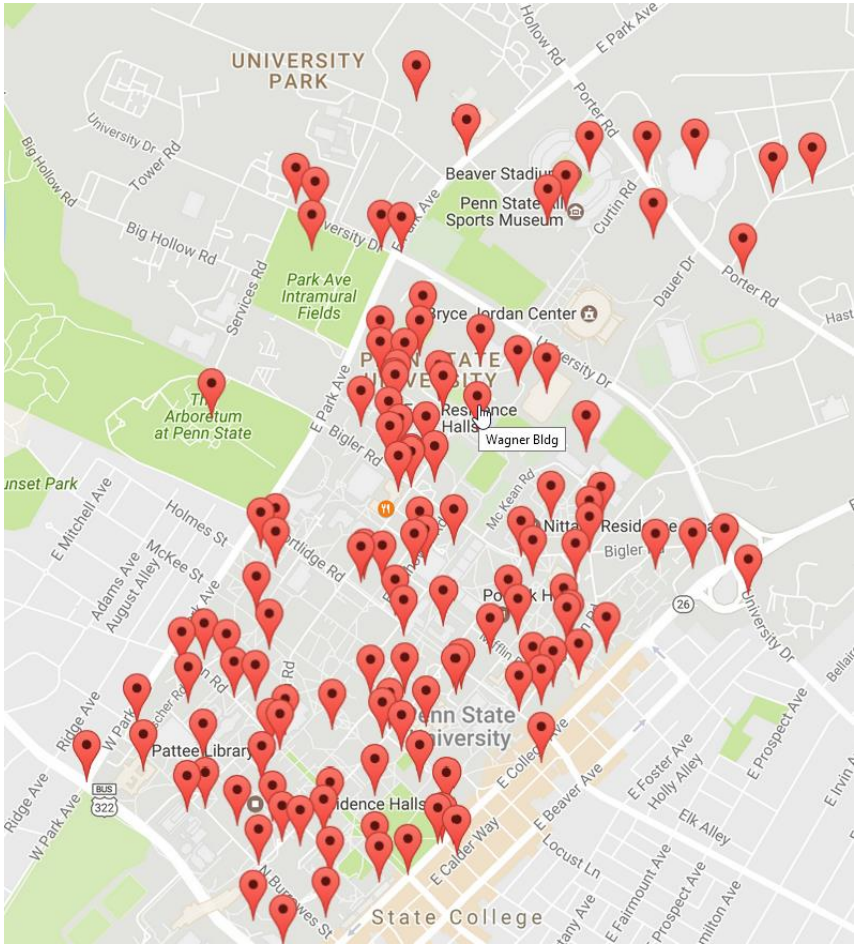
Your 1st Programming Assignment

- Showing reported crime entries on Google Map



Key Technologies Involved in This Course

What We Will Learn Here …

- Web programming
  - HTML, CSS, JavaScript, JSON
- Data processing
  - Python

Web Programming

Web-based Tools Are Dominant

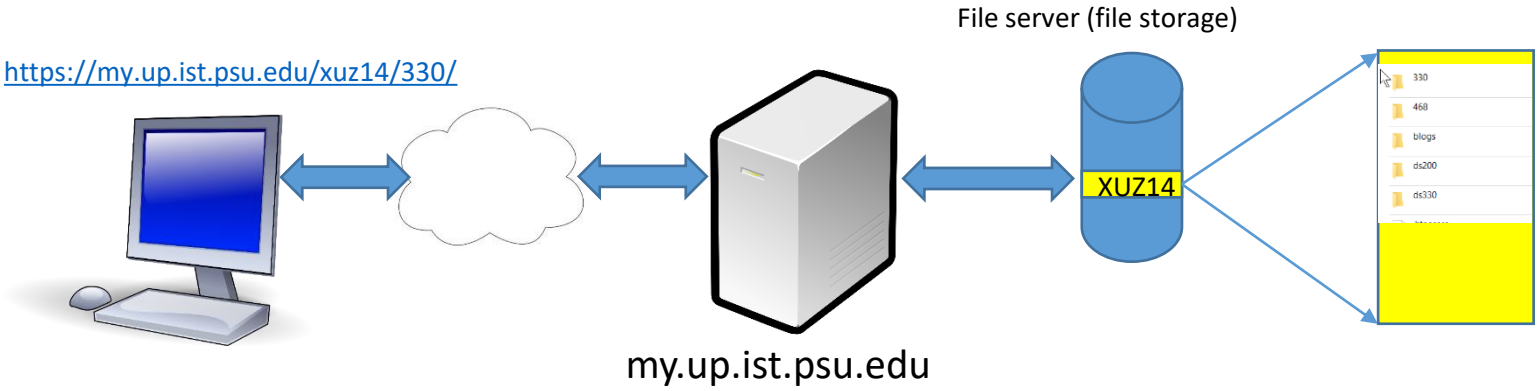
- Examples:
  - Election website on CNN
  - CANVAS
- Key considerations in the design of such tools
  - Contents: what to present?
  - Style: how to present?
  - Interaction: how to use?
  - Data: how to organize?

