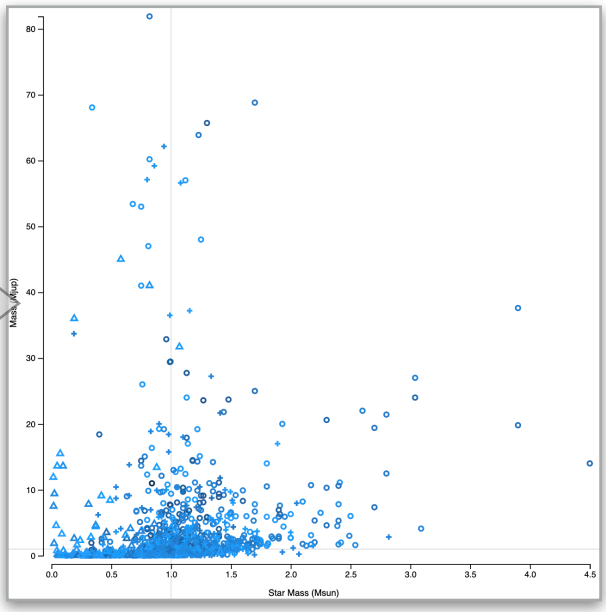
M2ID (2020-2021) - TD s02

Goal: we want to visualize multi-variate data about exoplanets, see if there is some obvious relationship between the mass of planets and the mass of their parent star.

# name	mass	discovered	detection_type	star_name	mag_v	star_mass
11 Com b	19.4	2008	Radial Velocity	11 Com	4.74	2.7
11 Oph b	21.0	2007	Imaging	11 Oph		0.0162
11 UMi b	10.5	2009	Radial Velocity	11 UMi	5.02	1.8
14 And b	5.33	2008	Radial Velocity	14 And	5.22	2.2
14 Her b	4.64	2002	Radial Velocity	14 Her	6.67	0.9
16 Cyg B b	1.68	1996	Radial Velocity	16 Cyg B	6.2	1.01
18 Del b	10.3	2008	Radial Velocity	18 Del	5.52	2.3
1RXS 1609 b	14.0	2008	Imaging	1RXS1609		0.73
1SWASP J1407 b	20.0	2012	Primary Transit	1SWASP J1407	12.4	0.9
24 Boo b	0.91	2018	Radial Velocity	24 Boo	5.6	0.99
24 Sex b	1.99	2010	Radial Velocity	24 Sex	7.38	1.54
24 Sex c	0.86	2010	Radial Velocity	24 Sex	7.38	1.54
2M 0103-55 (AB) b	13.0	2013	Imaging	2M 0103-55 (AB)		0.4
2M 0122-24 b	20.0	2013	Imaging	2M 0122-24		0.4
2M 0219-39 b	13.9	2015	Imaging	2M 0219-39		0.11
2M 0441+23 b	7.5	2010	Imaging	2M 0441+23		0.02
2M 0746+20 b	30.0	2010	Imaging	2M 0746+20		0.12
2M 1207-39	24.0	2001	Imaging	2M 1207-39	20.15	0.025
2M 1207-39 b	4.0	2004	Imaging	2M 1207-39	20.15	0.025
2M 1938+46 b	1.9	2015	Pulsar	2M 1938+46		0.6
2M 2140+16 b	20.0	2010	Imaging	2M 2140+16		0.08
2M 2206-20 b	30.0	2010	Imaging	2M 2206-20		0.13
2M 2236+4751 b	12.5	2016	Imaging	2M 2236+4751	12.5	0.6
2M J2126-81 b	13.3	2016	Imaging	TYC 9486-927-1	9.0	0.4
2MASS J0249-0557 (AB) c	11.6	2018	Astrometry			
2MASS J0249-0557A	48.0	2018	Astrometry			
2MASS J0249-0557B	44.0	2018	Astrometry			
2MASS J11193254 AB	3.7	2017	Imaging	2MASS J11193254 AB		
2MASS J1450-7841 A	40.0	2017	Imaging	2MASS J1450-7841 B		0.04
2MASS J1450-7841 B	40.0	2017	Imaging	2MASS J1450-7841 A		0.04
2MASS J2250+2325 b	30.0	2017	Imaging	2MASS J2250+2325		
30 Ari B b	9.88	2009	Radial Velocity	30 Ari B	7.1	1.22
38 Vir b	4.51	2016	Primary Transit	38 Vir	6.11	1.18
4 Uma b	7.1	2007	Radial Velocity	4 Uma	5.79	1.234
42 Dra b	3.88	2009	Radial Velocity	42 Dra	4.83	0.98
47 Uma b	2.53	1996	Radial Velocity	47 Uma	5.1	1.03
47 Uma c	0.54	2001	Radial Velocity	47 Uma	5.1	1.03
47 Uma d	1.64	2010	Radial Velocity	47 Uma	5.1	1.03
51 Eri b	9.1	2015	Imaging	51 Eri	5.223	1.75
51 Peg b	0.47	1995	Radial Velocity	51 Peg	5.49	1.11
55 Cnc b	0.84	1996	Radial Velocity	55 Cnc	5.95	0.905
55 Cnc c	0.1784	2002	Radial Velocity	55 Cnc	5.95	0.905
55 Cnc d	3.86	2002	Radial Velocity	55 Cnc	5.95	0.905
55 Cnc e	0.02547	2004	Primary Transit	55 Cnc	5.95	0.905
55 Cnc f	0.1479	2007	Radial Velocity	55 Cnc	5.95	0.905



