



HKUST
VISLAB

COMP 4462




Data Visualization Tutorial

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Friday 1 November, 2024

D3.js Introduction

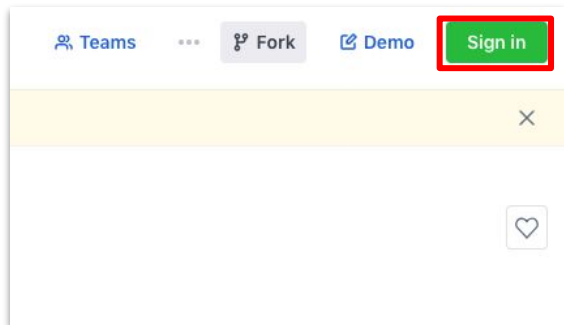
Visualization with D3.js

- SVG (Scalable Vector Graphics)
 - An extension of HTML for representing scalar graphics in XML syntax
 - Available in all the web browsers
- D3.js
 - The most widely used visualization library
 - The library behind Vega, Vega-Lite and Altair
 - Binding data with SVG DOM, marking data points visually onto screen
 - Imperative syntax, compared to the declarative syntax of Vega-Lite and Altair
- Why D3.js
 -  Exploring a dataset, use Altair with Python or Tableau instead
 -  Embed visualization in web applications, use Vega-Lite instead
 -  Make customized plots, customized interactions or transitions
- Cost
 - Much more coding, much easier to make mistakes
 - Check [Vega-Lite Gallery](#) and [Vega Gallery](#) before committing to D3.js