About Web Server

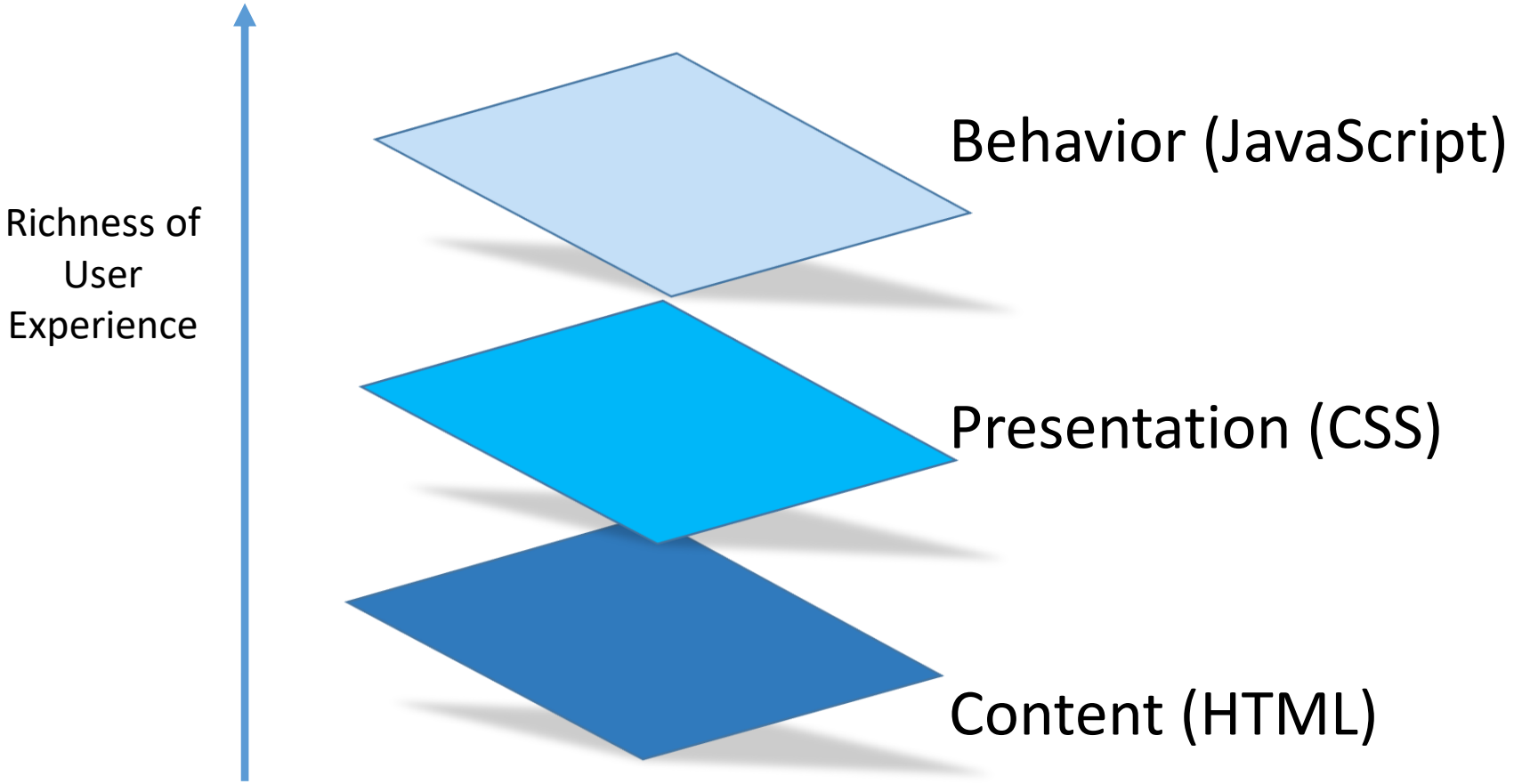
- After I type in this URL

  https://my.up.ist.psu.edu/xuz14/330/

  in browser, what really happens on the server side?
- my.up.ist.psu.edu is a web server, which
  - takes requests from outside, and
  - fetches requested documents and sends them back



Separation of Functions



Contents

- HTML-based
  - Hyper Text Markup Languages
- Types of contents
  - Text, images, UI components, etc.
- Format to present
  - Font size, alignment, color, etc.
- Challenges
  - Content + format.

