Getting familiar with R

Oct 1, 2021

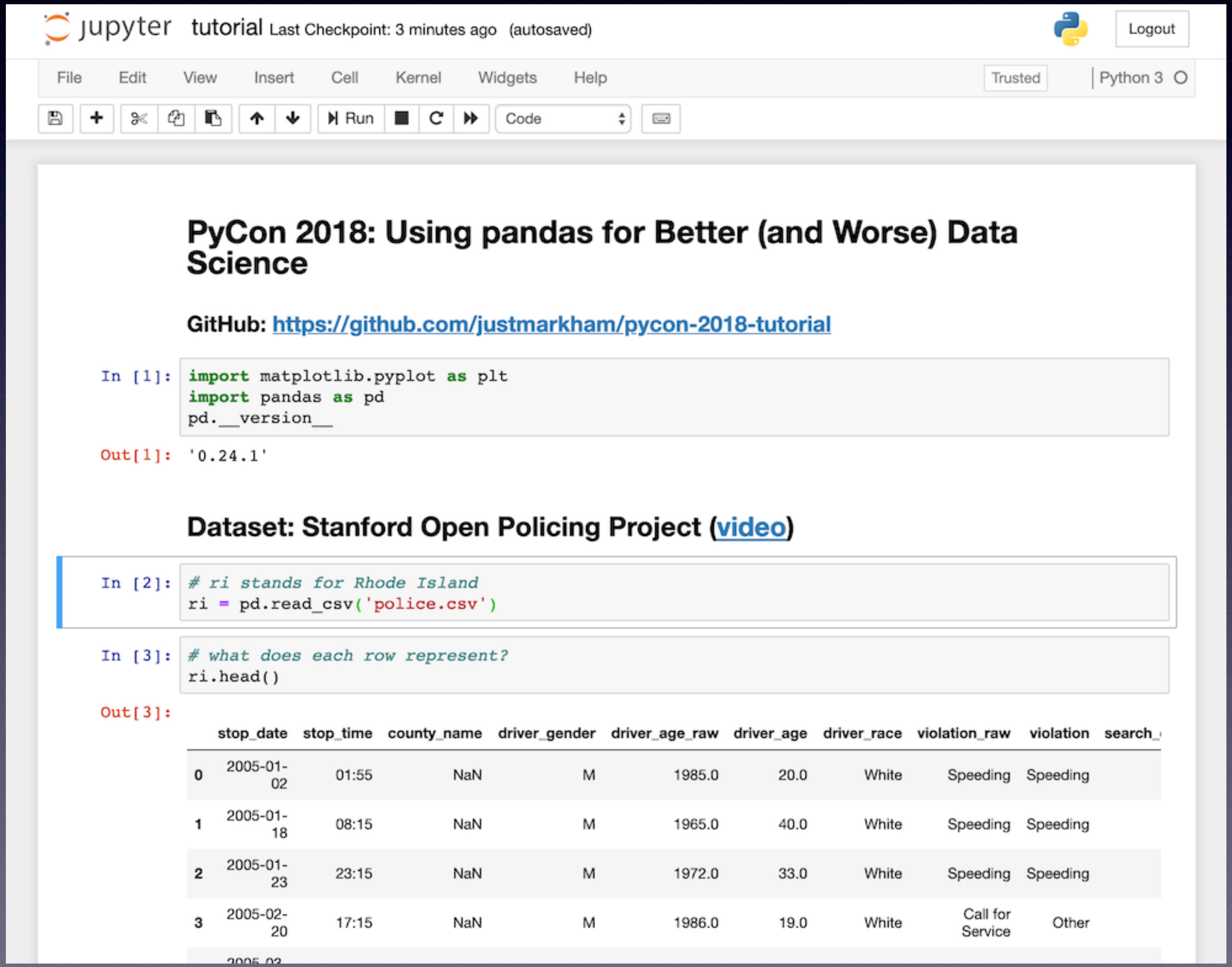
Qingyao
Baudis group

R v.s. Python

	Python	R
	popular, large community, library support	
Field	General-purpose	Finance, Healthcare
Usage	Web development, Machine learning, Scientific computing	Statistical modeling, Data visualisation
Advantage	Readable (indentation, English syntax) Unstructured data	Data frame! Exploratory visualization
Disadvantage	Slow	Unclear error message Slow

IDE

Python Jupiter notebook



PyCon 2018: Using pandas for Better (and Worse) Data Science

GitHub: https://github.com/justmarkham/pycon-2018-tutorial

```
In [1]: import matplotlib.pyplot as plt
        import pandas as pd
        pd.__version__
Out[1]: '0.24.1'
```

