meaningful output
- mastering your APIs of choice

Resources

https://developer.mozilla.org/en-US/

https://stackoverflow.com

official API websites

- demos
- documentation
- forums

Attribution

Demo data

Dr. Brent Ewers, UW
DataCorral.uwyo.edu
WyCEHG

Session Materials

plot.ly
esri.com

EPSCoR-WY-t1-2017 "Data Team"

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