Style

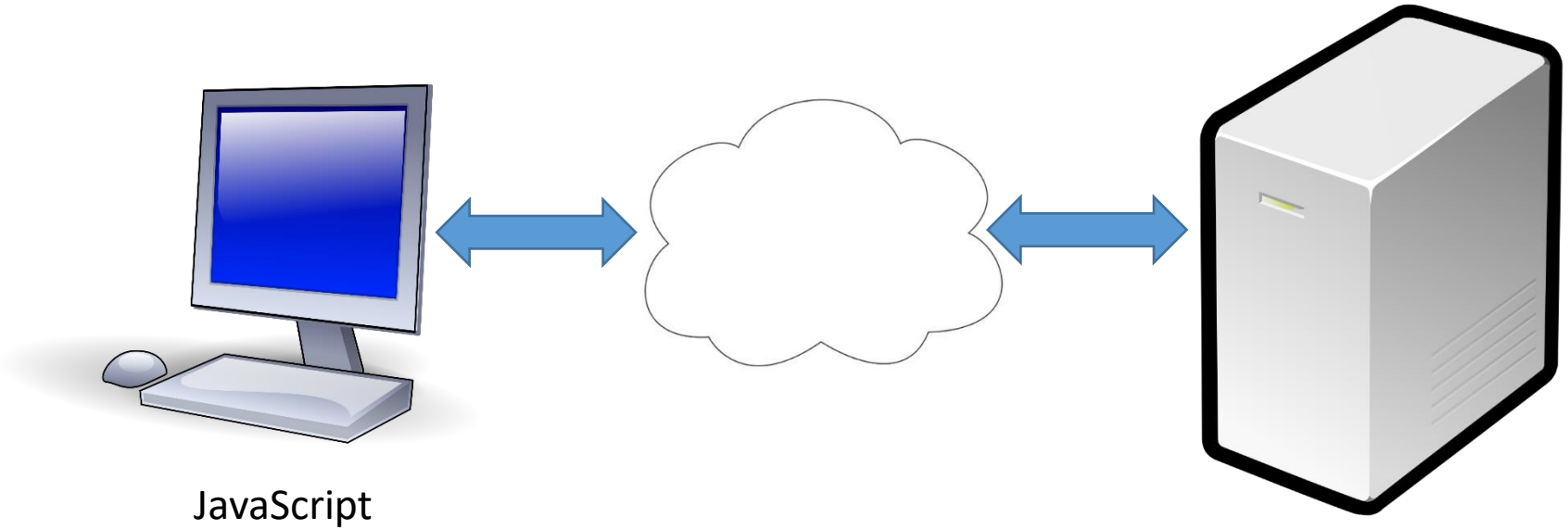
- CSS
  - Cascading style sheets
- Define a presentation style once and use many times
  - More flexible
    - E.g., change the format based on different types of devices

JavaScript

- Web-based applications need more
  - Presentation ➔ more complex interaction
    - Beyond button clicking, form filling, etc.
    - A browser to offer desktop experiences
  - Static web pages ➔ dynamic data
    - Database, steaming data
- More functions
  - Support user interaction
  - Communicate with data management tools

JavaScript

- A client-side scripting programming language for dynamic web pages
  - Must be run within a browser



Features of JavaScript

- A fully fledged programming language
  - JavaScript under HTML 5 is very powerful.
- Lightweight: commanding fewer resources
- Integrated with HTML
- React to client-side events
- Supported by all major browsers
  - Behaviors may vary slightly from browser to browser

- Limitations
  - No access to local file system.

How is JavaScript integrated with HTML?

- <script> … </script>
- Locations
  - Inside <head>…</head>
    - Dealing with user events or functions
    - Either external or internal
  - In <body>…</body>
    - Writing document content
- Internal integration: html contents and JS contents are in the same document.
- External integration: html and js contents are in different documents.

JSON

- JavaScript Object Notation
  - Data format easy for both human and machine

```
[
        {
                color: "red",
                value: "#f00"
        },
        {
                color: "green",
                value: "#0f0"
        },
        {
                color: "blue",
                value: "#00f"
        },
        {
                color: "cyan",
                value: "#0ff"
        },
        {
                color: "magenta",
                value: "#f0f"
        },
        {
                color: "yellow",
                value: "#ff0"
        },
        {
                color: "black",
                value: "#000"
        }
]
```