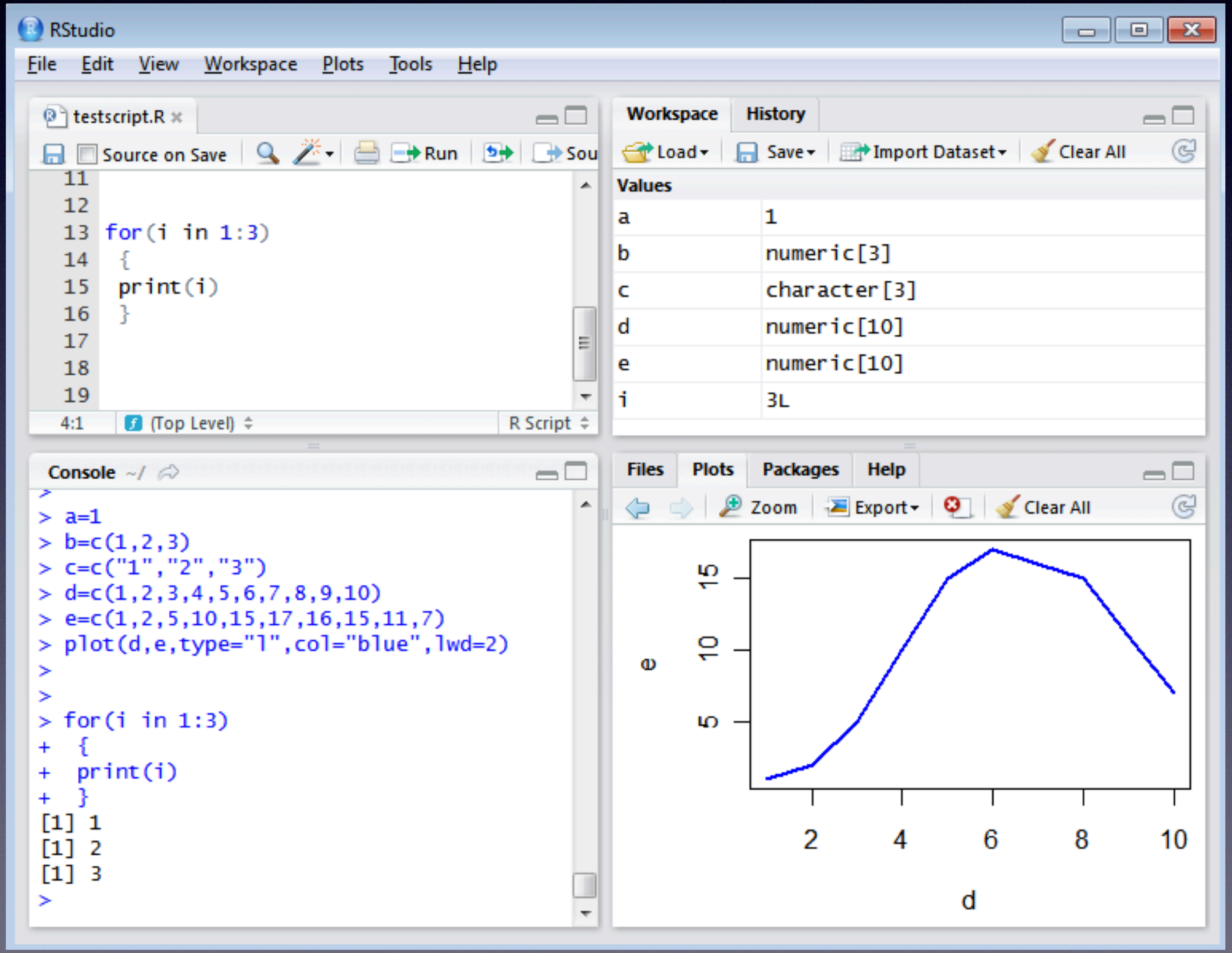
Dataset: Stanford Open Policing Project (video)

```
In [2]: # ri stands for Rhode Island
        ri = pd.read_csv('police.csv')
```

```
In [3]: # what does each row represent?
        ri.head()
Out[3]:
```

	stop_date	stop_time	county_name	driver_gender	driver_age_raw	driver_age	driver_race	violation_raw	violation	search_
0	2005-01-02	01:55	NaN	M	1985.0	20.0	White	Speeding	Speeding	
1	2005-01-18	08:15	NaN	M	1965.0	40.0	White	Speeding	Speeding	
2	2005-01-23	23:15	NaN	M	1972.0	33.0	White	Speeding	Speeding	
3	2005-02-20	17:15	NaN	M	1986.0	19.0	White	Call for Service	Other	
	2005-03									

