



HKUST
VISLAB

COMP 4462

Data Visualization Tutorial

Leo Yu Ho, Lo
Wenchao Li

Friday 3 April, 2019

<https://bit.ly/vis-t06>

Javascript and Observable

- Javascript

- Nothing to do with Java
- The native programming language of web browsers
 - Compile to JS, e.g. coffeescript, typescript, scala.js, elm
 - Compile to binary for performance, see [WebAssembly](#)
 - Runs with HTML, CSS and web technologies (SVG, WebGL, HTML5 Canvas)
 - The programming language for data visualization
- The most widely used programming language
 - Both web and server (node.js)
- Big community and a lot of libraries on GitHub / npm
 - Data visualization: D3.js, Vega-Lite, p5.js and many more

- Observable

- A Jupyter notebook like environment for Javascript
- It runs on your browser entirely! No remote runtime (server) is needed.
- Built by Mike Bostock (the author of D3.js), Jeremy Ashkenas (the author of Coffeescript) and Tom MacWright

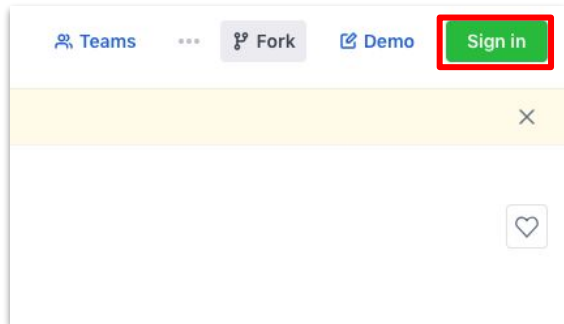
Data visualization workflow

1. Get data
2. Quick glance on data
 - a. What attributes are available? How large is the data size? How many missing values?
3. **Investigate data**
 - a. Make standard charts quickly
 - i. With MS Excel/Tableau
 - b. Twist and pull more data sources
 - i. With Python and Pandas, visualize with Altair
4. **Form hypotheses/insights/stories in data**
 - a. **Go back to 3** and check the hypotheses against the data
 - b. Until finding sound hypotheses/insights/stories
5. Present with visualizations tailor-made for the data
 - a. With D3 or other more expressive tools
 - i. It takes longer and more efforts to tailor-made a solution