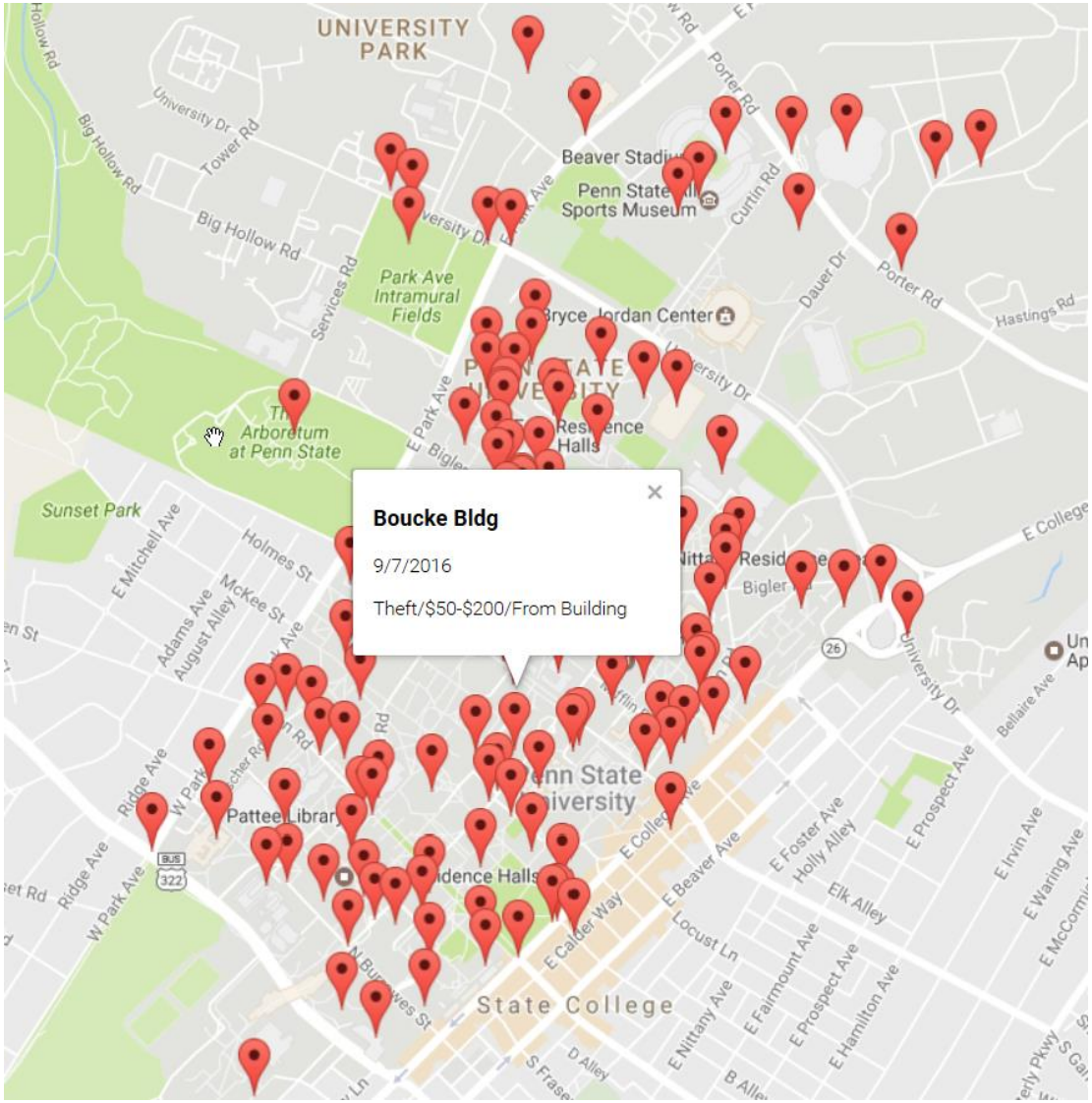
Combining Them Together …

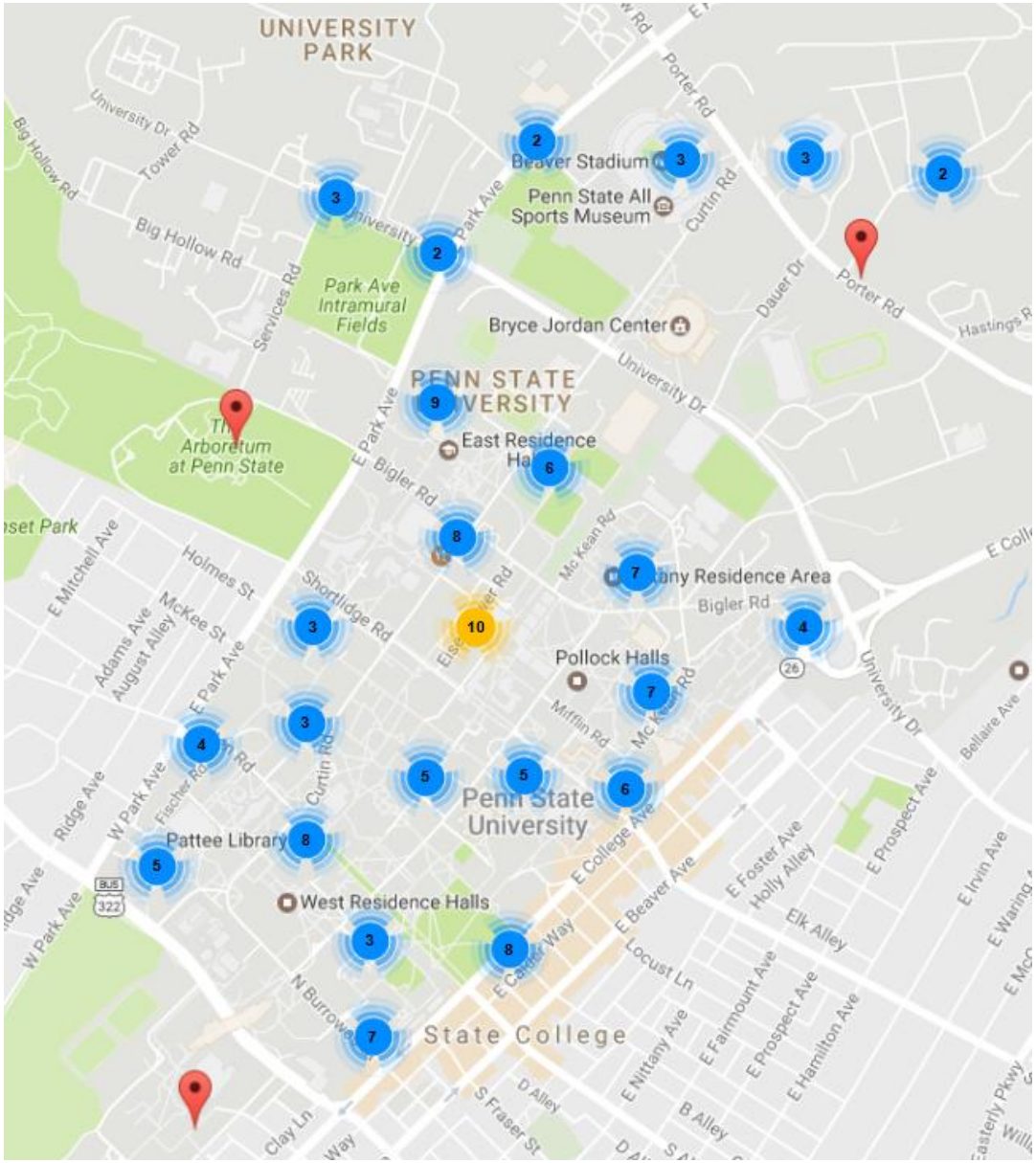
- Much powerful tools for in-depth data analysis

- An example: understanding the reported crimes on UP campus
  - http://police.psu.edu/daily-crime-log

Date	Offenses	Location	latitude	longitude
9/1/2016	Harassment	Wagner Bldg	40.805634	-77.859307
9/1/2016	Suspicious Activity - Othe	Reber Bldg	40.793368	-77.864351
9/1/2016	Health and Safety/RFA-Re	Food Science Bldg	40.804138	-77.861936
9/1/2016	Theft By Deception	Porter Hall	40.800789	-77.85641
8/30/2016	Health and Safety/RFA-Re	Runkle Hall	40.802215	-77.866037
9/1/2016	Vehicle Code - Accident	Mckean Rd	40.800367	-77.856198
9/1/2016	Vehicle Code - Accident	Yellow F Meters Lot	40.802177	-77.861388
8/31/2016	Health and Safety/RFA-Re	Intramural Bldg	40.807329	-77.859192
9/1/2016	Assist State College Polic	E College Ave & S Pugh St	40.795265	-77.860465
9/1/2016	Possession of Small Amou	Stuart Hall	40.807014	-77.862549
9/1/2016	Possession of Small Amou	Chace Hall	40.798725	-77.85715