R RStudio



```
for(i in 1:3)
 {
 print(i)
 }
```

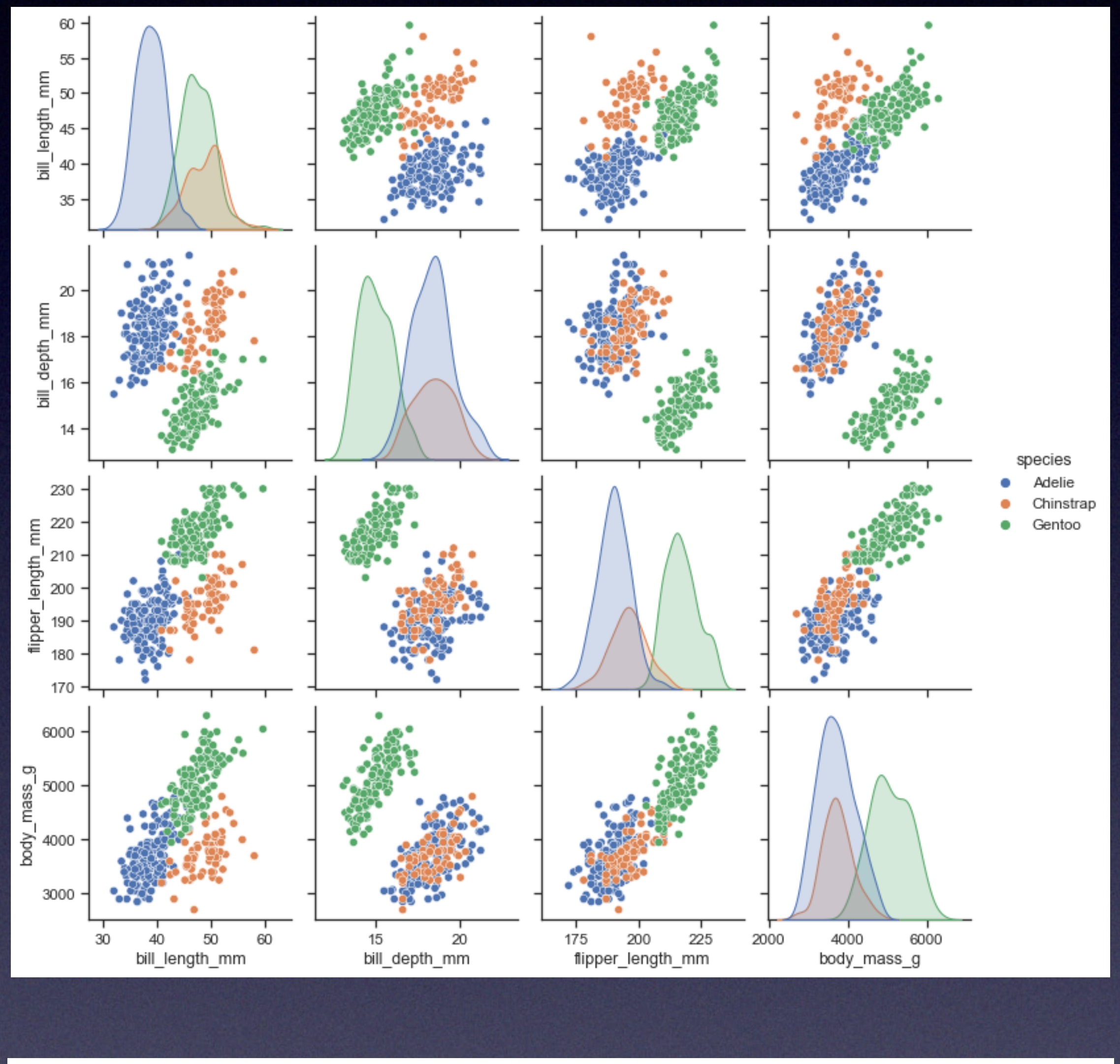
Values	
a	1
b	numeric[3]
c	character[3]
d	numeric[10]
e	numeric[10]
i	3L