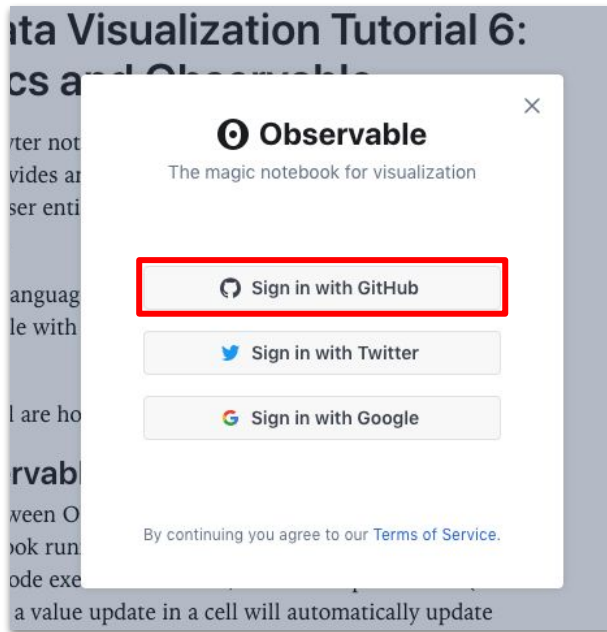
Sign in Observable

1. Go to the [notebook of this tutorial](#)

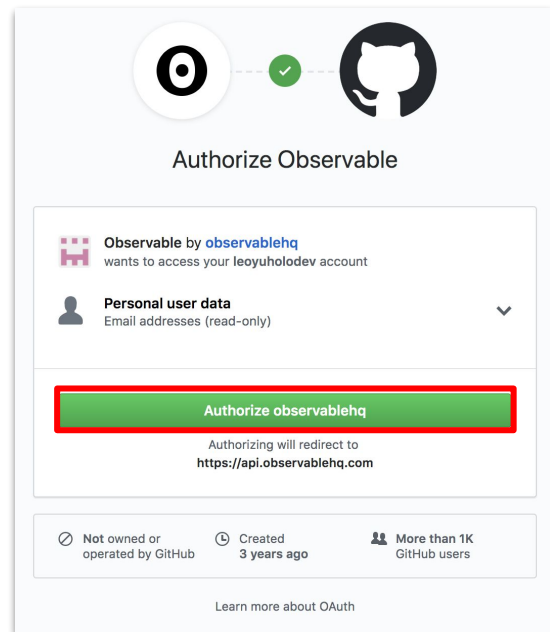
2. Click Sign in



3. Sign in with GitHub (recommended)



4. Authorize observablehq



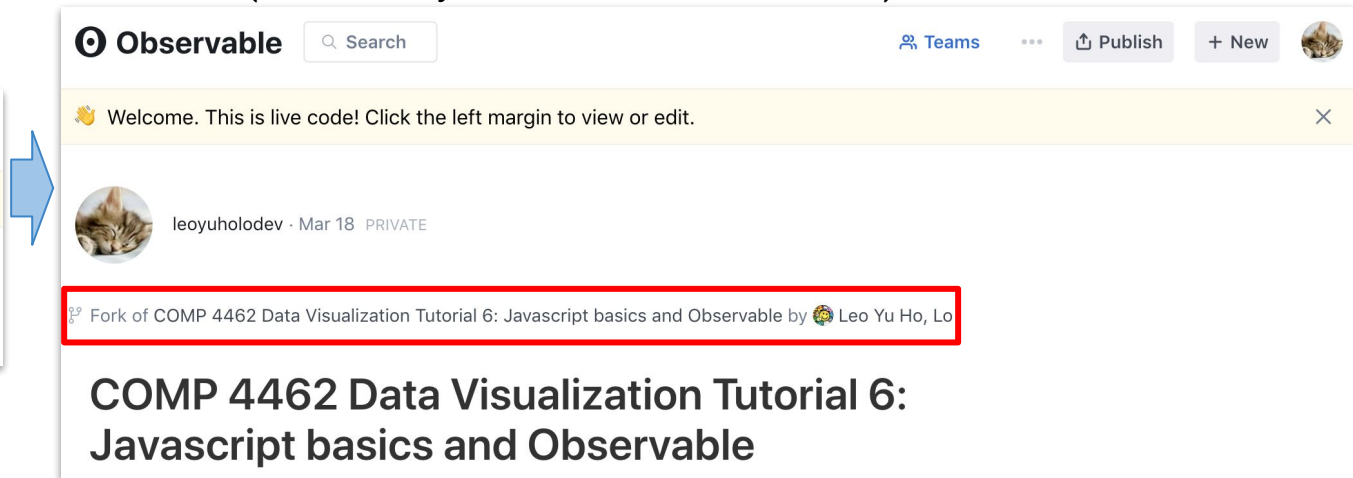
Fork Observable notebook

1. Go to the [notebook of this tutorial](#)

2. Click Fork



3. Check if you're working on your copy of the notebook (otherwise, your work will not be saved)



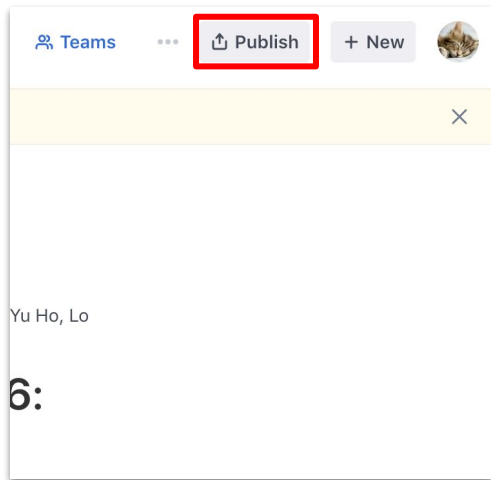
Javascript and Observable Basics

- See the [Observable notebook of this tutorial](#)
- Topics:
 - Javascript
 - Data types: number, string, array, object, date
 - Logic flow/loop
 - Function/arrow function
 - Callback/asynchronous
 - Datetime
 - Observable:
 - Expressions/blocks
 - Import libraries
 - Import data
 - Basic plot with Vega-Lite

