NYU | TANDON SCHOOL OF ENGINEERING

Lecture 4
Charts

Programming for Business Analytics
MG-GY 8401

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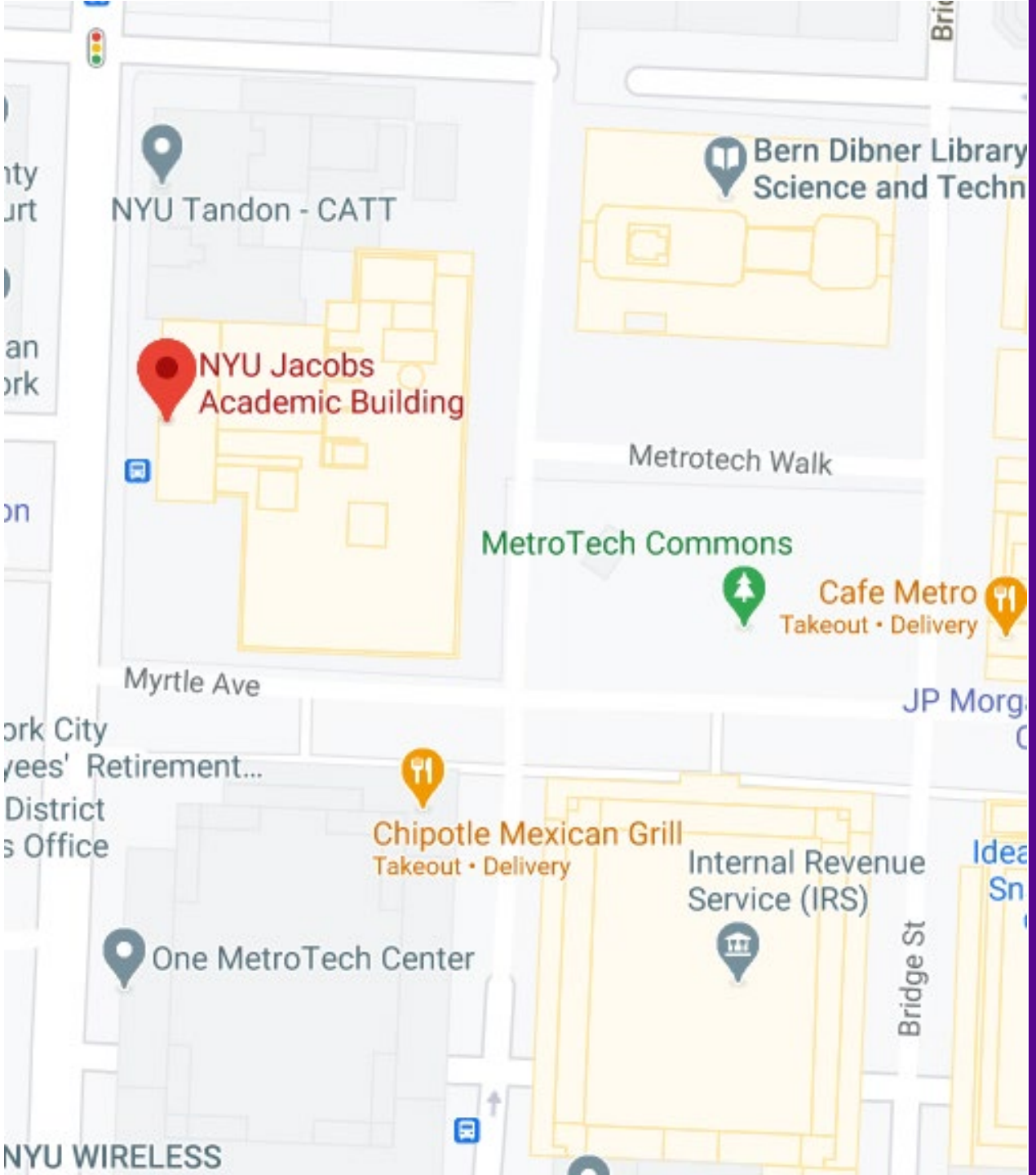
Agenda

- Charts
  - Figures + Axes
- Tables
  - File Input/Output



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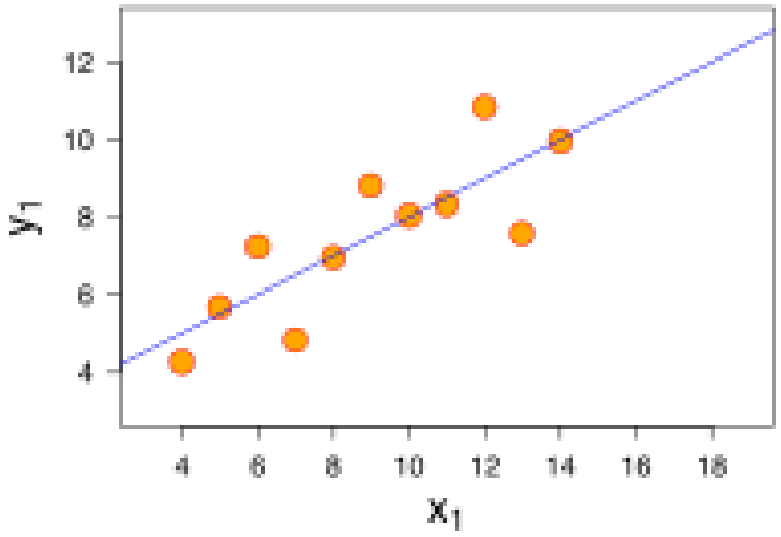
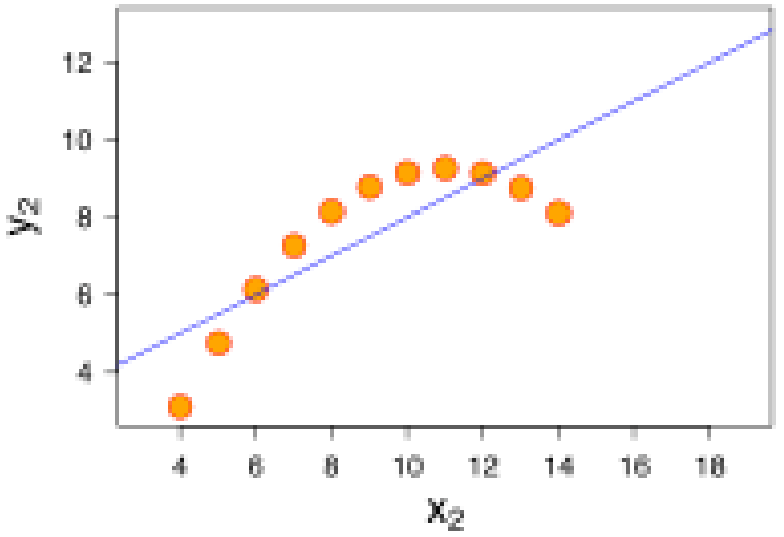
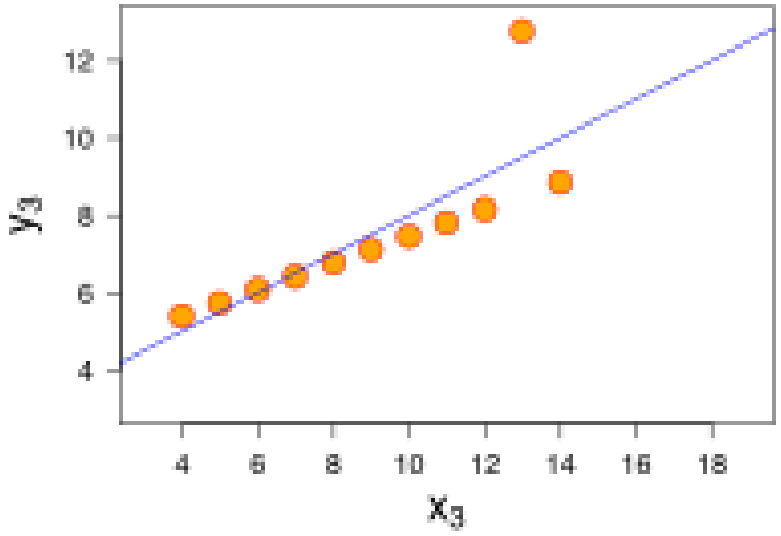
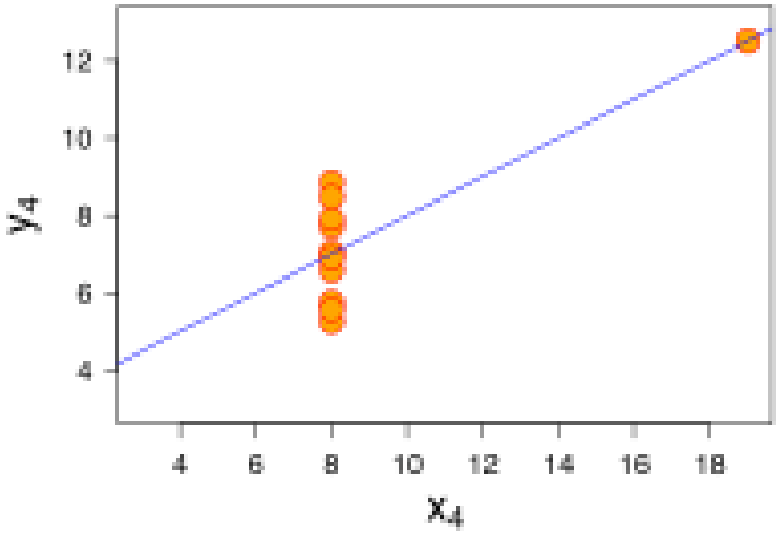
Logistics

- Homework
  - Homework 4
  - Homework 3


12
10
8
6
4
y_1
4 6 8 10 12 14 16 18
x_1


12
10
8
6
4
y_2
4 6 8 10 12 14 16 18
x_2


12
10
8
6
4
y_3
4 6 8 10 12 14 16 18
x_3


12
10
8
6
4
y_4
4 6 8 10 12 14 16 18
x_4

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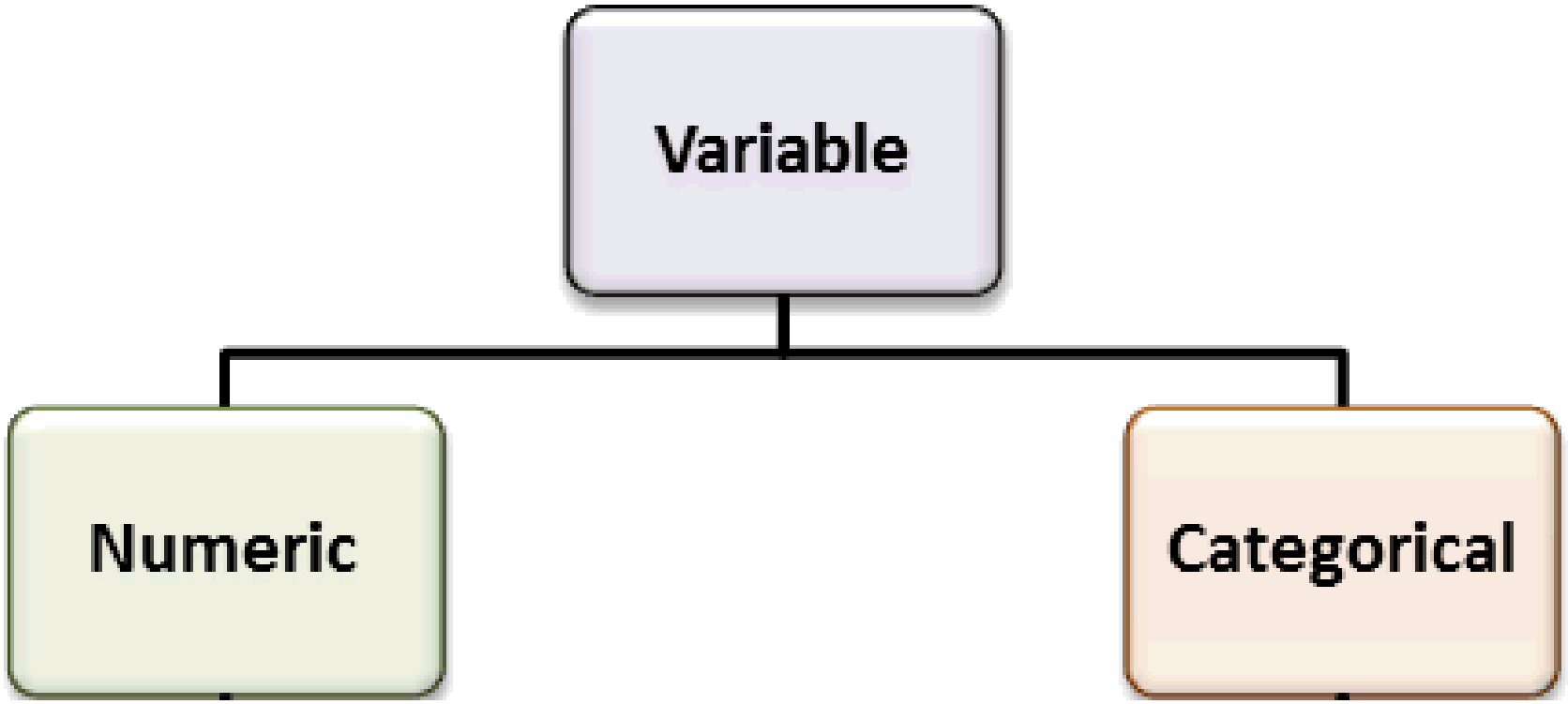
Data Types