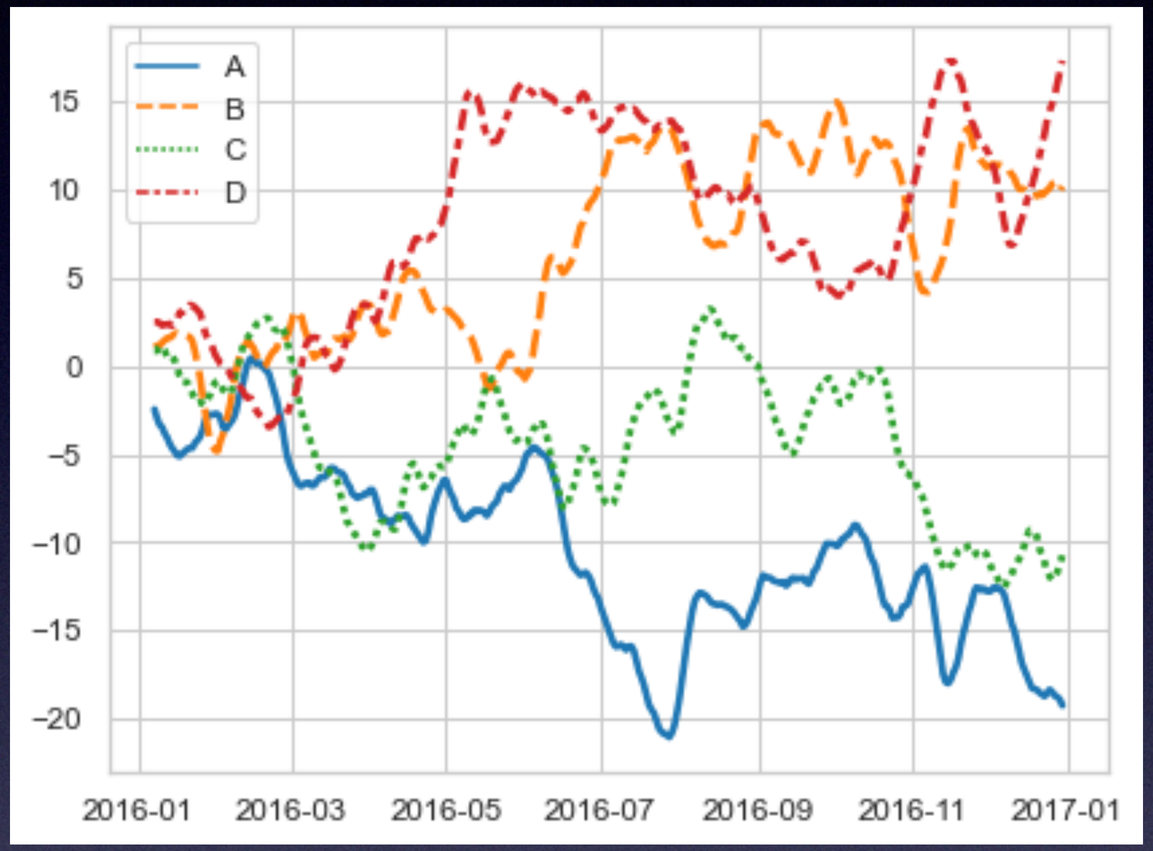
```
>
> a=1
> b=c(1,2,3)
> c=c("1","2","3")
> d=c(1,2,3,4,5,6,7,8,9,10)
> e=c(1,2,5,10,15,17,16,15,11,7)
> plot(d,e,type="l",col="blue",lwd=2)
>
>
> for(i in 1:3)
+  {
+  print(i)
+  }
[1] 1
[1] 2
[1] 3
>
```

