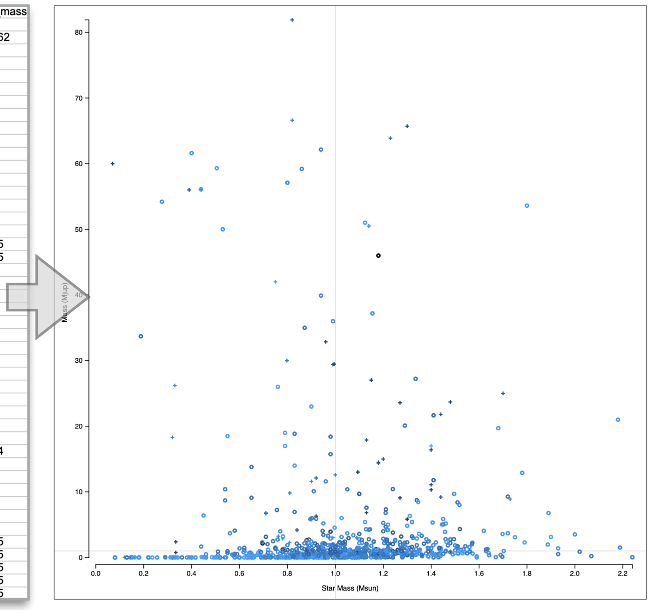
INF552 (2023-2024) - PC s02

Goal: we want to visualize multi-variate data about exoplanets, see if there is some 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 y-position;
- maps the mass of its parent star (as n times the mass of our Sun) to the x-position;
- maps the year when it was discovered to color brilliance;
- maps the method used to detect it to symbols (cross/circle);
- only shows planet detected with one of the following 2 methods:
  - `Primary Transit`;
  - `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, tell us.

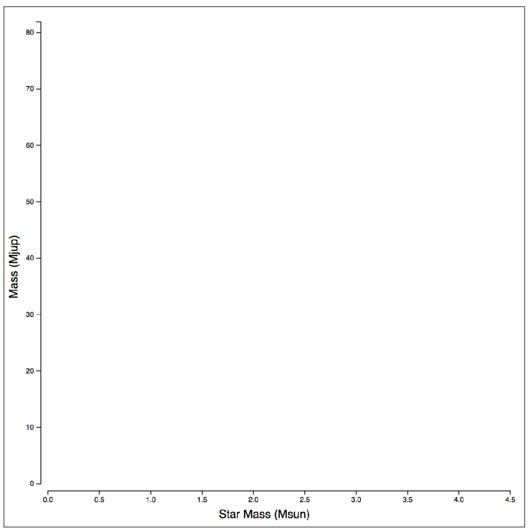


FIGURE 1: ELEMENTS ALREADY GENERATED

Read the tips in Section 2 on the next page before you actually start coding.

1.1 Linear Scales

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

In the DOM tree, put exoplanets discovered using Primary Transit in `<g#PT>`, and those discovered using Radial Velocity in `<g#RV>`. Both `<g>` have already been created in function `createVis()`.

Define your own scale for the year of discovery / color mapping. You can define scales for almost anything, including size, color, orientation, opacity, *etc*. Anything that can reasonably be interpolated. See PC s#02 slide 12 (D3 - Scales).

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

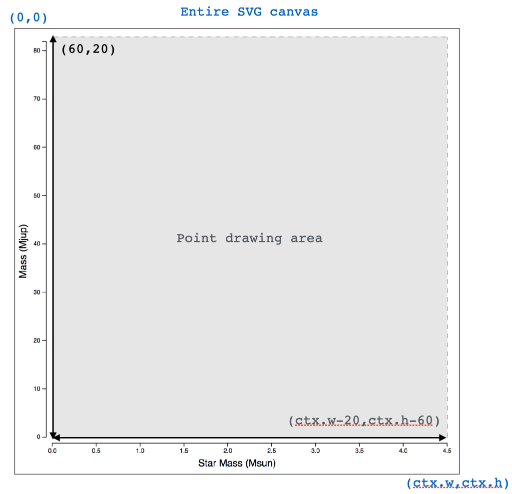


FIGURE 2: COORDINATES OF DRAWING AREA.