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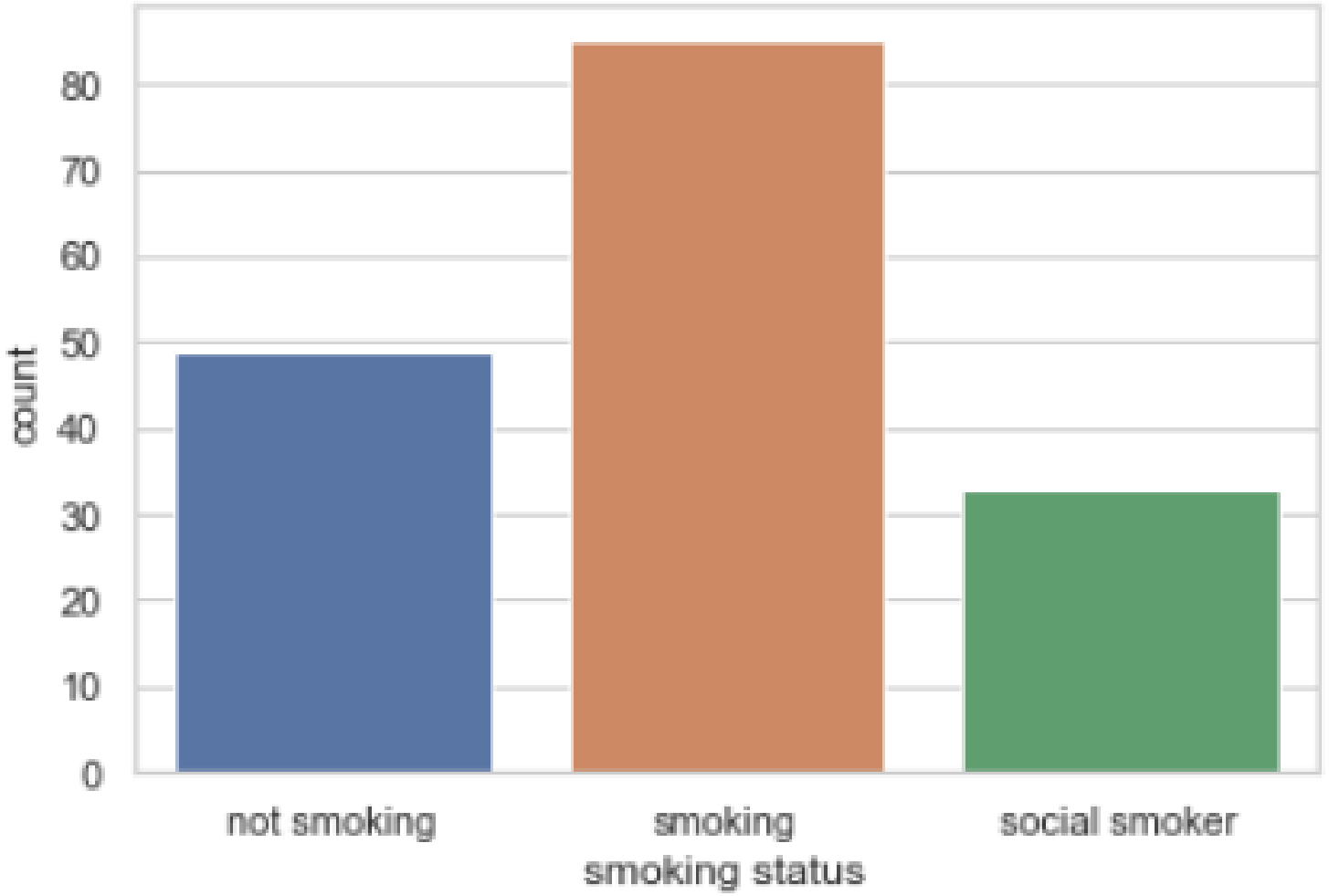
Bar-Chart



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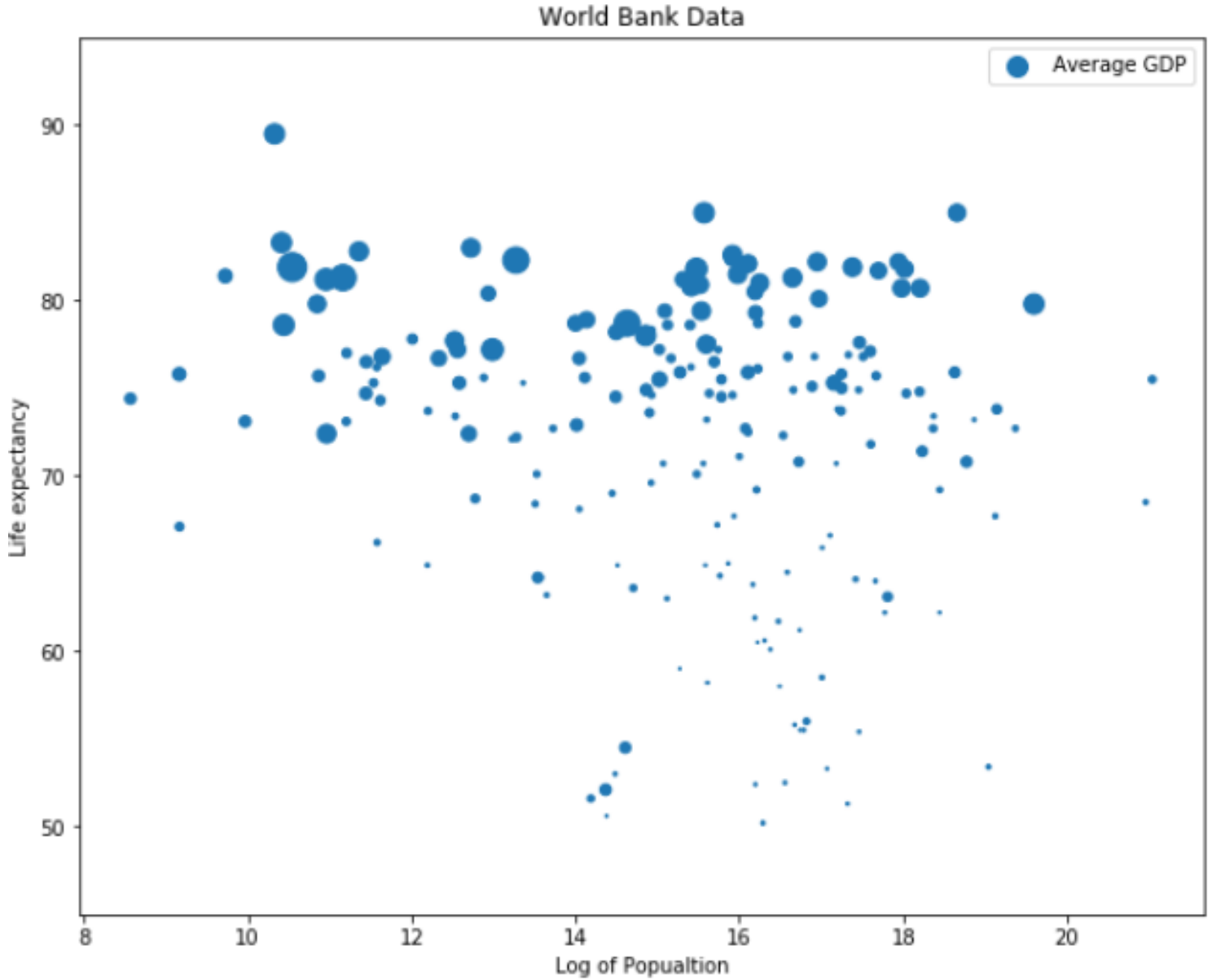
Scatter-Plot



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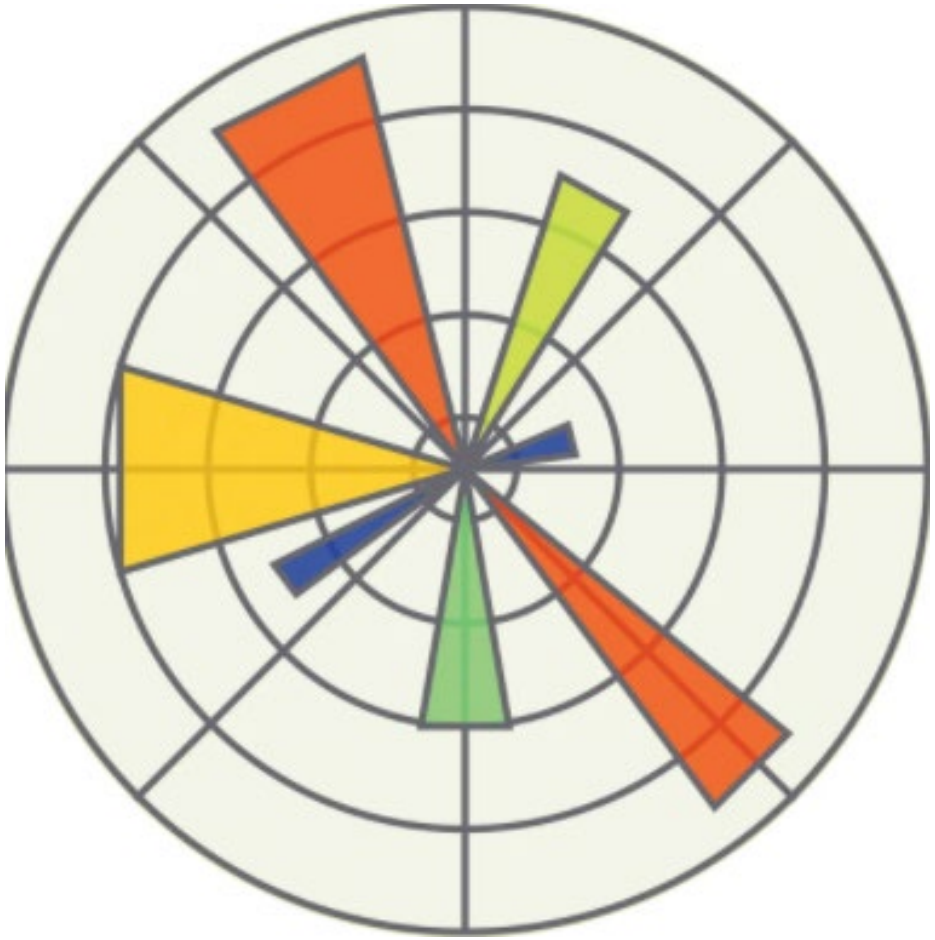
matplotlib