9/22/2016	Suspicious Activity - Pers	Old Main	40.796458	-77.862733
9/2/2016	RFA-Request for Assistan	Eisenhower Parking Deck	40.802261	-77.861044
9/2/2016	Vehicle Code - Accident/A	Hub Parking Deck	40.799004	-77.860042
9/2/2016	Sexual Assault	University Park Campus	40.810232	-77.862495
9/2/2016	Assist State College Polic	S Pugh St	40.794922	-77.859992
9/2/2016	Simple Assault/Pur,Cons,	E College Ave & S Pugh St	40.79523	-77.860603
9/2/2016	Possession Of An Unknow	Pattee Library Bldg	40.797626	-77.866232
9/2/2016	Health and Safety/RFA-Re	Pinchot Hall	40.805778	-77.863198
9/1/2016	Health and Safety/RFA-Re	Redifer Cmns	40.799376	-77.855902
9/2/2016	Suspicious Activity - Othe	Findlay Cmns	40.806448	-77.861963
9/2/2016	Pur,Cons,Poss, Trans Into	McElwain Hall	40.800028	-77.858893
9/1/2016	Theft By Unlawful Taking	White Bldg	40.799143	-77.859844
9/2/2016	Pur,Cons,Poss, Trans Into	Mckean Rd & Shortlidge Rd	40.798567	-77.857916
9/3/2016	CAD Error-Incident Numb	Services Rd & University Dr	40.811432	-77.865373