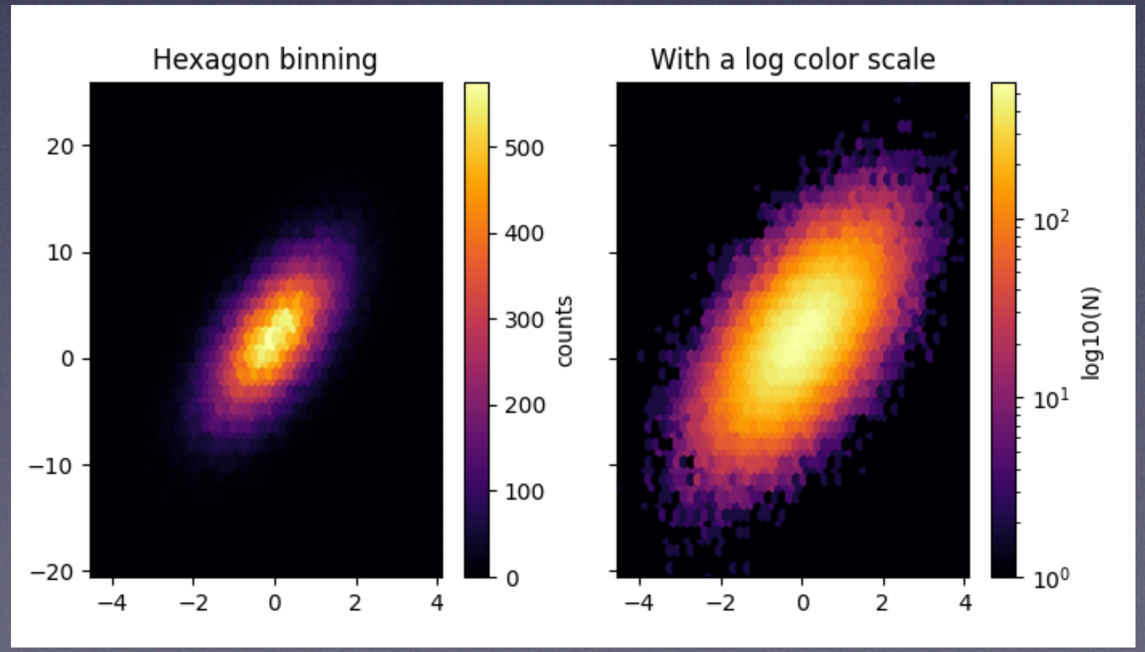
Data visualisation

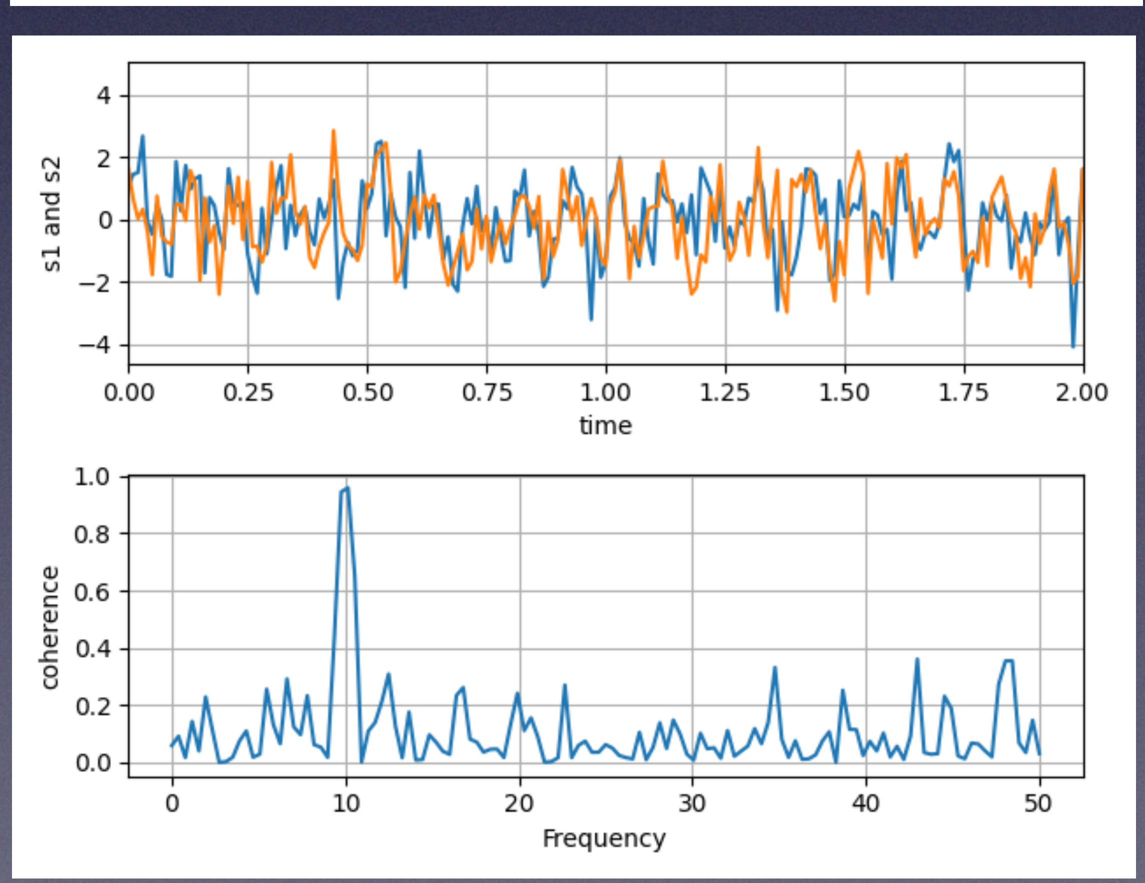