- import matplotlib as mpl
- import matplotlib.pyplot as plt

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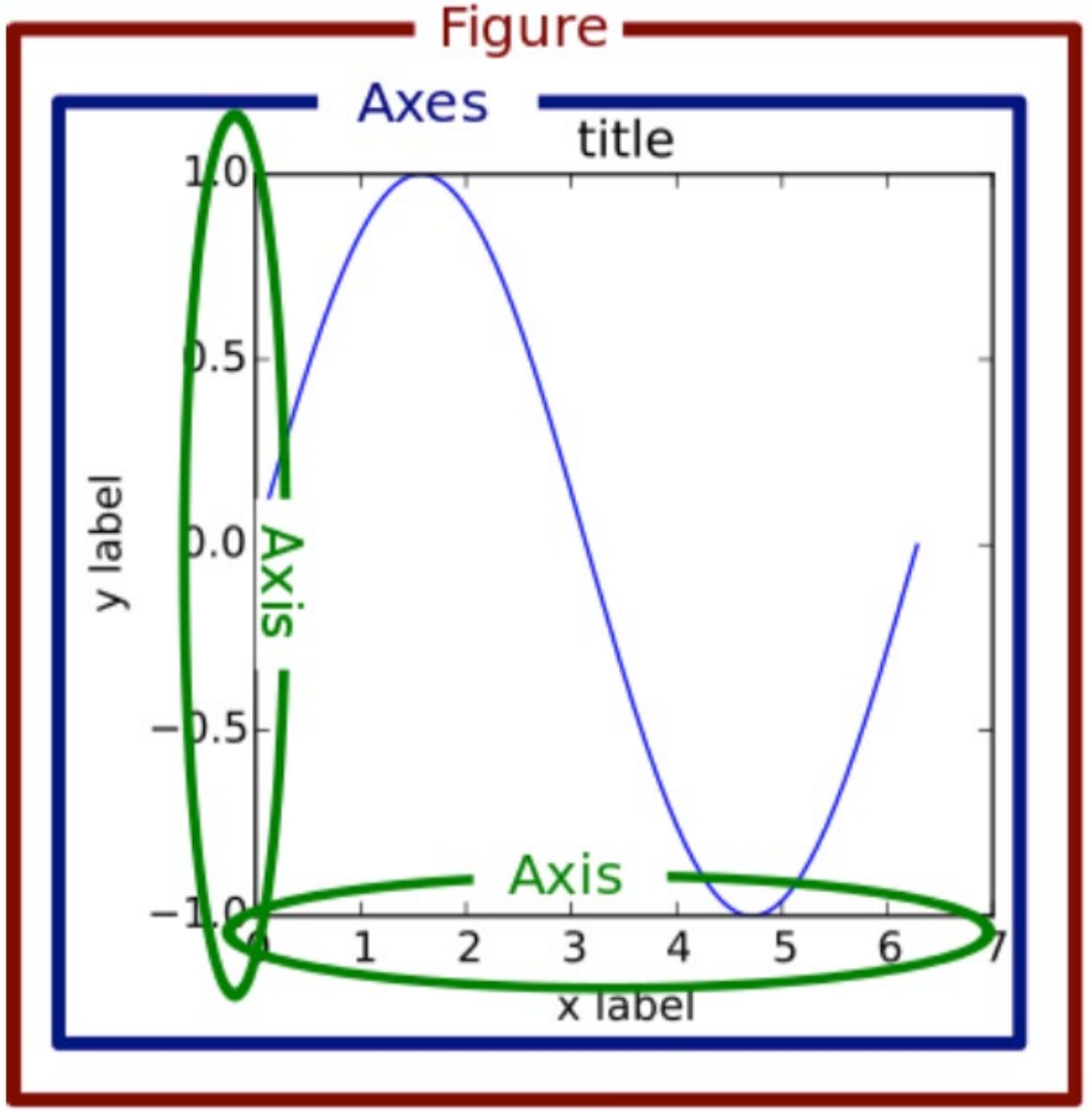
A ***figure*** holds multiple ***axes***.

An axis contains the information for a chart

- numbers
- tick markers
- tick labels



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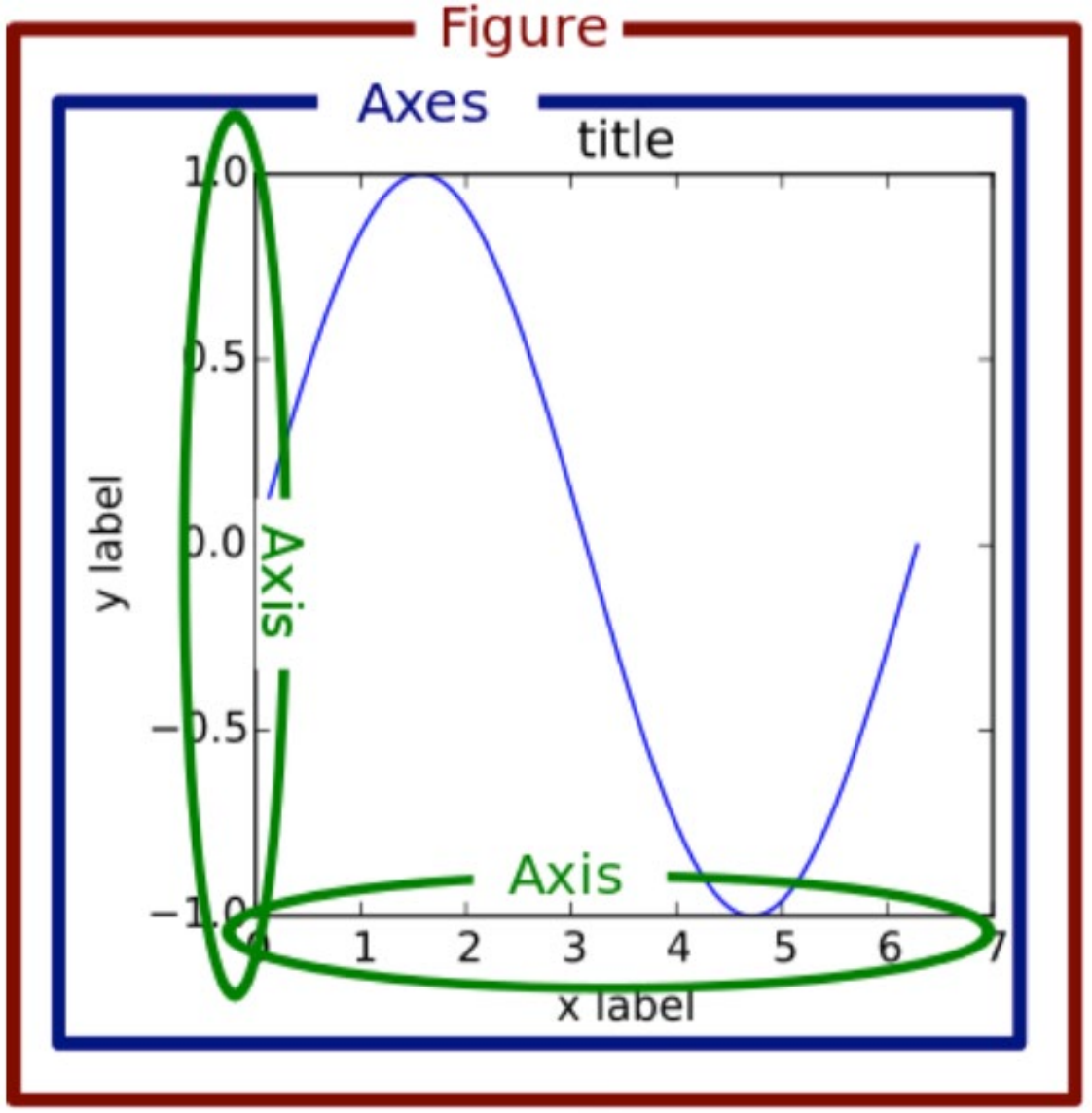
A ***patch*** is a collection of ***artists***.

An artist contains the graphics corresponding to the numbers in the axes

- color
- shape
- style



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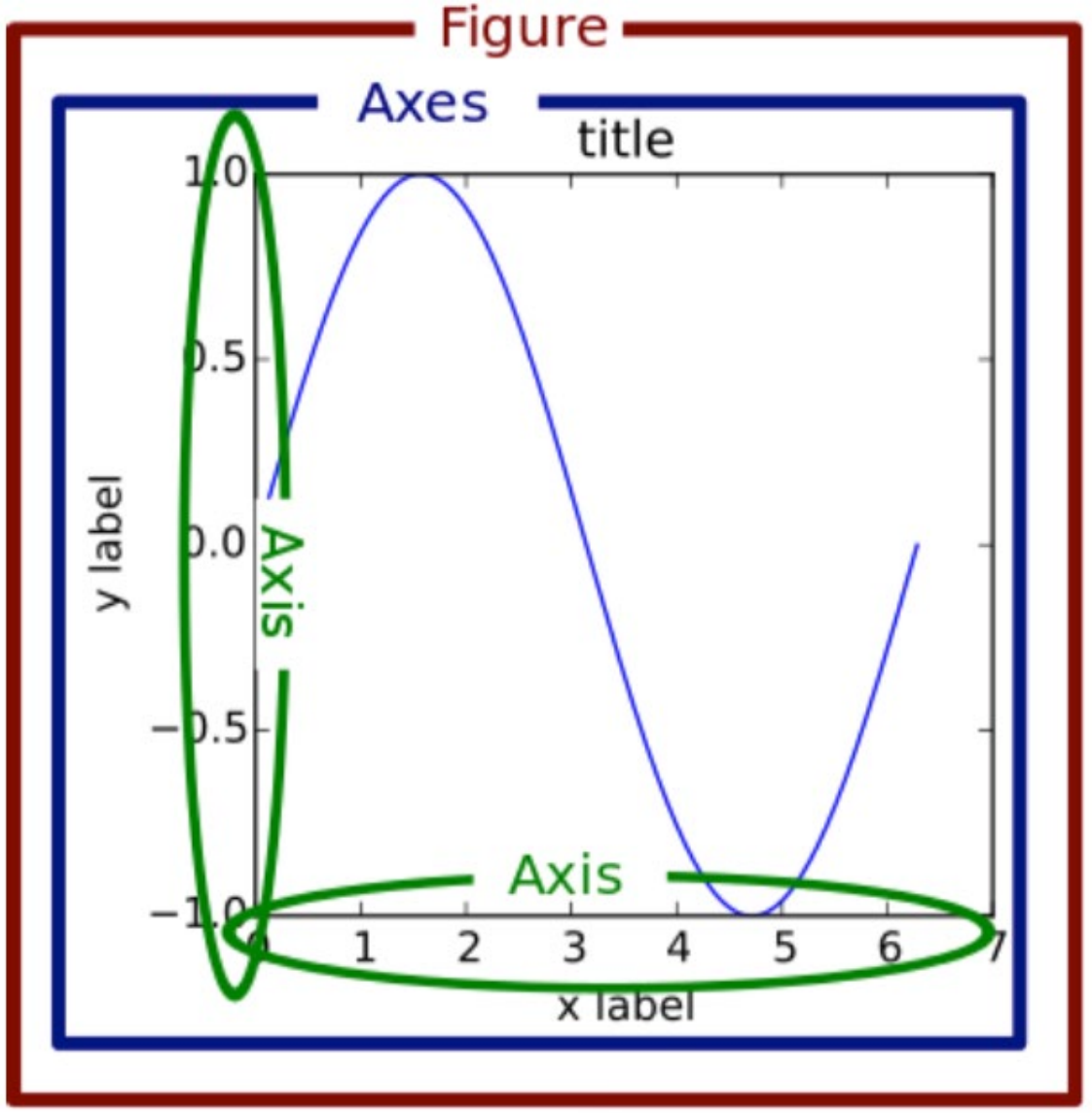
- Many commands change the current figure/axes
- If we have a current figure/axes then we can access them
  - `gca()` function returns the current axes,
  - `sca()` function sets the current axes
  - `cla()` function clears the current axes



