Basics of Programming

L13: Data Visualization Multiple Plots (Graphs)

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Resources

- Visualization with python
  - https://matplotlib.org
- Data Science from Scracth, 2nd edition
  - author: Joel Grus
  - publisher: O’Reilly, 2019

Visualization: Multi Plots

- Matplotlib enables multiple graphs in a figure
  - Supported by `subplot()` method
- `subplot()`
  - Divides given plot into sectors
  - Divides the drawing area in a grid of sub-areas
    - Advance management done using `GridSpec(m,n)`
      - `m` rows and `n` columns e.g. `GridSpec(2,3)`
    - Each subarea can be assigned to one subplot
- Using `subplot`()
  - invocation: `plt.subplot(abc)`
    - `a - number of rows`
    - `b - number of columns`
    - `c - grid number` (starts from `1` to `a*b`)

Polynomials/Exponentials of x

file: `multiplot-polynomial.py`

#creating 6 graphs for $\sqrt{x}$, x, $x\sqrt{x}$, x^2, x^3, 2^x

```
import math
import matplotlib.pyplot as plt

cnt=9

x=[i for i in range(cnt)]
y0=[math.sqrt(i) for i in range(cnt)]
y1=[i for i in range(cnt)]
y2=[i*math.sqrt(i) for i in range(cnt)]
y3=[i*i for i in range(cnt)]
y4=[i*i*i for i in range(cnt)]
y5=[2**i for i in range(cnt)]
```

Polynomials/Exponentials of x

```
#considering 2 rows and 3 columns, 6 grid subareas
fig = plt.figure() # define drawing area object
plt.subplot(231) # subarea 1-left upper corner
plt.plot(x,y0,’k.--', label="sqrt(x)")
plt.legend()

plt.subplot(232) # subarea 2-middle upper corner
plt.plot(x,y1,'bo--', label="linear")
plt.legend()

plt.subplot(233) # subarea 3-right upper corner
plt.plot(x,y2,’r*--', label="x*sqrt(x)")
plt.legend()
```

Polynomials/Exponentials of x

```
#considering 2 rows and 3 columns, 6 grid subareas
fig = plt.figure() # define drawing area object
plt.subplot(231) # subarea 1-left upper corner
plt.plot(x,y3,’c.--', label="sqrt(x)")
plt.legend()

plt.subplot(232) # subarea 2-middle upper corner
plt.plot(x,y4,'go--', label="linear")
plt.legend()

plt.subplot(233) # subarea 3-right upper corner
plt.plot(x,y5,’y*--', label="x*sqrt(x)")
plt.legend()

plt.show()
```

Covid-19 data of India

- src:
  - https://ourworldindata.org/coronavirus-source-data
  - https://covid.ourworldindata.org/data/ecdc/full_data.csv
- Basic code (covid-india.py)

```
filename=sys.argv[1]
fh = open(filename)
#Data for new cases, new deaths, total cases, total deaths
x=[]
xnum = 0
newcases=[]
newdeaths=[]
totalcases = []
```

Covid-19 data of India

```
#considering 2 rows and 2 columns, 4 grid subareas
fig = plt.figure() # define drawing area object
fig.suptitle("Data starting from March 01, 
2020\nx-axis: Number of days from 2020-03-01")
plt.subplot(221) # subarea 1-left upper corner
plt.plot(x,newcases,’k.--',
        label="new cases")
plt.legend()

plt.subplot(222) # subarea 2-right upper corner
plt.plot(x,newdeaths,’bo--',
        label="new deaths")
plt.legend()
```

Covid-19 data of India

```
#considering 2 rows and 2 columns, 4 grid subareas
plt.subplot(223) # subarea 3-left lower corner
plt.plot(x,totalcases,'r*--',
        label="total cases")
plt.legend()

plt.subplot(224) # subarea 2-right lower corner
plt.plot(x,totaldeaths,’c.--',
       label="total deaths")
plt.legend()

plt.show()
```

Exercises

- Ex 01: Draw graph of your marks from 9th, 10th, 11th and 12th in 4 sub-areas

- Ex 02: Make a subplot of 6 areas (2x3)
  - row 1: Graphically show $\cos 2\theta = \cos^2\theta - \sin^2\theta$
    - subarea 1: $\cos 2\theta$
    - subarea 2: $\cos^2\theta$
    - subarea 3: $\sin^2\theta$
  - row 1: Graphically show $\cos^2\theta + \sin^2\theta = 1$
    - subarea 1: $\cos^2\theta$
    - subarea 2: $\sin^2\theta$
    - subarea 3: $\cos^2\theta + \sin^2\theta$

Questions