Or


UNIVERSITY PARK
Beaver Stadium
Penn State Sports Museum
Bryce Jordan Center
Park Ave Intramural Fields
The Arboretum at Penn State
Sunset Park
Boucke Bldg
9/7/2016
Theft/$50-$200/From Building
Pattee Library
Penn State University
State College
Big Hollow Rd
Tower Rd
Porter Rd
Curtin Rd
Dauer Dr
Hastings Rd
Services Rd
E Park Ave
E Mitchell Ave
Holmes St
McKee St
Adams Ave
August Alley
Ridge Ave
W Park Ave
E College Ave
E Beaver Ave
E Foster Ave
Holly Alley
E Prospect Ave
Bellaire Ave
E Irvin Ave
E Waring Ave
Elk Alley
Locust Ln
E Calder Way
E Nittany Ave
E Fairmount Ave
E Hamilton Ave
University Dr
Bigler Rd
BUS 322
26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East Residence Halls
The Arboretum at Penn State
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Pattee Library
West Residence Halls
State College
Porter Rd
University Dr
Big Hollow Rd
Tower Rd
Curtin Rd
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Bigler Rd
Shortlidge Rd
McKee St
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W Park Ave
E College Ave
E Beaver Ave
Locust Ln
Elk Alley
Mc Kean Rd
Mifflin Rd
Curtin Rd
Fischer Rd
Ridge Ave
Adams Ave
August Alley
E Mitchell Ave
Services Rd
N Burrowes St
S Fraser St
Clay Ln
E Nittany Ave
E Fairmount Ave
E Prospect Ave
E Hamilton Ave
E Foster Ave
Holly Alley
E Irvin Ave
Belaire Ave
D Alley
B Alley
Nittany Residence Area

Data Processing

Data Could Be Messy!

- Source data like this:
  - http://police.psu.edu/daily-crime-log
- Visualization requires data tables like this:

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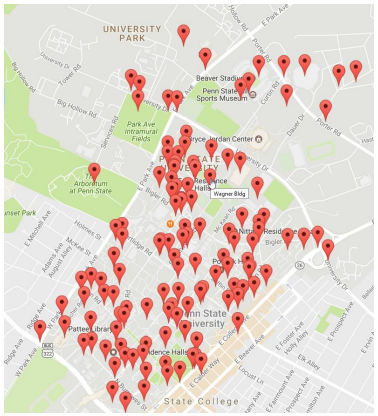
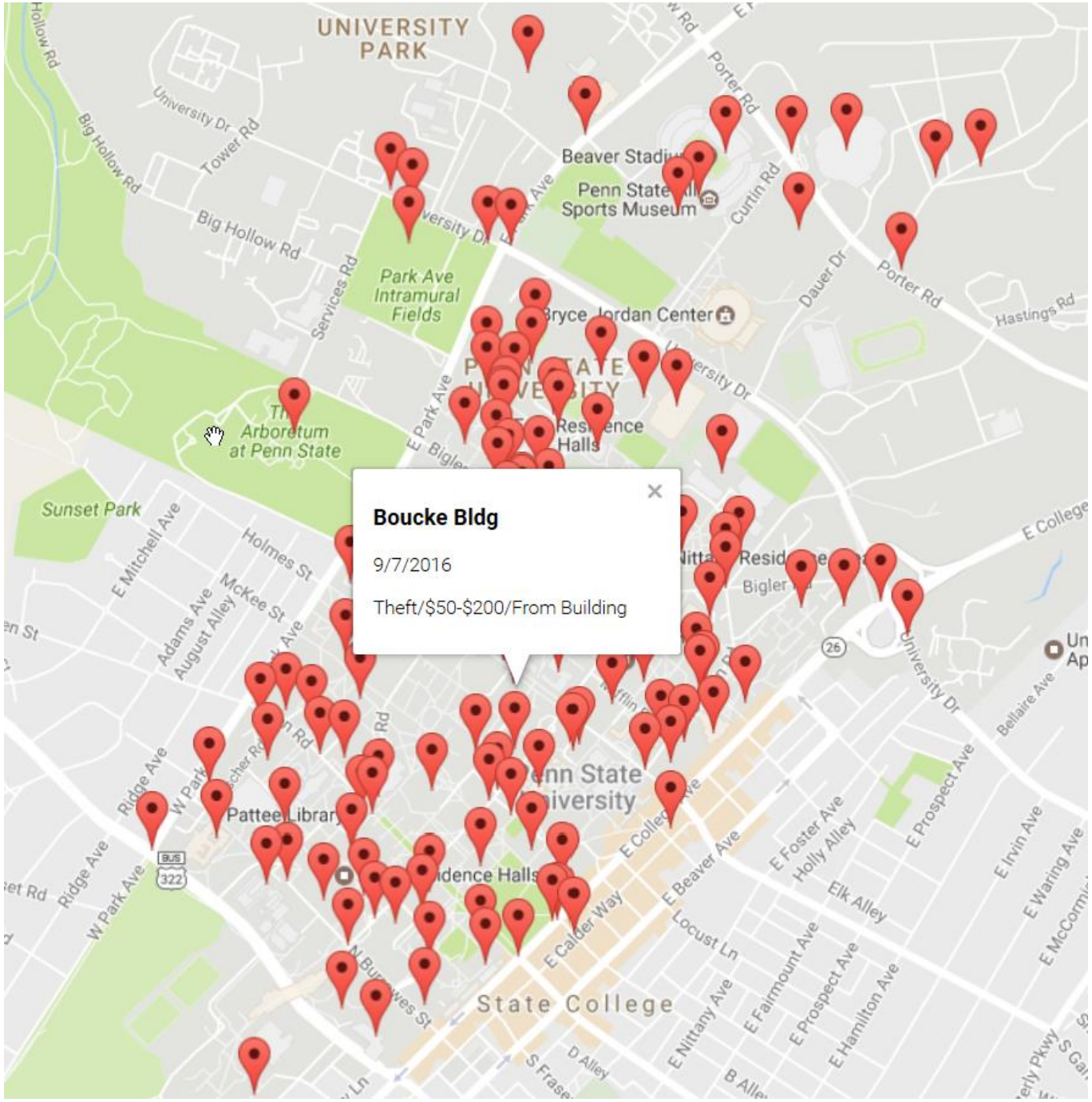
How to Extract Useful and Necessary Data?