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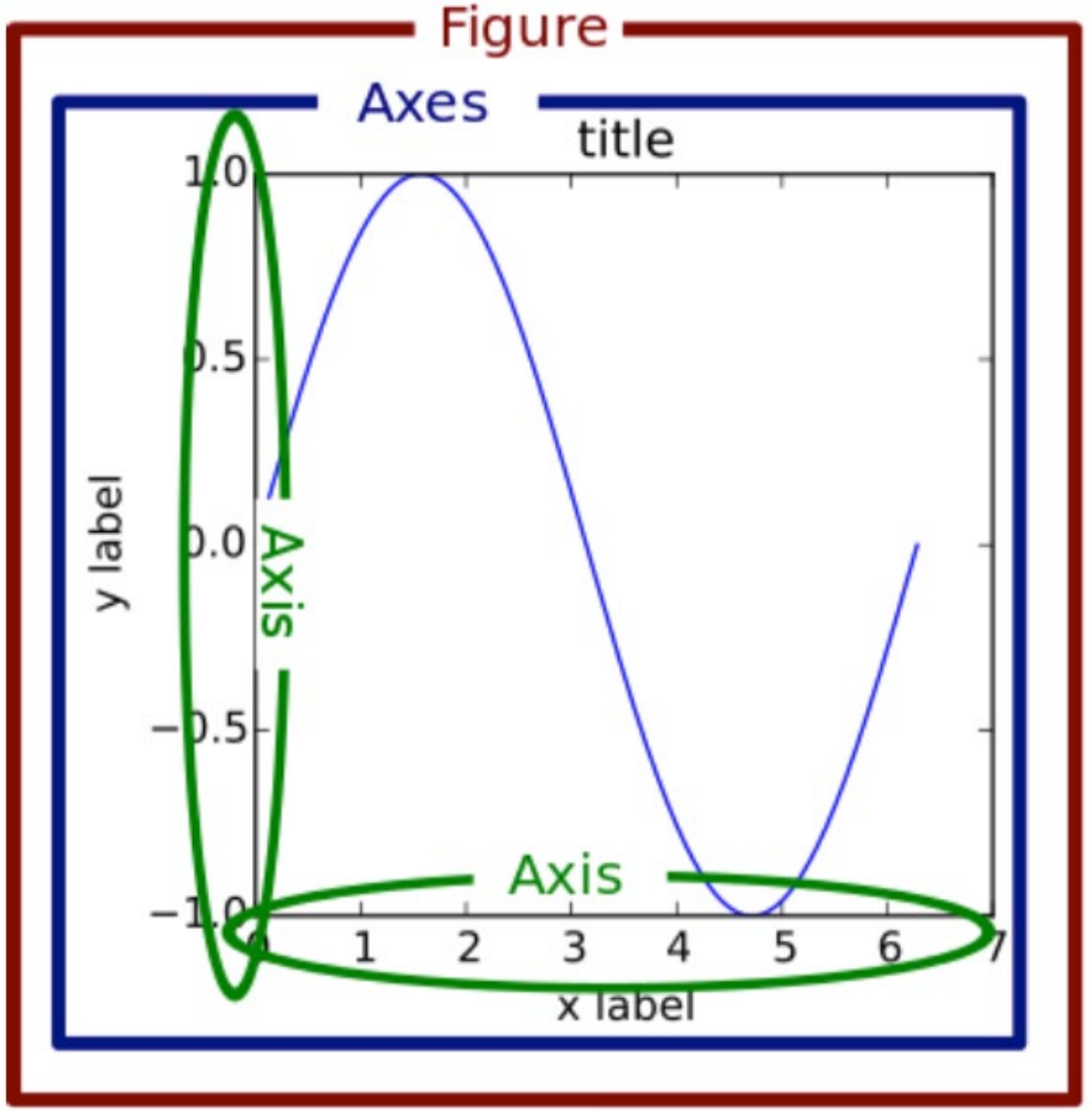
- Many commands change the current figure/axes
- If we have a current figure/axes then we can access them
  - `gcf()` function returns the current figure
  - `figure()` function sets the current figure or creates a new figure
  - `clf()` function clears the current figure



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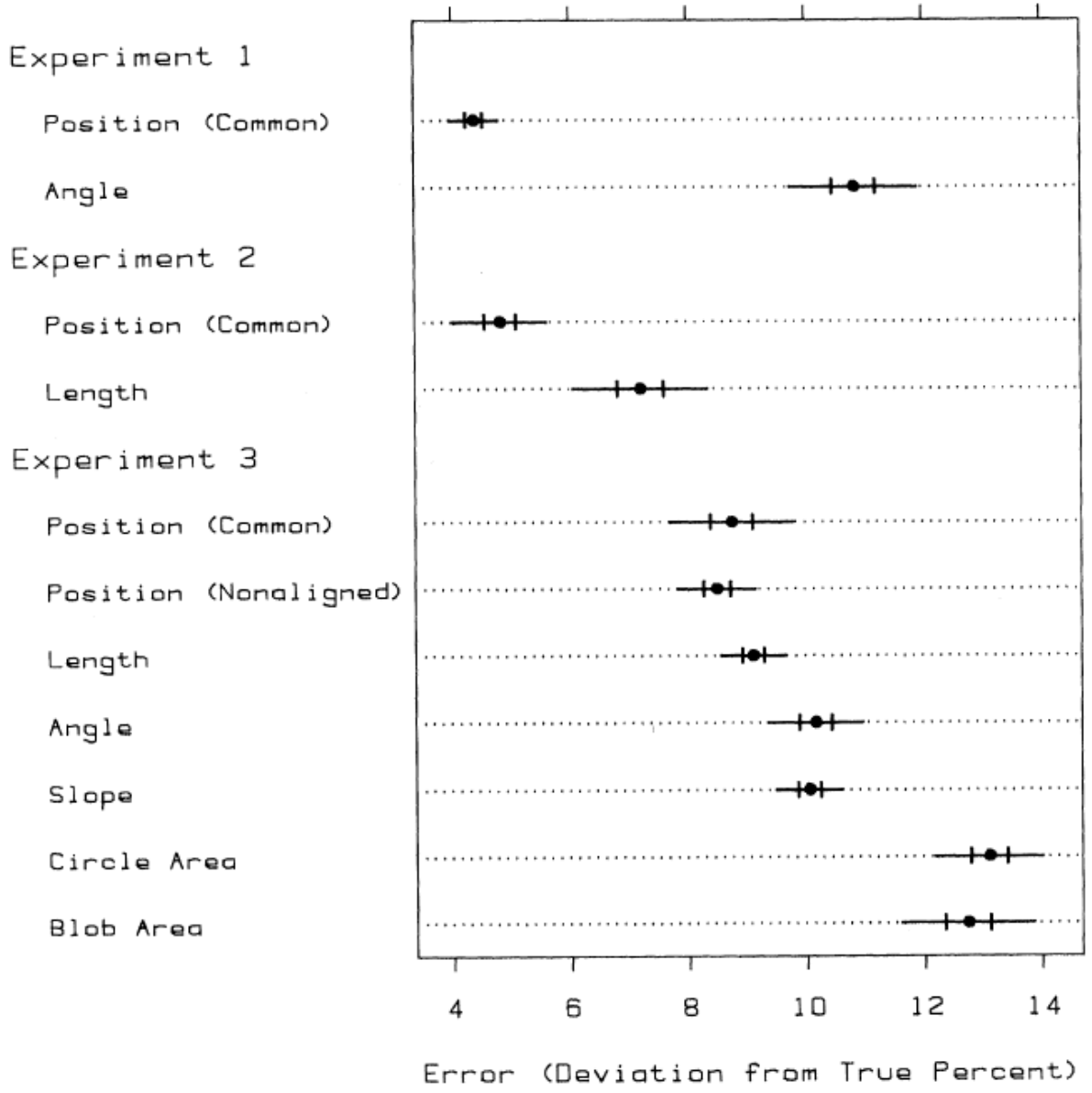
Which aspect of a chart would be most perceptible?

1. Position
2. Length
3. Angle
4. Area
5. Shading



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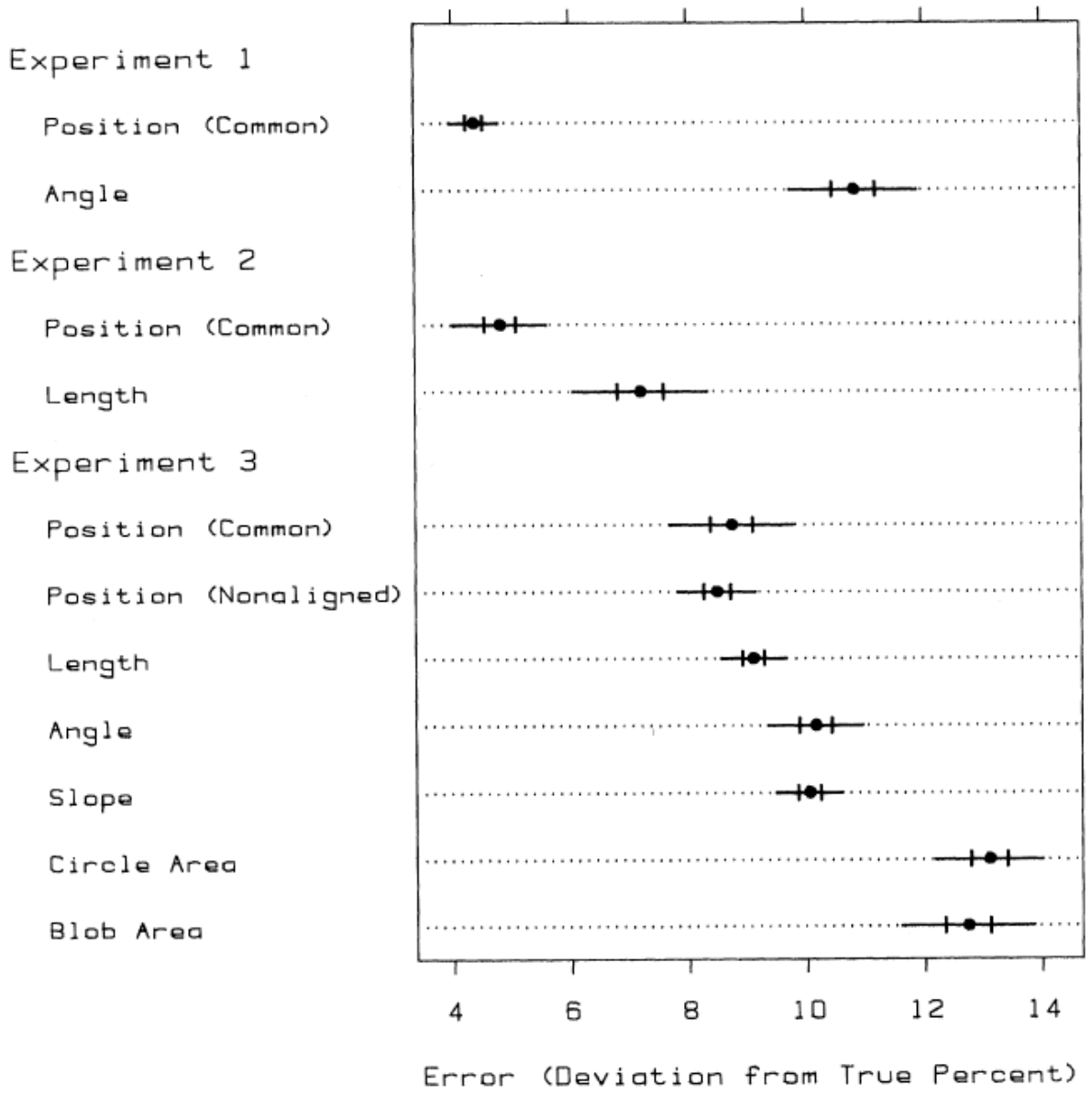