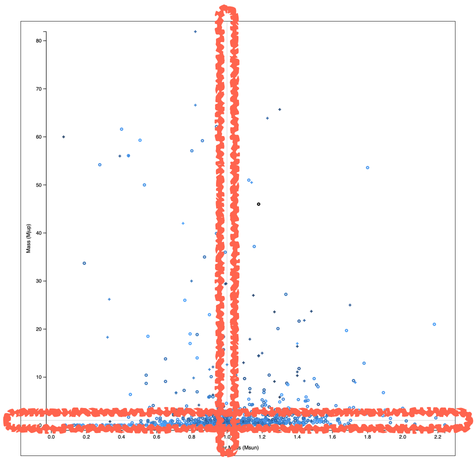


FIGURE 3: GRAY LINES INDICATE 1 MSUN AND 1 MJUP

1.2 Log Scales (optional)

Switch to a log scale for planet mass and star mass. The result should look like Figure 4.

Null-values have already been removed for you (remember Tip#3) so there is no need to perform any additional filtering. Simply adjust scale domains so that they do not include `0`.

PC s#02 slide 12 (D3 - Scales) has links to the relevant documentation about scales.

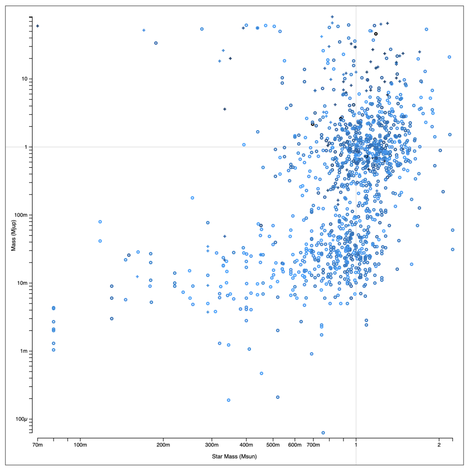


FIGURE 4: USING LOG SCALES

1.3 Tooltips (optional)

Show the name of the planet associated with a given data point when the cursor hovers over that point (Figure 5).

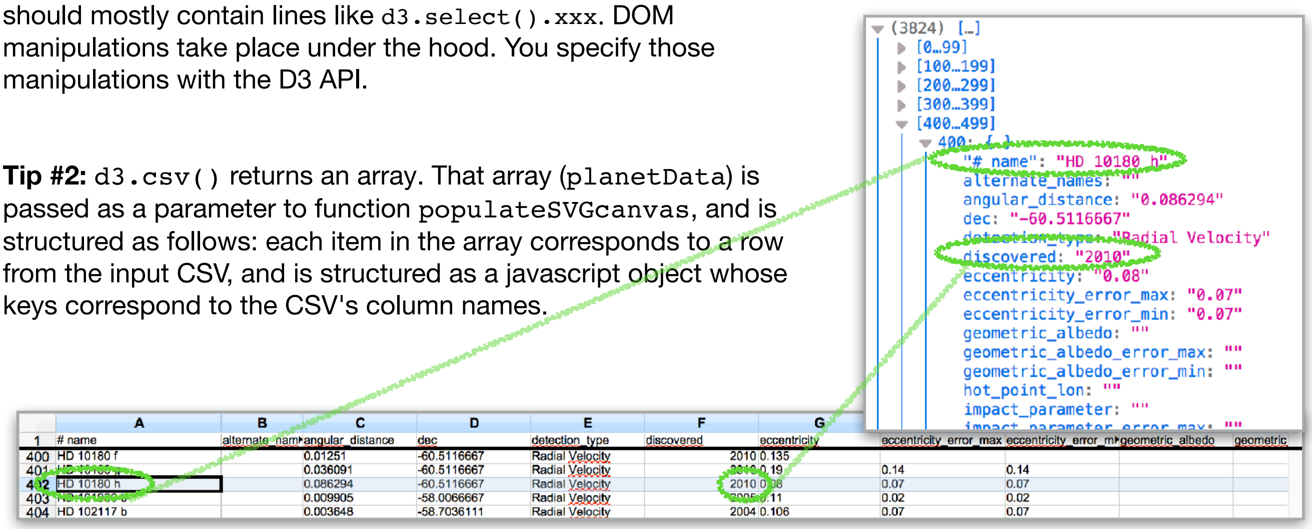
To do this, append a `<title>` node to each `<path>` mark. The content of that `<title>` element should be the planet's name.

FIGURE 5: TOOLTIP

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: planet data is already filtered to eliminate entries with `mass==0` or `star_mass==0` or detected using another method than the two considered here (primary transit, radial velocity).