- Programming languages
  - Java, C, Python, etc.
- Python
  - Popular and powerful
  - High-level
  - With lots of useful libraries
- E.g., extracting specific HTML fields with python.
  - https://www.youtube.com/watch?v=4d5px1jFL_A

Requirements of the First Assignment



- Data
  - https://my.up.ist.psu.edu/xuz14/330/InClassExercises/Week1/PSU_ReportedCrimes.txt(raw data)
  - https://my.up.ist.psu.edu/xuz14/330/InClassExercises/Week1/JSArray.txt (JavaScript array)
- Requirement
  - Create a web page (HTML+JavaScript) to show all entries
    - Correct map locations
    - Each entry is displayed as a marker
      - Mouse over a marker to show its location.
    - Requirement: map + location + markers +location tip
- Bonus
  - Click a marker to show the time, location, and reported crimes associated with it.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Locust Ln
E Foster Ave
Holly Alley
E Prospect Ave
Elk Alley
E Irvin Ave
E Waring Ave
E Fairmount Ave
E Nittany Ave
E Hamilton Ave
Bellaire Ave
Bigler Rd
BUS 322
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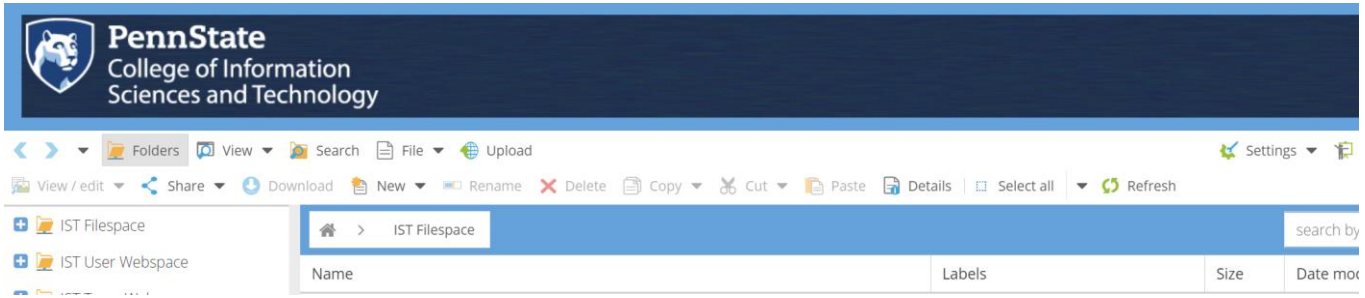
Today's Exercises

- Create a web page on your Penn State personal web site to show a Google Map Marker.