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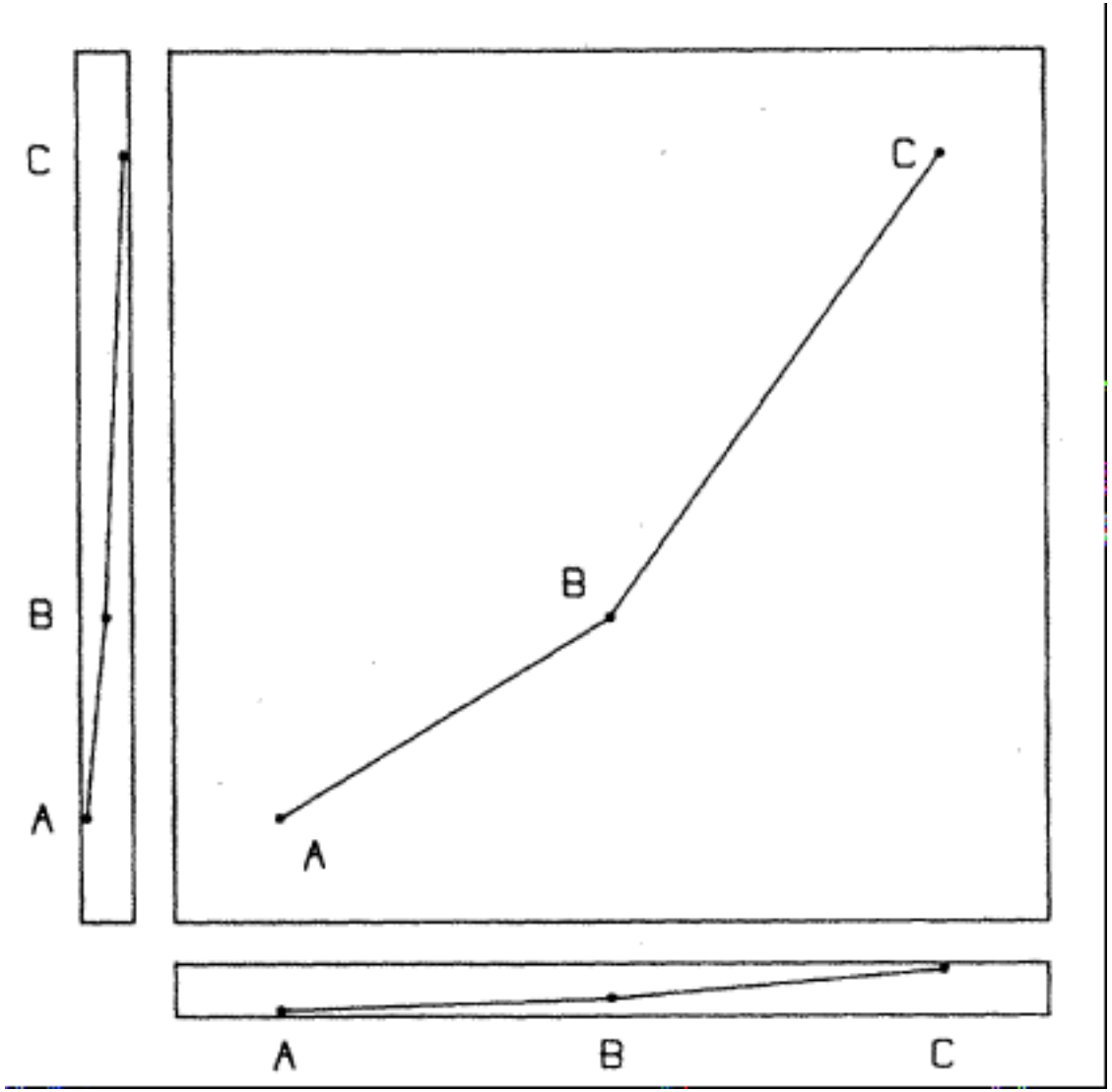

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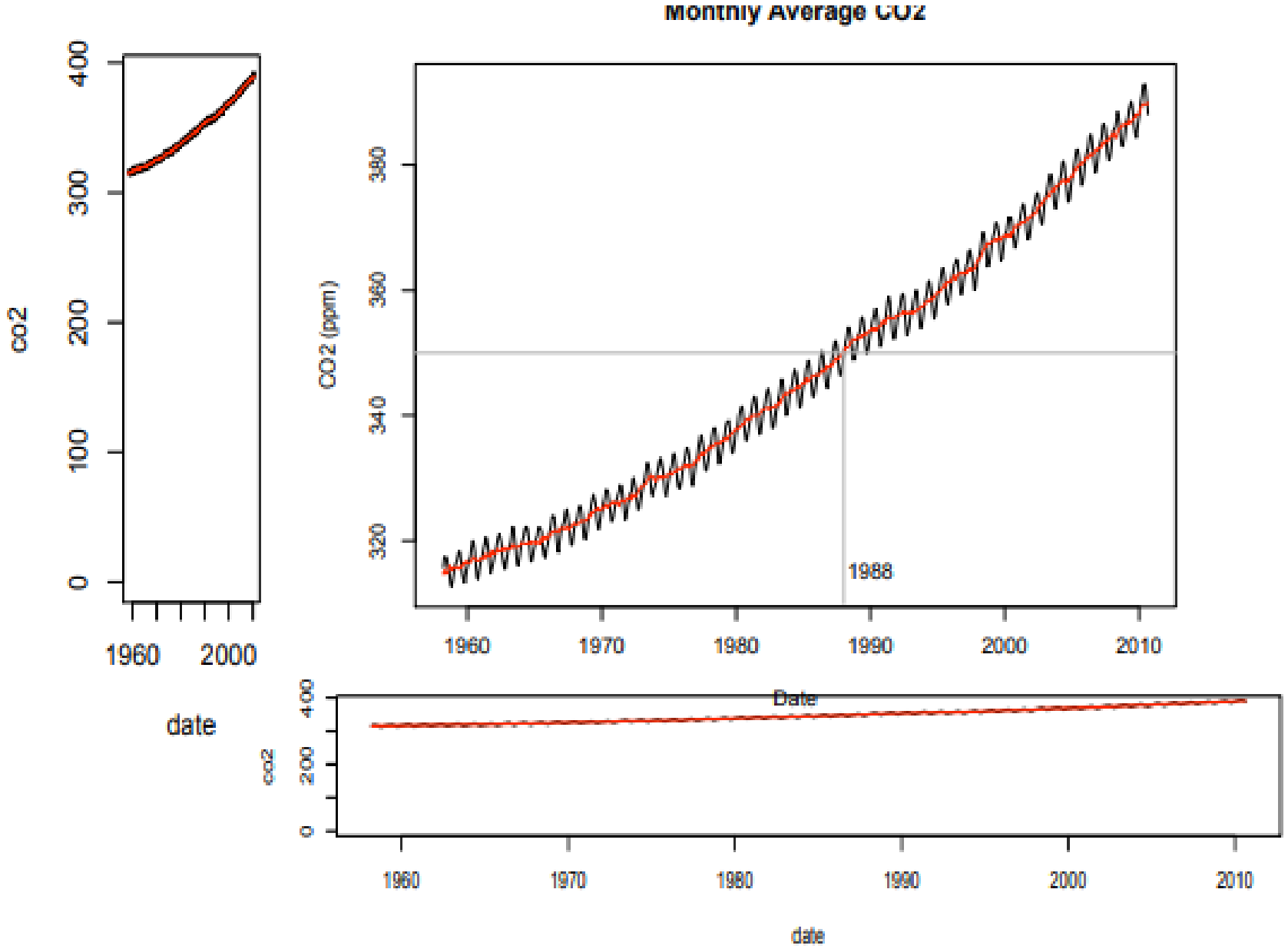
Scale



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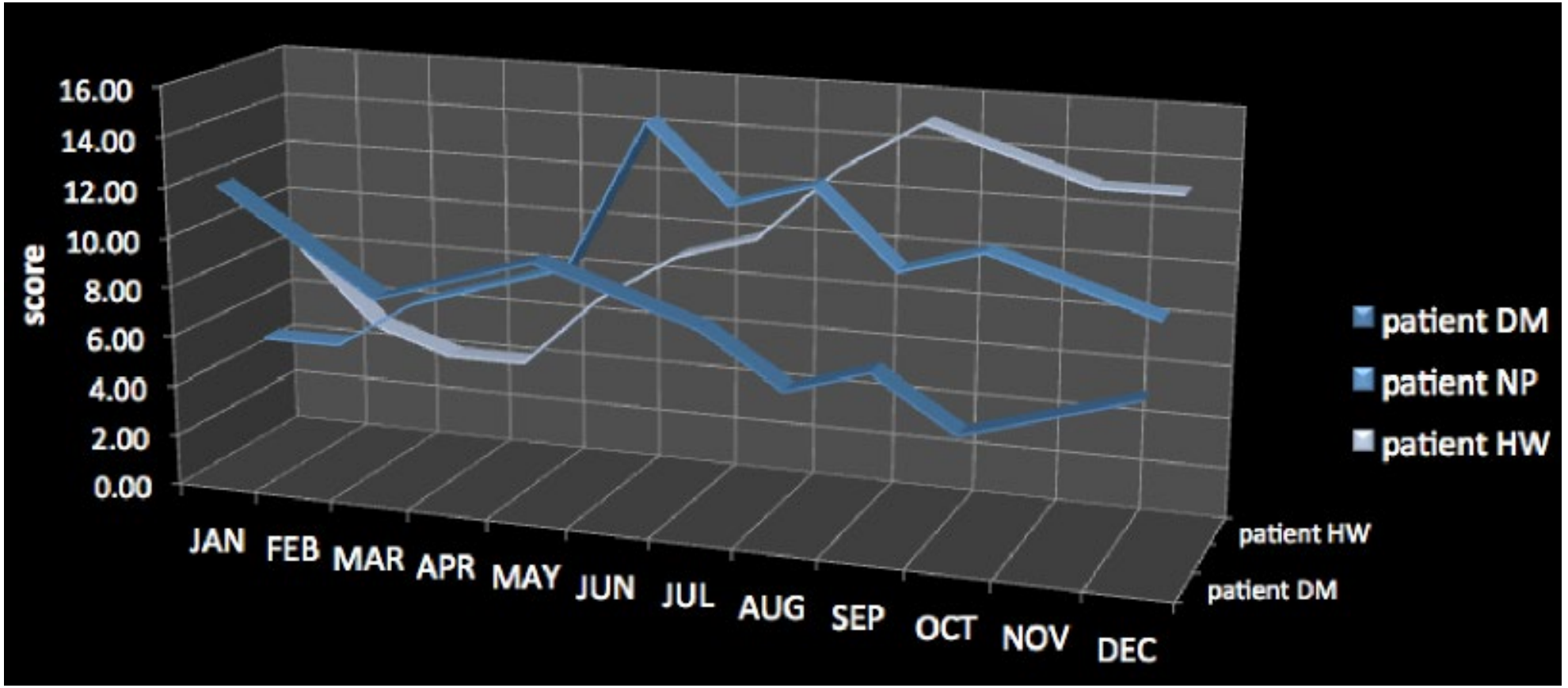
Recommended Practices



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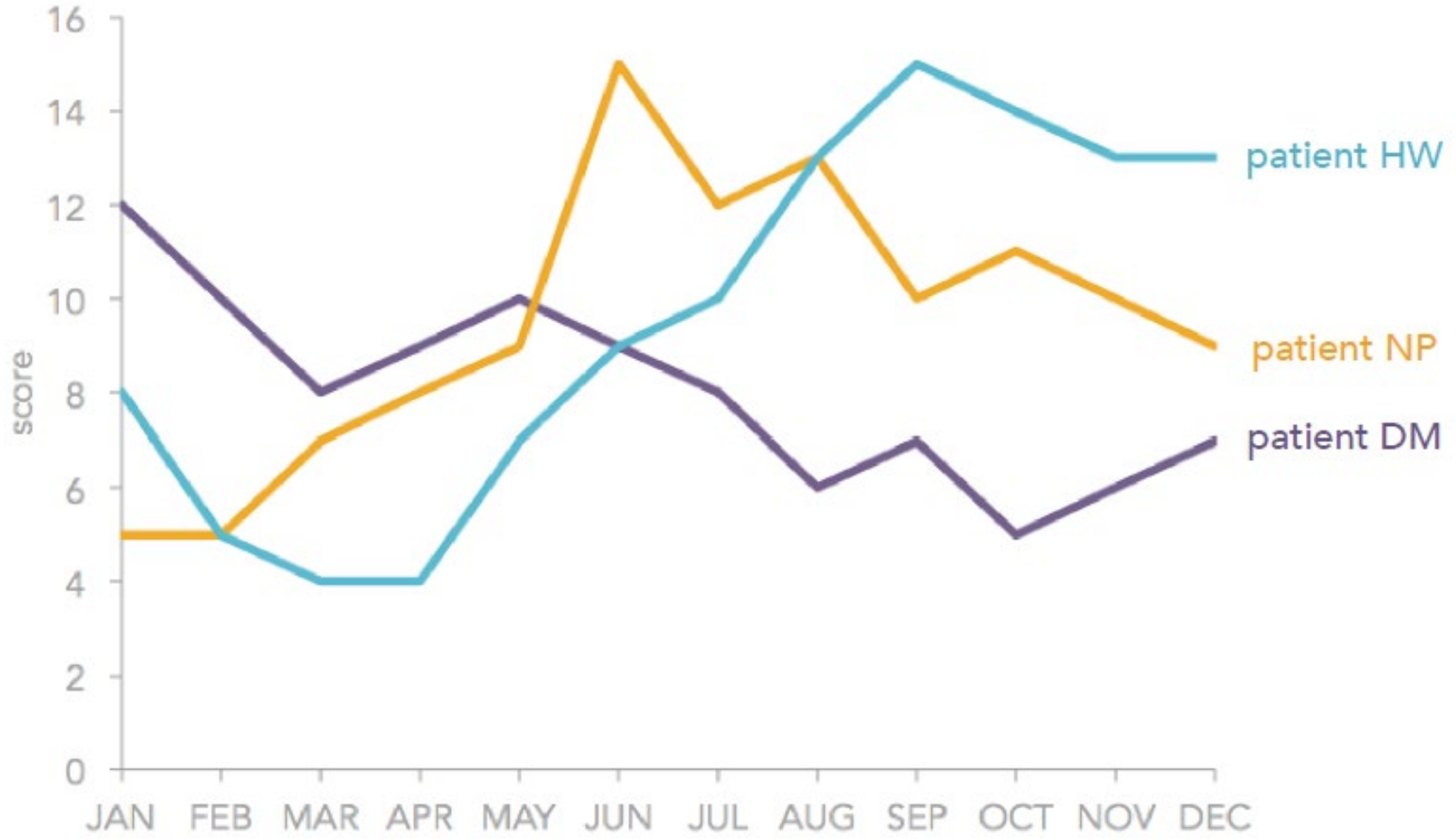
16
14
12
10
8
6
4
2
0
score
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
patient HW
patient NP
patient DM