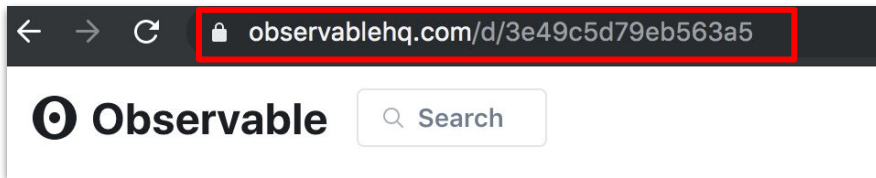
Publish your Observable notebook

1. In your working copy of the notebook

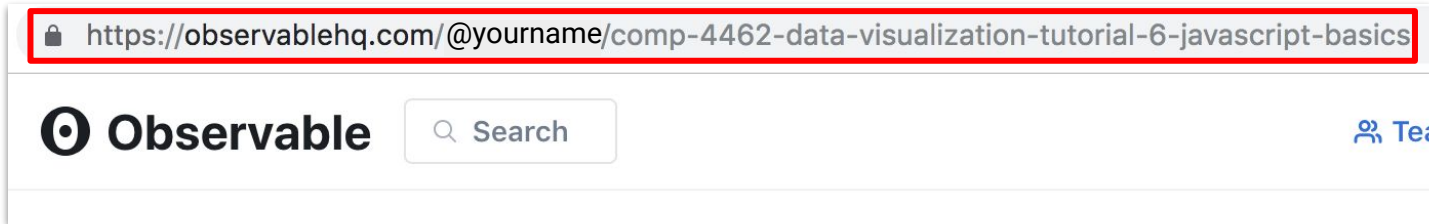
2. Click Publish



3. The URL changes from a hash...



4. To a meaningful URL, this URL is publicly accessible



Lab exercise

- Tasks

- Sign in [Observable](#)
- Open [this Observable notebook](#) and fork it (otherwise, your work will not be saved)
- Read through “Javascript and Observable Basics” and fill in the “TODO” cells
- Learn about how to load data from GitHub
- Plot the Pokemon dataset with vizsla
- Plot the Pokemon dataset with Vega-Lite
- Publish your notebook when finished
- Copy the URL of your Observable notebook and submit to Canvas
 - The URL should be something like:
 - <https://observablehq.com/@yourname/comp-4462-data-visualization-tutorial-6-javascript-basics>

- Optional

- Like [our Observable notebook](#) ❤️❤️❤️ and star [our GitHub repository](#) ★★★★★ Thank you! ❤️
- Learn about asynchronous in Javascript: [A blog post by Sebastian Lindström](#)
- Learn about event loop of Javascript: [A visualized explanation by Philip Roberts](#)

More topics on Javascript and Observable

- **A lot more about Javascript**

- Promise / async / await / generator / iterator / delegation / asynchronous generator / variable scope / immutability / prototypal inheritance / event loop / “this” keyword / class / object destructuring / web worker
- Compile to JS languages
 - Babel / Typescript / Coffeescript / Elm / Scala.js
- Frontend development
 - Frameworks like React / Vue.js / AngularJS
 - Webpack module bundler
- Backend development: Node.js and npm
- Use Javascript to build desktop/mobile apps: Electron / React Native

- **More on Observable features**

- See the ["Observable: The User Manual"](#) notebook
- Streaming data / latex / files / viewof / mutable / different kinds of input / tables / saving SVG / presentation slides / streaming shapefiles / create animated gif

Next tutorial

Vega-lite and data
processing libraries

- We will use [Observable](#) again
- Learn more about Javascript!
- [Vega-Lite](#)
 - The library behind Altair
- [Lodash](#)
 - Utility library of Javascript
- [Moment.js](#)
 - Datetime manipulation library