- Road map
  1. Get your PSU personal web site ready
  2. Get a Google Maps API Key
  3. Create/edit files and upload them to your PSU personal web site
  4. Visit the website in a browser

Exercise 1: my.up.ist.psu.edu server

- Go to https://webfiles.up.ist.psu.edu
- Log on the site with your PSU credential
- If you can access to the site and see something like the figure on the right, follow the instruction on the next slide (prepare files on your IST website).
  - Otherwise, go Slide 28 to prepare your files on your PSU website.



Exercise 1:
Prepare files on your IST website

- Log on to https://webfiles.up.ist.psu.edu
- Click “IST User Webspace” on the left panel to navigate to your IST web file space.
- Click the “New” button on the toolbar to create a document named as hello.html and edit the file by adding the following content:

  <html> <body> Hello World! </body></html>

- Save the file.
- Open a browser to visit this file with appropriate URL
  - http://my.up.ist.psu.edu/yourpsuid/hello.html

Exercise 2:
Get your Google Maps API Key

- https://developers.google.com/maps/documentation/javascript/examples/marker-simple#maps_marker_simple-javascript
- Jump to Step 3 to get the key first.
- Save your API key somewhere.

Exercise 3:
Prepare Google Map Documents

- Follow the instructions on https://developers.google.com/maps/documentation/javascript/adding-a-google-map to create three documents:
  - index.html, style.css, and index.js
- Edit these files by coping the corresponding contents from the web site.
- In the index.html file, replace the Google Maps API key with yours. Your key should appear after this string:

  src="https://maps.googleapis.com/maps/api/js?key=

- Open a browser to visit this file with appropriate URL

  http://my.up.ist.psu.edu/yourpsuid/index.html (if you use IST website)

  http://www.personal.psu.edu/yourpsuid/index.html (if you use PSU website)

Functions of Three Documents

- index.html: defining html content, include the map
- style.css: defining the size of the map
- index.js: defining the tasks to show a map by calling various Google Maps APIs
  - E.g., location, scale, marker, etc.

Google Maps

- Map services through a browser
- Various APIs
  - Maps: types of maps, scale, center
  - Overlay objects: markers, polylines
  - Events: on map and overlay objects
- How to use Google Maps?
  - Web programming languages to call APIs
  - APIs for different kinds of program languages
    - JavaScript

JavaScript Basics

- Statements
- Variables
- Events
- Functions

Statements

```
<script type="text/javascript">

var a = 10;
var b = 11;
var c;
c = a + b;
alert('The answer is' + c);

</script>
```

JavaScript Variables

- Case sensitive
- Must begin with a letter or the underscore character
- Need to be declared
  - var variableName

JavaScript Operators

- Arithmetic Operators
  - +,-,*,/,%,++,--
- Assignment Operators
  - =, +=, -=, *=, /=, %=
- Comparison Operators
  - ==: value only
  - ===: value and type
  - !=
  - >,<,>=,<=
- Logical Operators
  - &&, ||, !

Functions

```
<script>
    function myFunction() {
        alert(Date());
    }
</script>

<button onclick="myFunction()">The Time is?</button>
```

Events

- What is happening to HTML elements.
- User and browser events
  - onclick, onmouseover, onmouseout, onkeydown, etc.
- Example: onclick

```
<button onclick="this.innerHTML = Date()">The time is?</button>
```

  - http://www.w3schools.com/js/tryit.asp?filename=tryjs_event_onclick

Coding Tips

- Semicolons in JavaScript
- Match on parentheses, brackets, quotes
  - (), [], {}, "", ''
    - Using tabs
- Variable names
  - Capitalization
- Use the developer tools
  - Chrome developer tools
  - Firefox Developer tools
    - Web console, JavaScript debugger
- Use comments
  - // a single line comment
  - /* more lines
    more comments */

For Your First Programming Assignment

- You need to deal with multiple markers.
- You need to know how to handle an array in JavaScript.

From Google Maps Example

- index.html:
  - Contents

```
<link rel="stylesheet" type="text/css" href="./style.css" />
<script type="module" src="./index.js"></script>
```

  - CSS and JS file names
- style.css
  - map size
- index.js
  - Map definition

Exercise 4: Make your map centered on the UP Campus

- Modify the file index.js by changing the values of lat and lng in the variable uluru so that the map will be centered at the UP campus.
  - Go to https://maps.google.com and navigate to the UP campus. Click a place you want to focus (e.g., the Westgate, or the Old Main) and the latitude and longitude of the place will appear in the URL.
- Modify the value of the variable zoom to change the map scale to show more details of the campus.
  - You can also find the map scale number from the URL. The scale is an integer.

Next Week

- No class on Monday
- Wednesday: work on your PSU map assignment