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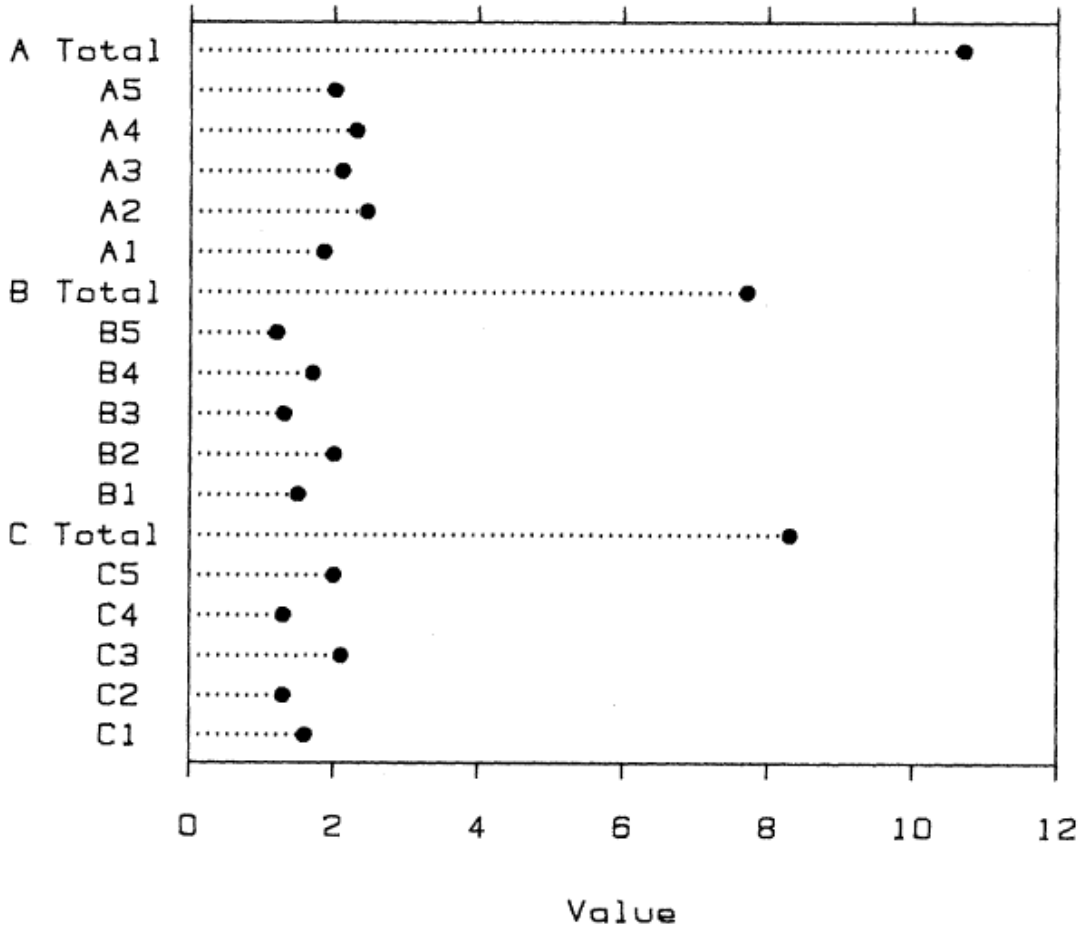
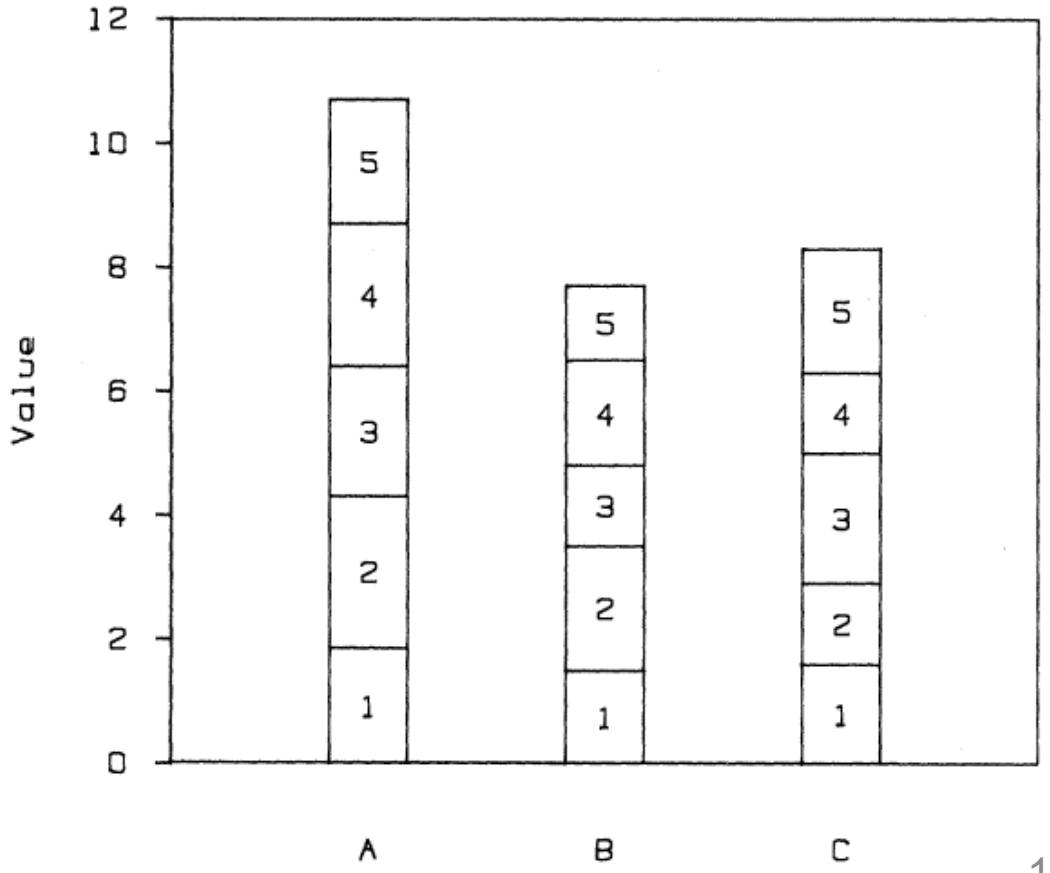
We have two different graphical representations of the same dataset. Which chart is more understandable?





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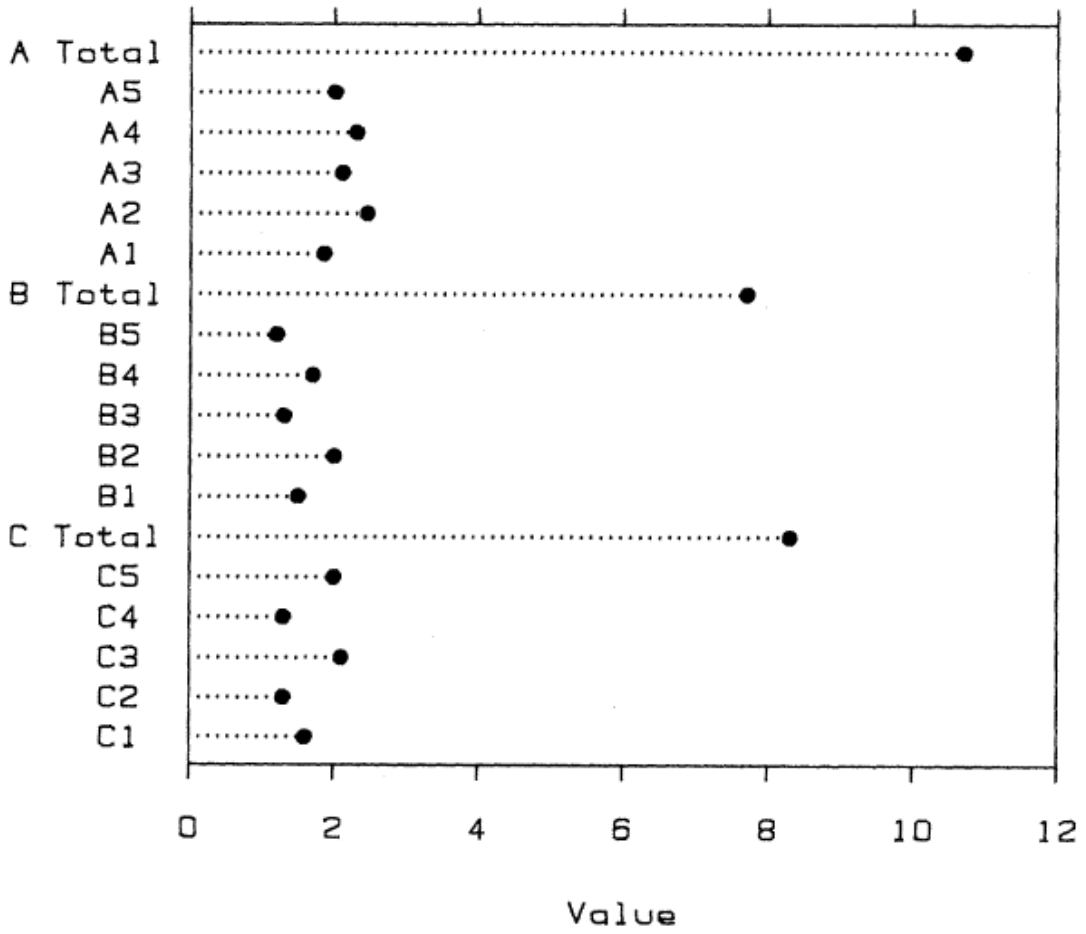