We will use D3 to create a scatterplot visualization that:

- maps the planet's mass (as *n* times the mass of Jupiter) to x-position;
- maps the mass of its parent star (as n times the mass of our Sun) to the y-position;
- maps the year when it was discovered to color brilliance;
- maps the method used to detect it to symbols (triangle/cross/circle);
- only shows planet detected with one of the following 3 methods:
  - `Primary Transit`;
  - `Microlensing`;
  - `Radial Velocity`.

1. Task

We no longer use the DOM API to manipulate the HTML+SVG structure. We use the D3 API, which makes the code much less verbose and features a lot of extremely useful functions, as we will see throughout the petite classe sessions.

Reminder: make sure that you have a local HTTP server running (with, e.g., atom-live-server or python) and that you access your files through the `http://` protocol, not the `file://` protocol.

The code skeleton already contains some D3 code to parse the input data file, create the SVG canvas and initialize the scatterplot's axes and associated scales. When you load `ex02.html` in your browser, you should already see these elements, as depicted in Figure 1. If you do not, contact us.

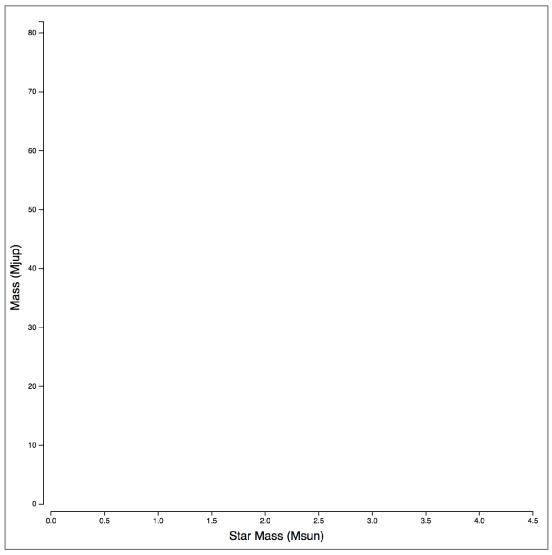


FIGURE 1: ELEMENTS ALREADY GENERATED

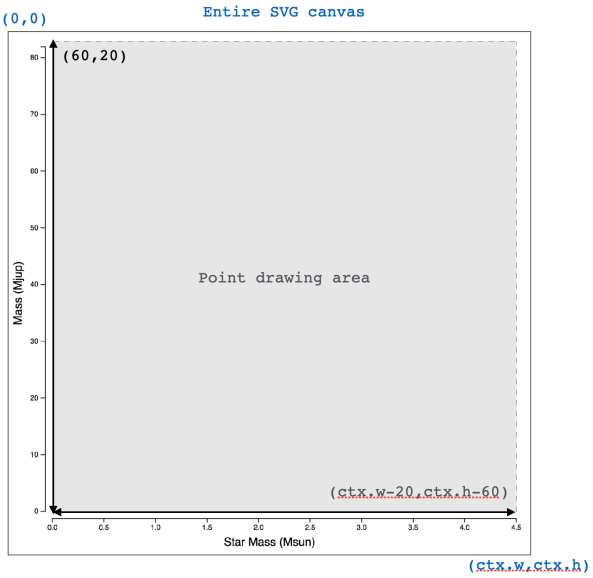


FIGURE 2: COORDINATES OF DRAWING AREA.

Your task is now to write the contents of method `populateSVGcanvas()`, which should draw all exoplanets (after filtering, see Tip #3 below) in the drawing area identified in Figure 2.

Read the tips in Section 2 below before you actually start coding.

Once done, add the gray line indicators for `1 Msun` and `1 Mjup` to the background layer, as illustrated in Figure 3.