Python seaborn, Matplotlib

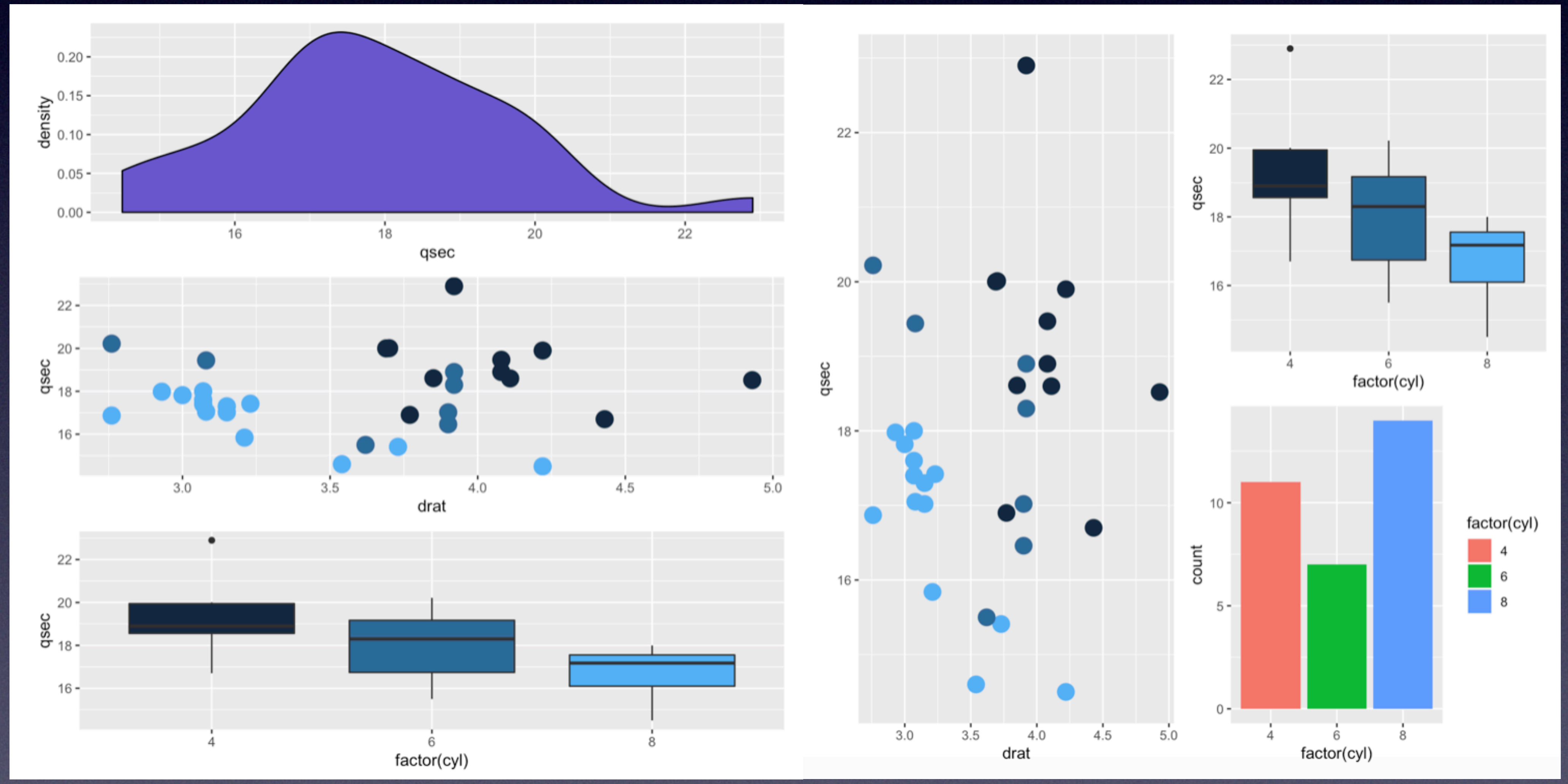
R ggplot2











https://www.r-graph-gallery.com