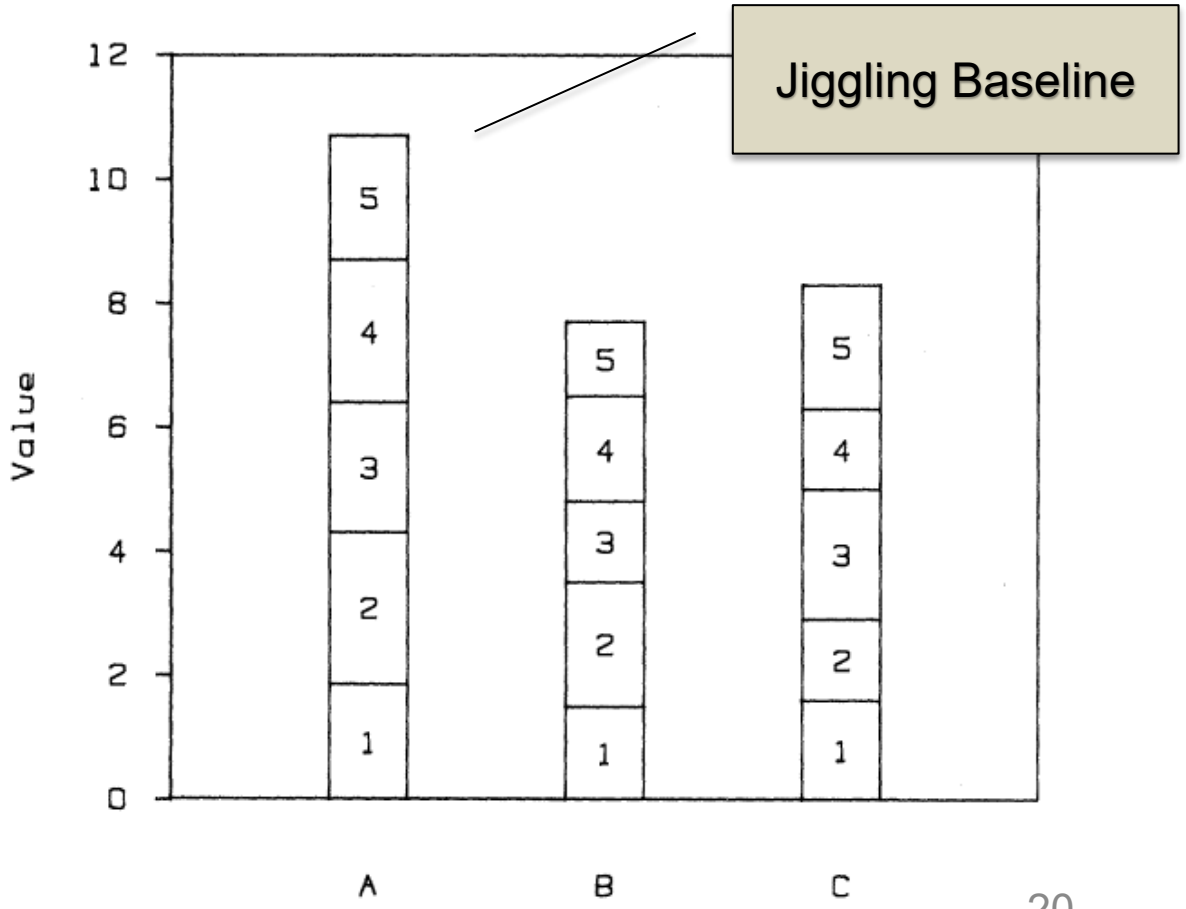

seaborn

- import seaborn
- import seaborn as sns

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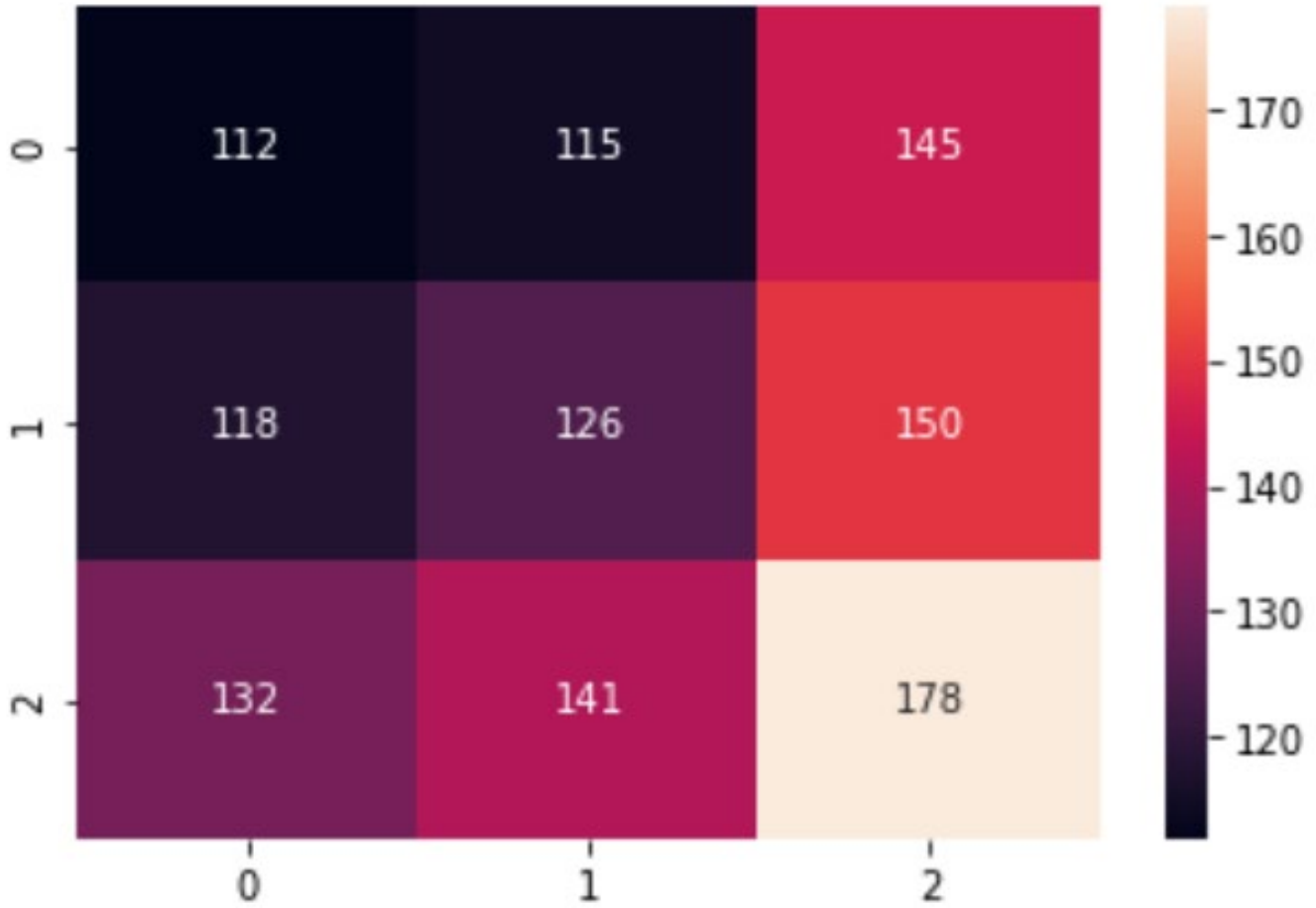
Heatmap

```
arr = np.array([[112, 115, 145],
                [118, 126, 150],
                [132, 141, 178]])

sns.heatmap(arr, annot=True, fmt="d");
```



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plotly | Dash

- import plotly.graph_objects as go
- import plotly.express as px

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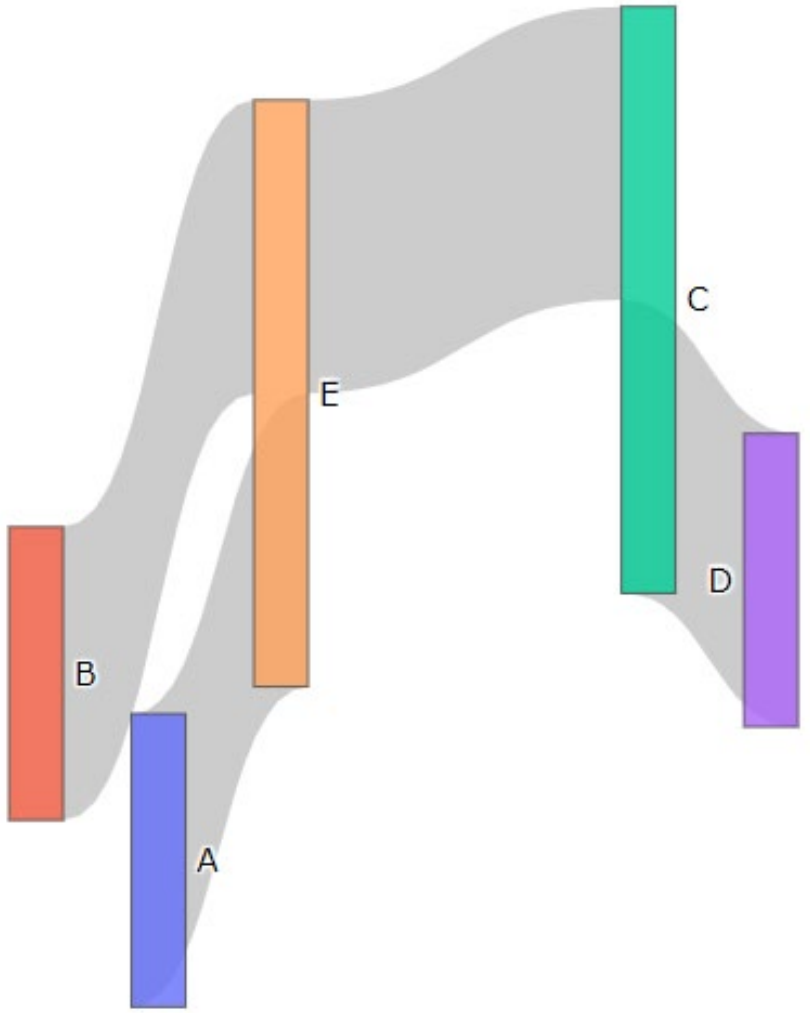
Sankey

```
fig = go.Figure(go.Sankey(
    node = {
        "label": ["A", "B", "C", "D", "E"],
        "x": [0.2, 0.1, 0.6, 0.7, 0.3],
        "y": [0.7, 0.5, 0.1, 0.4, 0.2]},
    link = {
        "source": [1, 4, 4, 3, 4],
        "target": [4, 0, 2, 2, 3],
        "value": [1, 1, 1, 1, 0]}))

fig.show()
```



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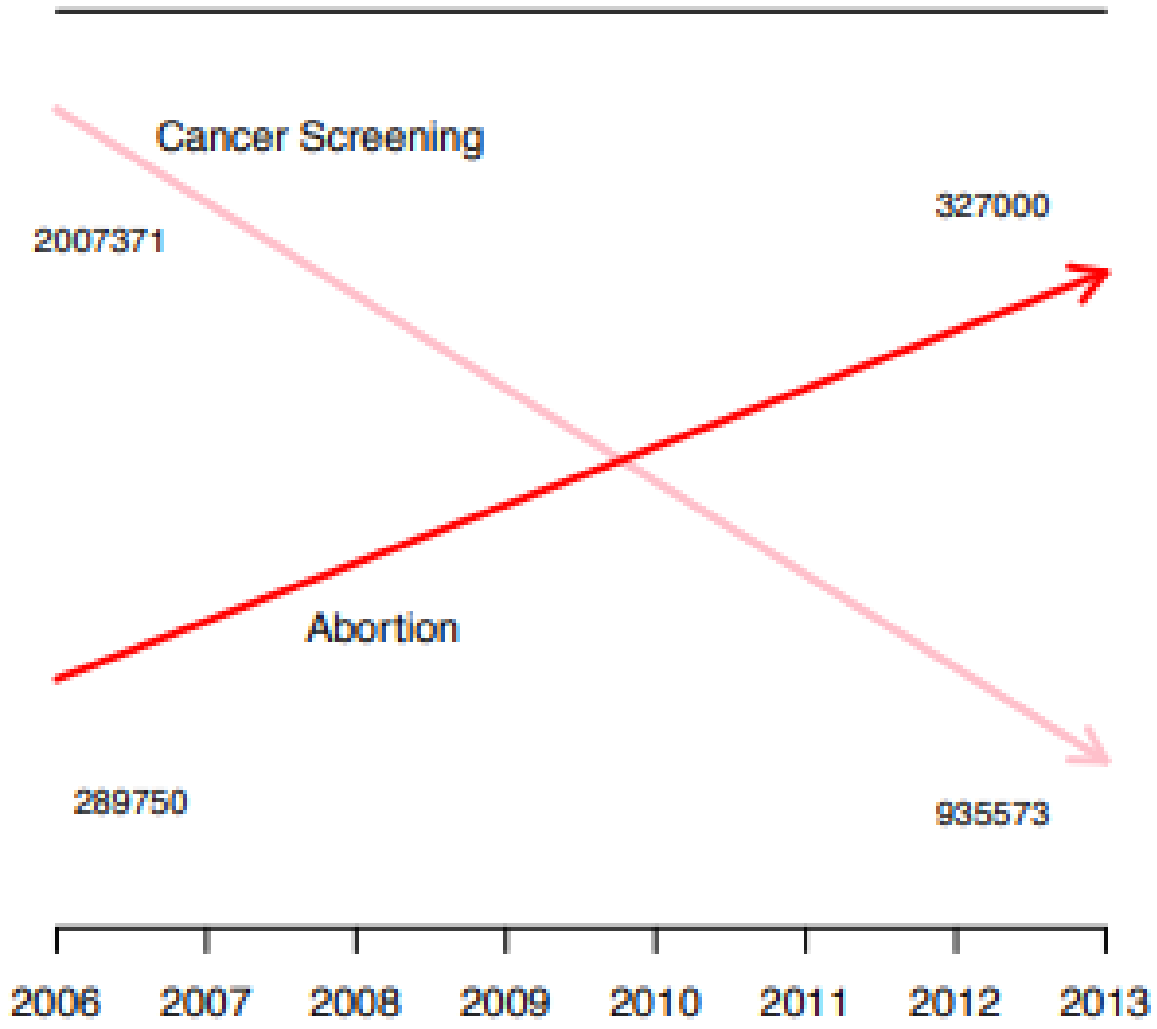
When plotting data, which of the following approaches to axis scaling should be avoided?