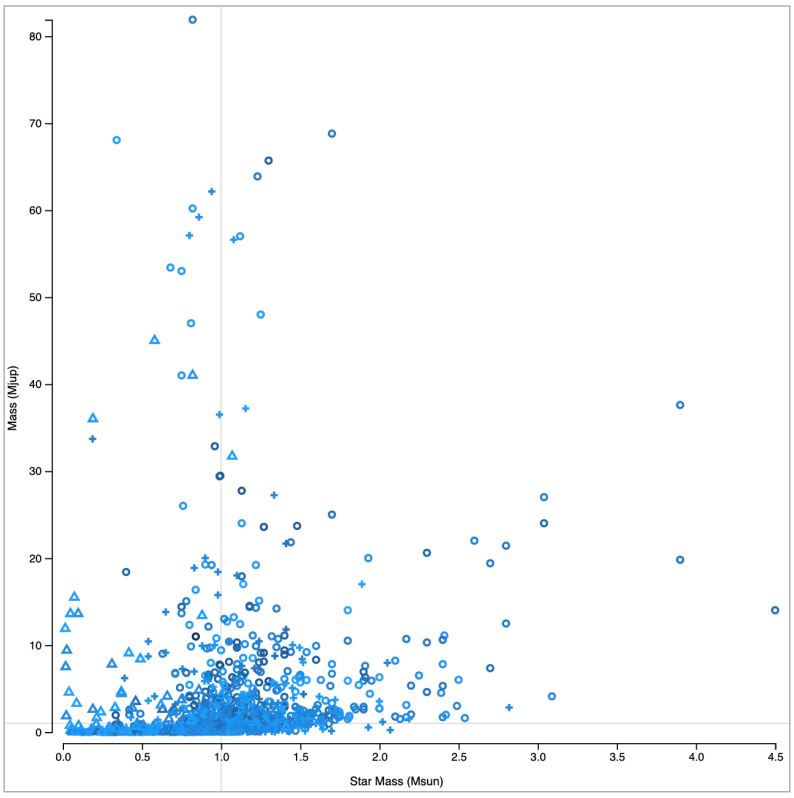
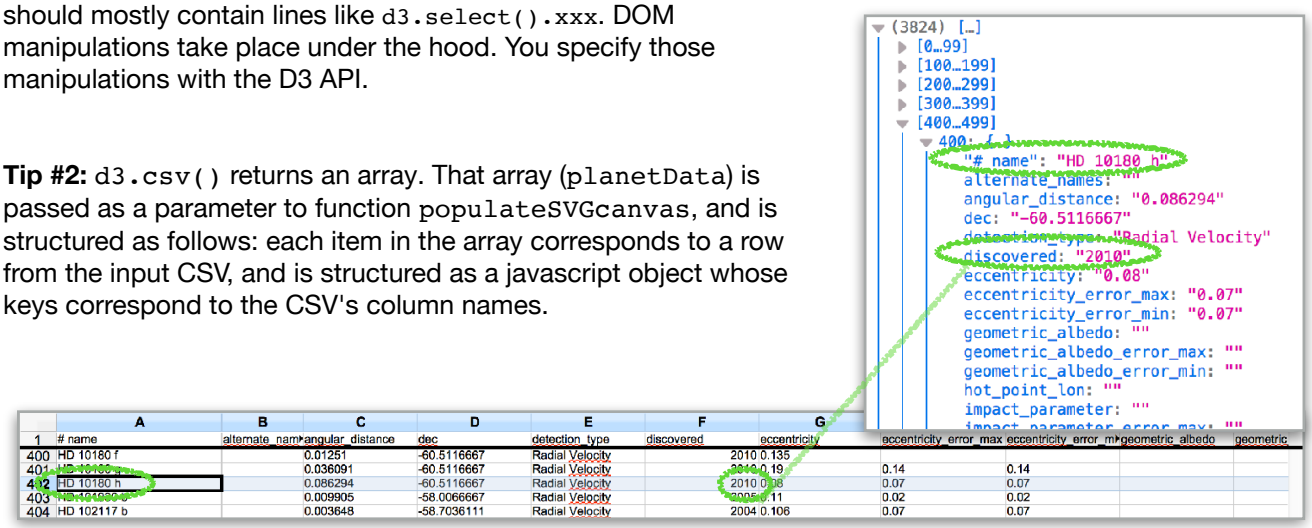


FIGURE 3: GRAY LINES INDICATE 1MSUN AND 1MJUP

2. Tips

Tip #1: as mentioned in Section 1, we no longer use the DOM API to manipulate the HTML+SVG tree. This means that your code should *NOT* contain *ANY* line like `document.getElementById(...)` or `Node.appendChild(...)` or `document.createElementNS(...)`. It should mostly contain lines like `d3.select().xxx`. DOM manipulations take place under the hood. You specify those manipulations with the D3 API.

Tip #2: `d3.csv()` returns an array. That array (`planetData`) is passed as a parameter to function `populateSVGcanvas`, and is structured as follows: each item in the array corresponds to a row from the input CSV, and is structured as a javascript object whose keys correspond to the CSV's column names.



You will find all the necessary data columns in this table: `mass, star_mass, detection_type, discovered`.

Tip #3: filter out planets with `mass==0` or `star_mass==0`. Function `Array.filter()` is your friend.

Tip #4: define your own scales for other mappings if need be. For instance to assign colors to years of discovery. You can define scales for almost anything, including size, color, orientation, opacity, *etc*. Anything that can reasonably be interpolated.