/ggplot2-package.html

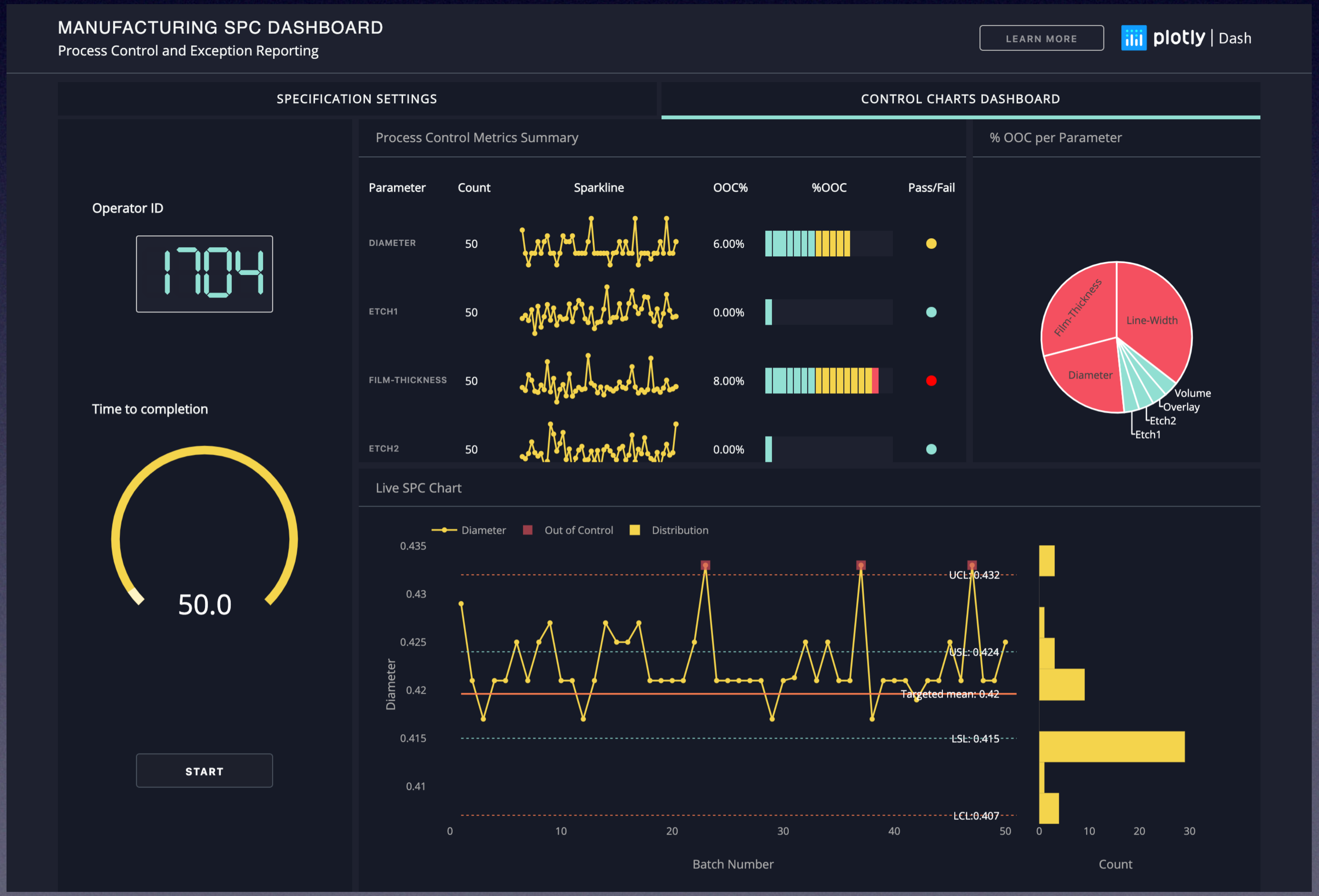
https://seaborn.pydata.org/examples/index.html