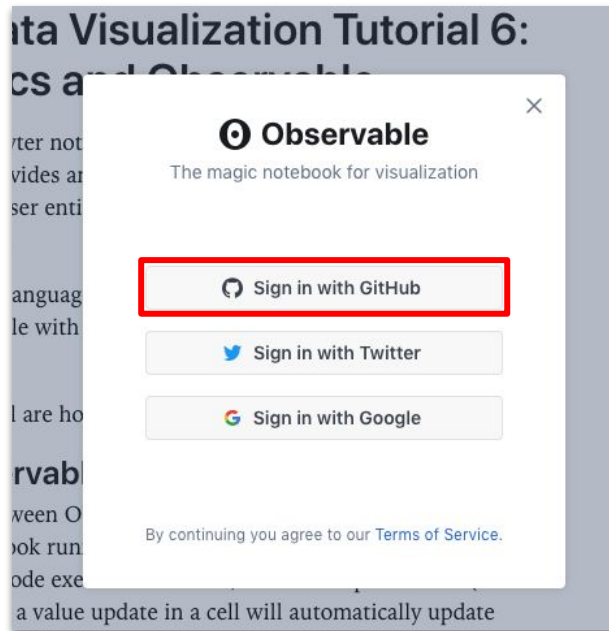
Sign in Observable

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

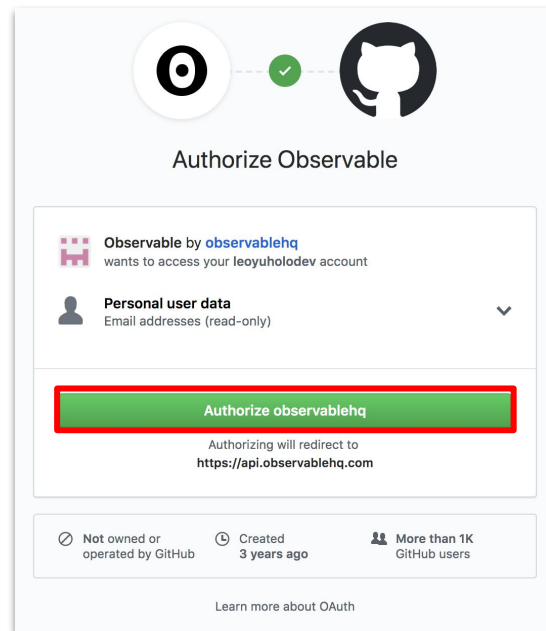
2. Click Sign in



3. Sign in with GitHub (recommended)



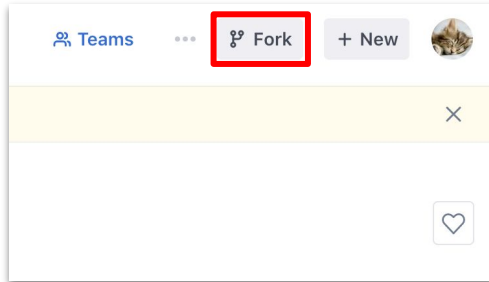
4. Authorize observablehq



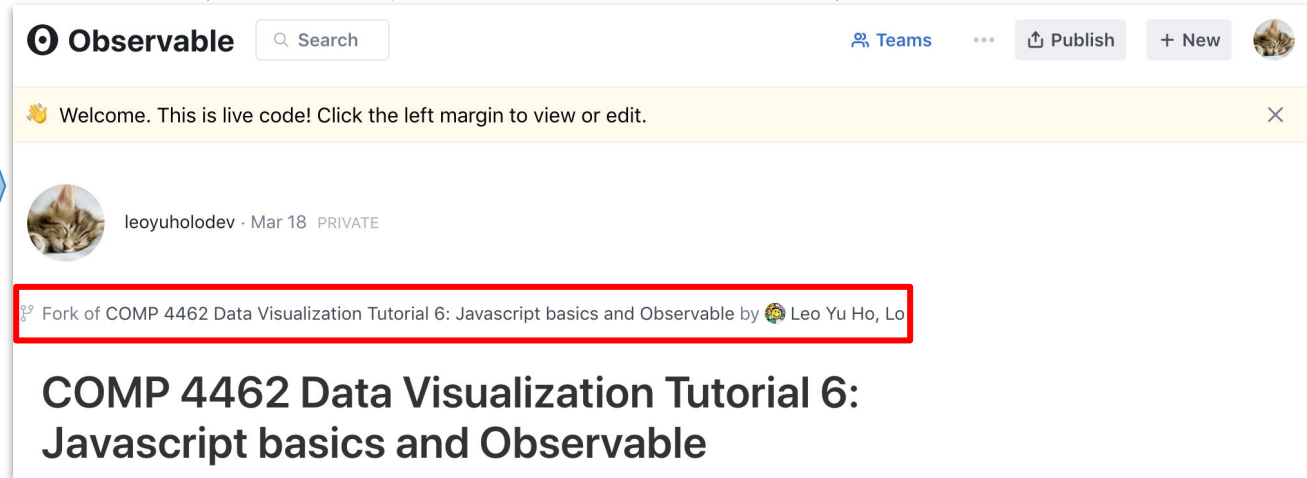
Fork Observable notebook

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)



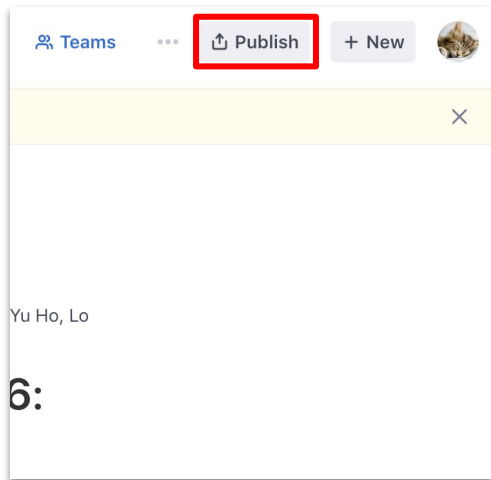
Visualization with D3.js

- See the [Observable notebook of this tutorial](#)
- SVG
- Scales
 - Linear scale (numeric, color)
 - Time scale
 - Point scale (categorical)
- Coordinate System
 - Axes
 - Cartesian coordinate (X and Y)
 - Polar coordinate (angular and distance)
- Marks and channel
 - Point: scatter plot
 - Line: (multi-)line chart, parallel coordinate, radar chart
- Selection