1. Using different scales for variables on the same axis
2. Changing the scale in middle of axis
3. Standardizing the scales for the same axis
4. Maintaining a consistent scale through the axis



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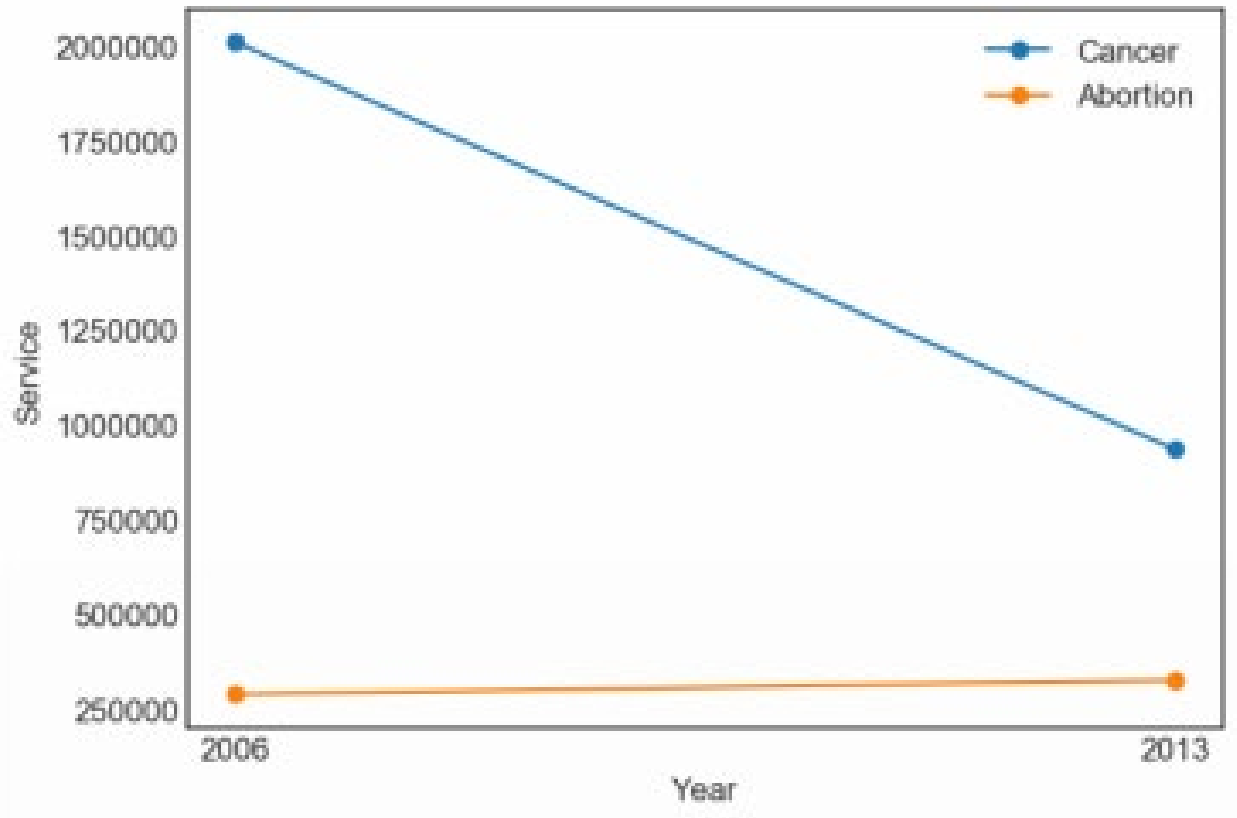

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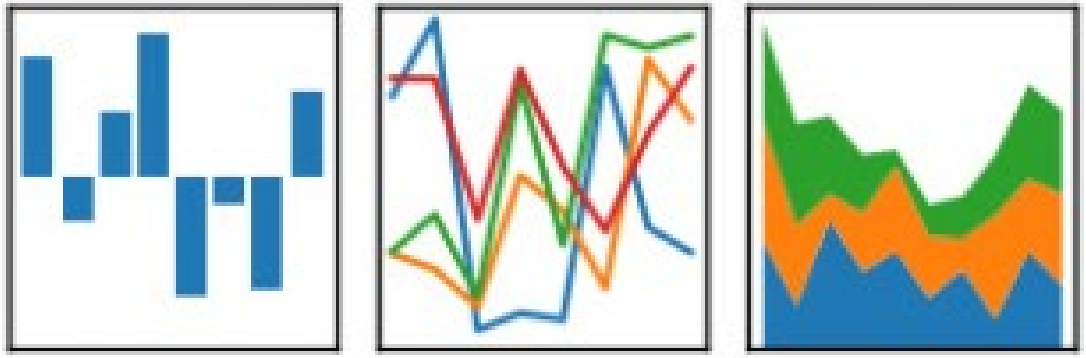
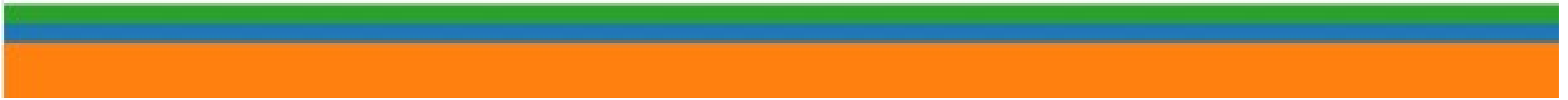
- import pandas as pd

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$





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- import pandas as pd

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A comma separated value (csv) format can store tabular data

- We separate rows with different lines
- We separate columns with commas
- The first row indicates the headings of the columns

```
year,month,returns
2010,1,-0.5964769750070603
2010,2,0.323102811722204
2010,3,0.5936238389378875
2010,4,0.4837228609905558
2010,5,-0.12064664554679042
2010,6,-0.11388800636514022
2010,7,0.09647915933528232
```

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Character	Meaning
`'r'`	open for reading (default)
`'w'`	open for writing, truncating the file first
`'x'`	open for exclusive creation, failing if the file already exists
`'a'`	open for writing, appending to the end of the file if it exists
`'b'`	binary mode
`'t'`	text mode (default)
`'+'`	open a disk file for updating (reading and writing)

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We can load the contents of a file in comma separated value (csv) format with read_csv

```
aapl = pd.read_csv("AAPL.csv")
aapl
```

```
year,month,returns
2010,1,-0.596476975007060 3
2010,2,0.323102811722204
2010,3,0.593623838937887 5
2010,4,0.483722860990555 8
2010,5,-0.120646645546790 42
2010,6,-0.113888006365140 22
2010,7,0.096479159335282 32
```

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The pandas package supports three containers for storing data

- DataFrame
  - 2-dimensional data
- Series
  - 1-dimensional data
- Index
  - collection of labels.

	year	month	returns
0	2010	1	-0.596477
1	2010	2	0.323103
2	2010	3	0.593624
3	2010	4	0.483723
4	2010	5	-0.120647
...	...	...	...
91	2017	8	0.430815
92	2017	9	-0.316260
93	2017	10	0.412639
94	2017	11	0.088907
95	2017	12	-0.081133

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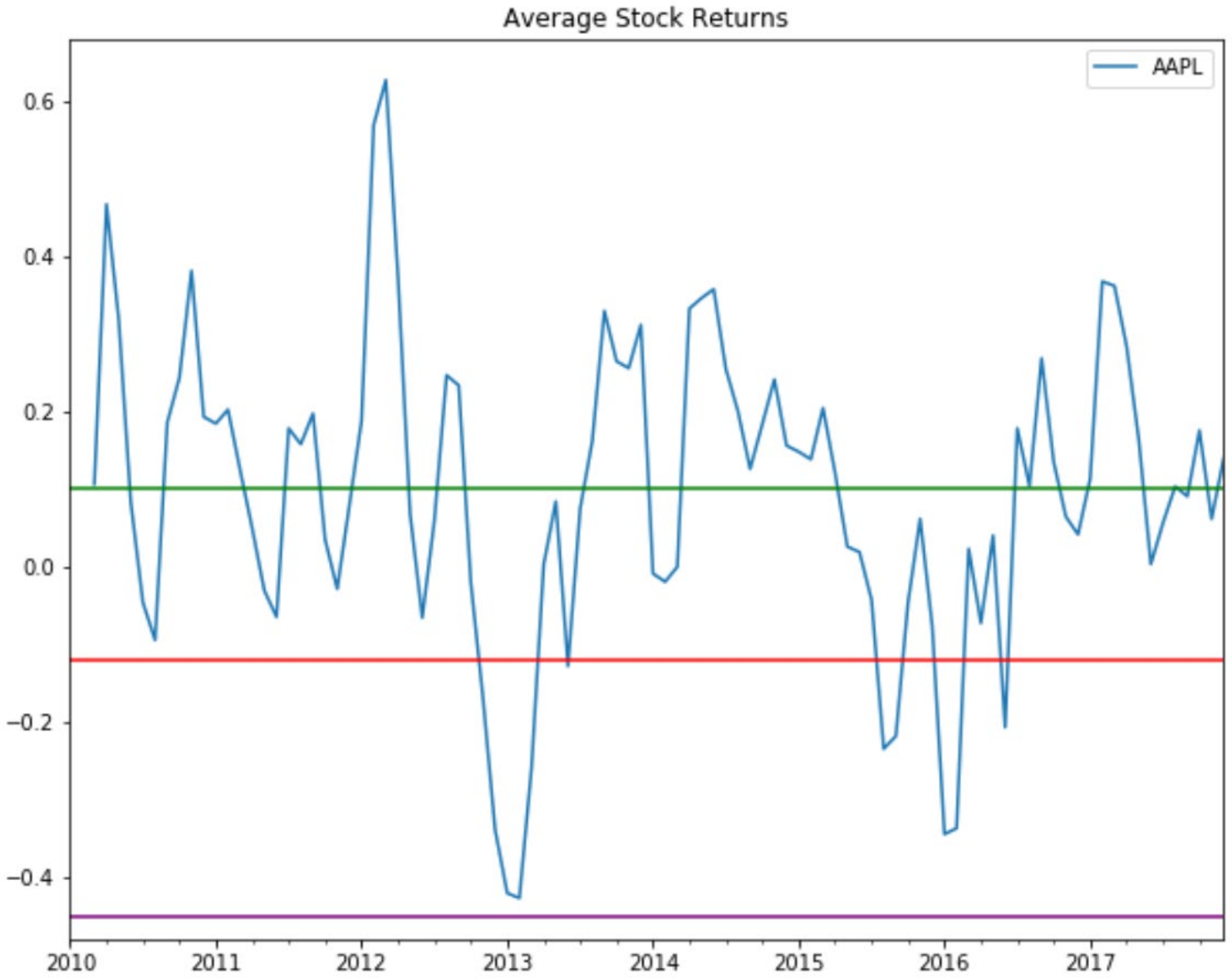
Example



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Charts

- matplotlib
- seaborn
- plotly

Tables

- pandas

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References

- McKinney, Python for Data Analysis

(Chapter 5.1-5.2 + 9.1-9.2)

Questions

- Describe the learning objectives.
- Summarize the relevant take-aways.
- Ask about unclear information.