https://matplotlib.org/gallery/index.html

https://docs.bokeh.org/en/latest/index.html

Web app

Python Dash



MANUFACTURING SPC DASHBOARD

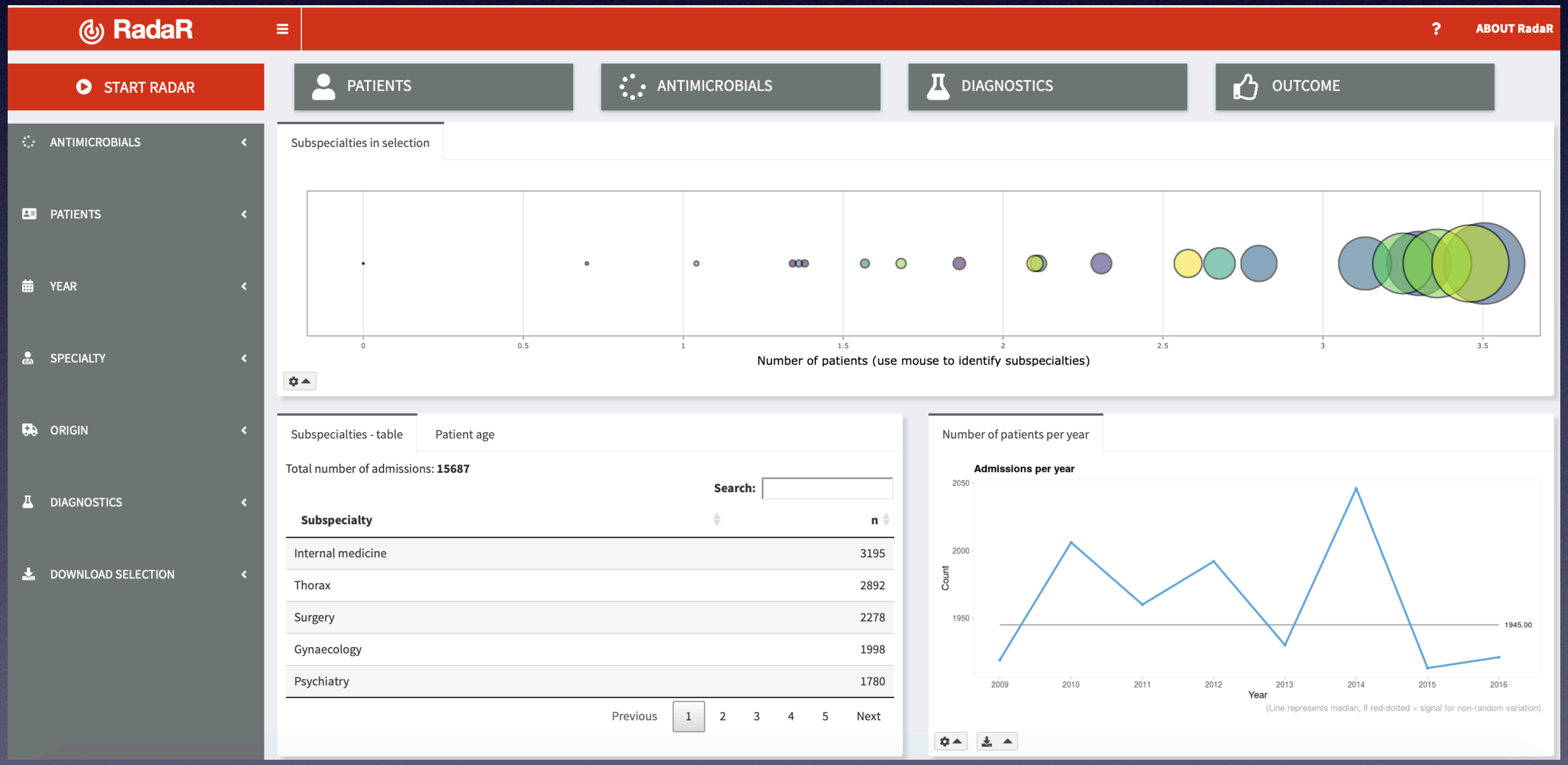
Process Control and Exception Reporting

Process Control Metrics Summary

Parameter	Count	Sparkline	OOC%	%OOC	Pass/Fail
DIAMETER	50		6.00%		●
ETCH1	50		0.00%		●
FILM-THICKNESS	50		8.00%		●
ETCH2	50		0.00%		●

https://dash-gallery.plotly.host/dash-manufacture-spc-dashboard/

R Rshiny



RadaR
?
ABOUT RadaR
START RADAR
PATIENTS
ANTIMICROBIALS
DIAGNOSTICS
OUTCOME
ANTIMICROBIALS
PATIENTS
YEAR
SPECIALTY
ORIGIN
DIAGNOSTICS
DOWNLOAD SELECTION
Subspecialties in selection
Number of patients (use mouse to identify subspecialties)
Number of patients per year
Admissions per year
Count
Year
1945.00
(Line represents median; if red-dotted = signal for non-random variation)

Subspecialties - table | Patient age

Total number of admissions: **15687**

Search:

Subspecialty	n
Internal medicine	3195
Thorax	2892
Surgery	2278
Gynaecology	1998
Psychiatry	1780

Previous 1 2 3 4 5 Next

https://shiny.rstudio.com/gallery/hospital-data-antimicrobial.html

Reading

A (very) short introduction to R (https://cran.r-project.org/doc/contrib/Torfs+Brauer-Short-R-Intro.pdf)

edX (HarvardX) Data Science: R basics (https://courses.edx.org/courses/course-v1:HarvardX+PH125.1x+2T2020/course/)

HarvardX Class Note (https://rafalab.github.io/dsbook/getting-started.html)

Cheatsheets, e.g. ggplot2, tidyverse (https://rstudio.com/resources/cheatsheets/)

Basics

- Mathematical operators: + - * / ^
- Logical operator: == <= >= %in%
- Assignment operator: <- =
- Programming: *if* conditional, *for* loop
- Calculation: mean max median sum log
- Comment: #

Classes

- 0-D: character, numeric, logical
- 1-D: vector

```
v = c(1,2,3)
```

- 2-D: matrix, data frame

```
M = matrix(data = c(1,2,3,4), nrow = 2)
df = data.frame(M)
```

- flexible: list

Function

```
> SumTwoNumber <- function(a,b){

      return (a+b)

    }

> result <- SumTwoNumber(1,2)

> result

3
```

Import data

- read.table(path_to_file)
- read_delim(path_to_file) #readr library

Use libraries

- install.packages(package_name)
- library(package_name)

Data frame

- nrow, ncol, dim
- colnames, rownames
- df[:,2], df$Value
- apply, sapply, lapply

df

	Name	Value
1	John	20
2	Alice	45

Plotting

```
v1 = rnorm(100); v2 = rnorm(100)+1
```

- hist(v1) plot(x=v1, y=v2) #basic
- ggplot(data_frame_name) + geom_*xxx*() #ggplot2 library
  - bar, histogram, boxplot, violin, line

Cheatsheet Here!

https://github.com/rstudio/cheatsheets/raw/master/data-visualization.pdf