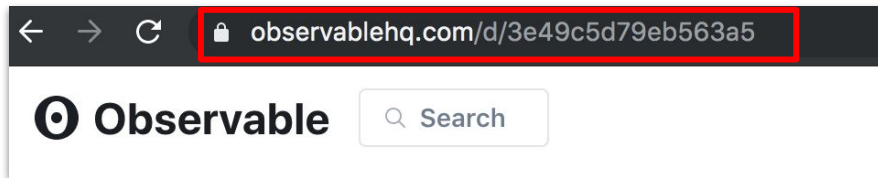
Publish your Observable notebook

1. In your working copy of the notebook

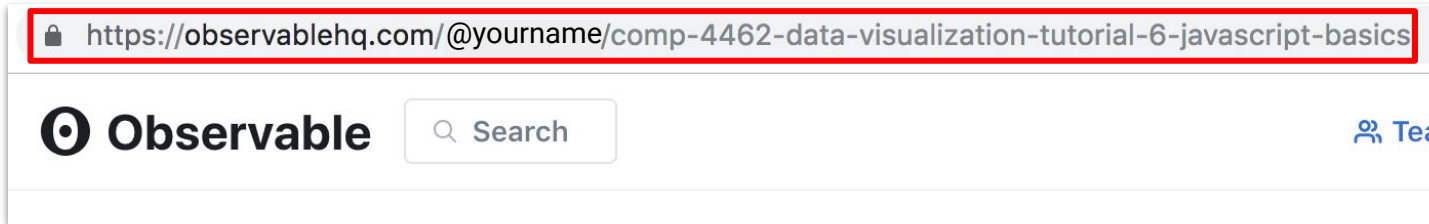
2. Click Publish



3. The URL changes from a hash...



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



Interaction with D3.js

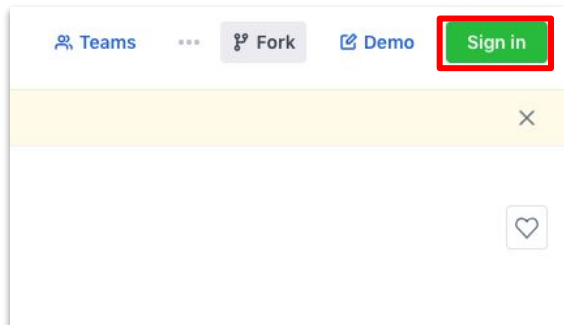
Visualization and Interaction with D3.js

- Interaction with visualization
 - Visualization has well established before the invention of computer
 - But interaction with visualization only available through the use of computers
 - Huge space of possibilities
 - But all successful interaction designs follow **“Overview first, details on demand”**
 - Visualization interactions mostly through mouse
 - Seldomly with keyboard
 - Interaction through touch devices is a grand challenge in data visualization
- Animation
 - Makes interaction smoother, more responsive
 - Keep conceptual consistency, objects enter the scene instead of appear suddenly
 - Motion is a very attention attractive channel
 - It is built-in in our mind to track moving objects (because of primal instincts?)
 - But too much moving objects will overwhelm viewers

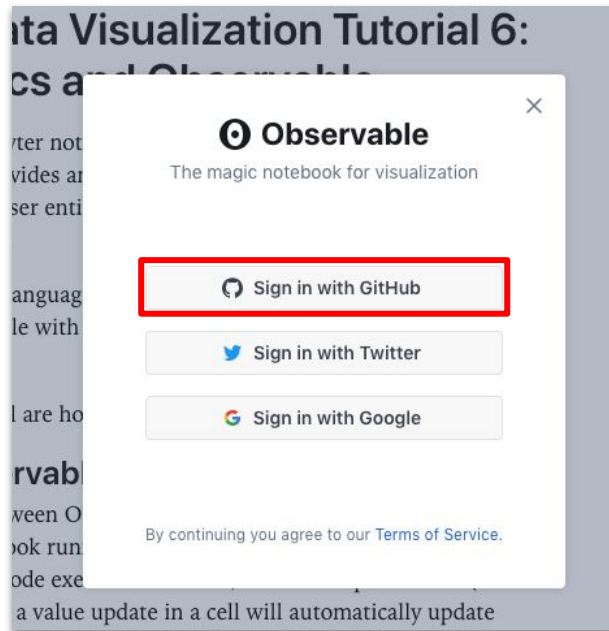
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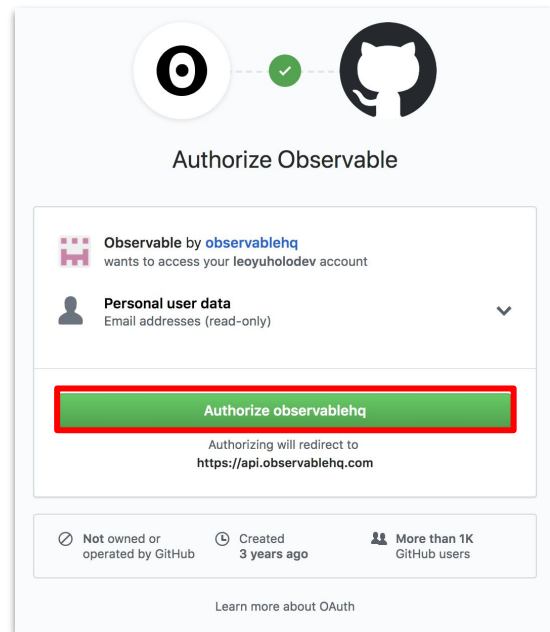
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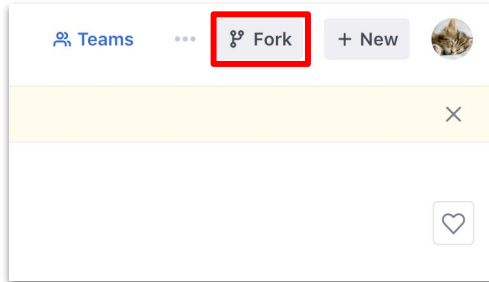
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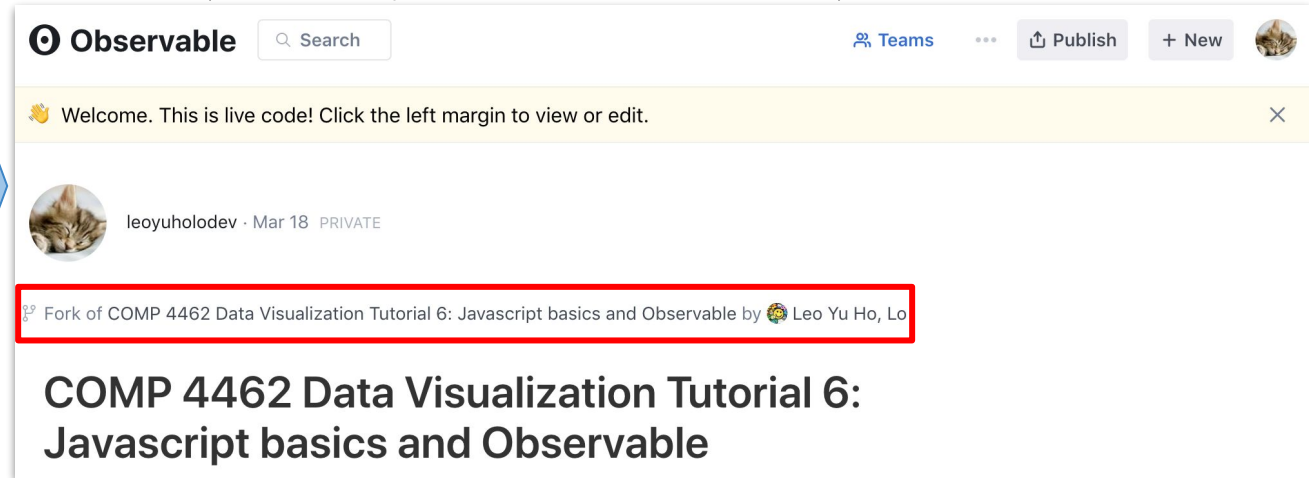
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Visualization and Interaction with D3.js

- See the [Observable notebook of this tutorial](#)
- Choropleth (maps with color encoding)
- Interaction
 - Overview first, details on demand!
 - Tooltip with <title> element, d3-tip
 - Mouse events: mouseover, mouseout, click
 - Observable inputs: dropdown menu, slider
 - Linked views
- Animation
 - Eyes beat memory!
 - Animation with redraw, D3.js transition
 - Motion encoding, pop-out effect
- Data analysis techniques
 - Daily average over month total
 - How to handle missing data?

More on interactions and D3.js

- More on interactions
 - D3.js: [d3-drag](#), [d3-zoom](#), [d3-brush](#)
 - Demos: [d3-drag](#), [d3-zoom](#), [d3-brush](#)
 - Vega-Lite:
 - [Interactive Plots with Selection in Vega-Lite](#)
 - Altair:
 - [Making Charts Interactive in Altair](#)
- Visualizations not covered in tutorials
 - Wordle (a.k.a. Word Cloud)
 - [Javascript implementation of wordle by Jason Davies](#)
 - [Vega Word Cloud Example](#)
 - Graph visualization
 - [D3 in Depth: Layouts](#) and [D3 in Depth: Force layout](#)
 - [Vega Force Directed Layout Example](#)
 - Besides D3, [Gephi](#) is a professional graph visualization tool