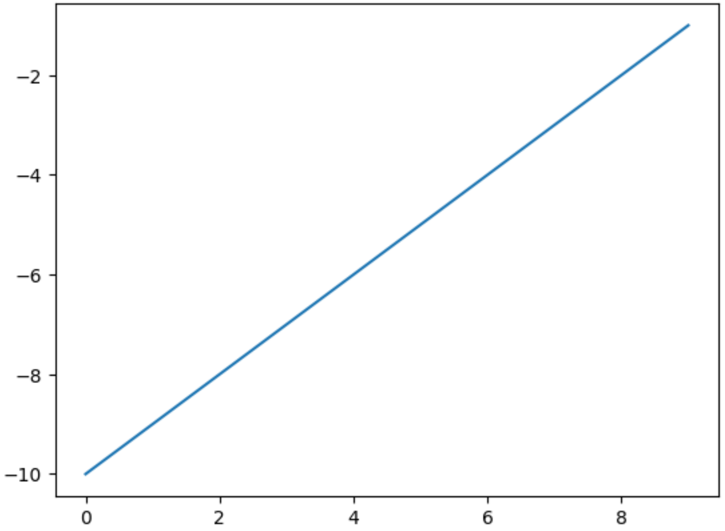
```
import matplotlib.pyplot as plt#import
```

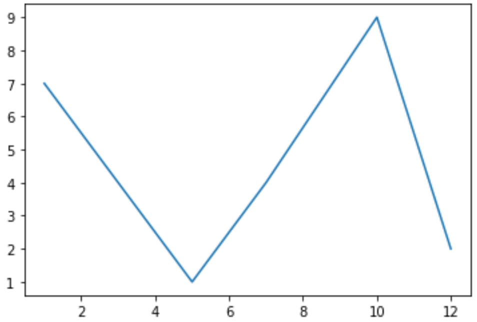
```
import matplotlib.pyplot as plt#import
x=list(range(0,10))
y=list(range(-10,0))
plt.plot(x,y)
```

```
[<matplotlib.lines.Line2D at 0x7fe7cc14d160>]
```



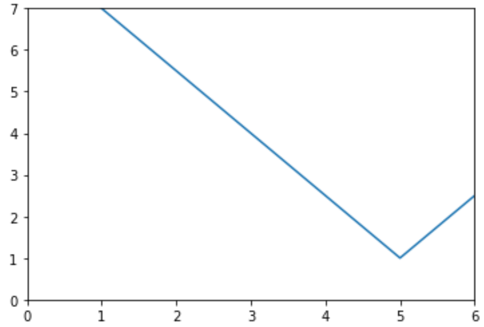
```
import matplotlib.pyplot as plt#import
x=list([1,5,7,10,12])
y=list([7,1,4,9,2])
plt.plot(x,y)
```

```
[<matplotlib.lines.Line2D at 0x7f8c1ab2d350>]
```



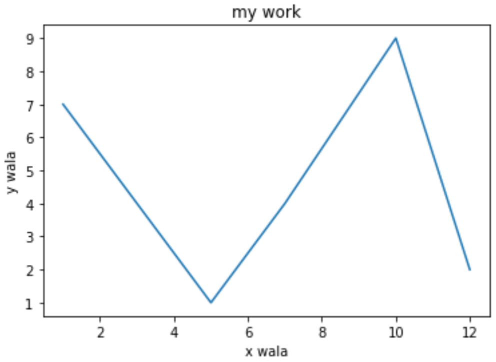
```
#part of [x-start x-end to y-start y-end]
plt.axis([0,6,0,7])
plt.plot(x,y)
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a89acd0>]
```



```
#add title
plt.title("my work")
plt.xlabel("x wala")
plt.ylabel("y wala")
plt.plot(x,y)
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a808b90>]
```

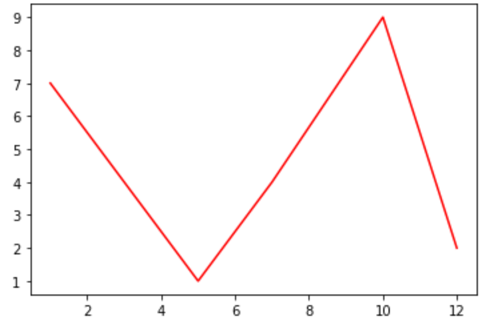


```
#rename tics /points seen
plt.xticks((2,4,6,8,10,12),("hi","i","am","amar","here","@"))
plt.plot(x,y)
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a708090>]
```

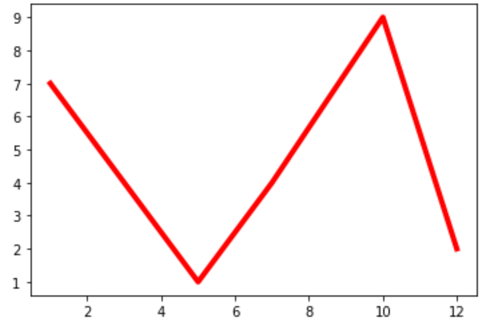
```
plt.plot(x,y,color="red")#adding color
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a6c2850>]
```



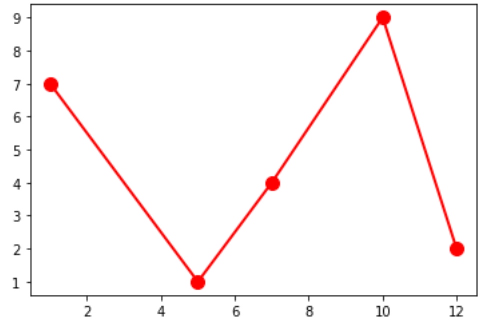
```
plt.plot(x,y,color="red",linewidth=4)#width
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a415090>]
```



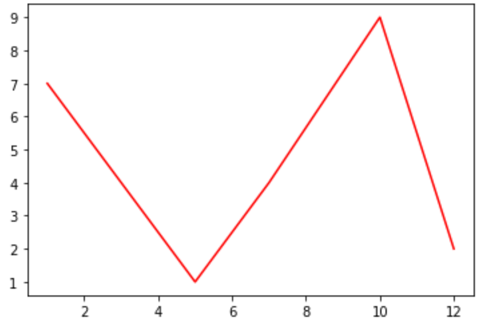
```
plt.plot(x,y,color="red",linewidth=2,marker="o",markersize=10)#marker x and o
```

```
[<matplotlib.lines.Line2D at 0x7f8c1a2b5050>]
```



```
plt.plot(x,y,color="red",label="2022")#marker x and o
```

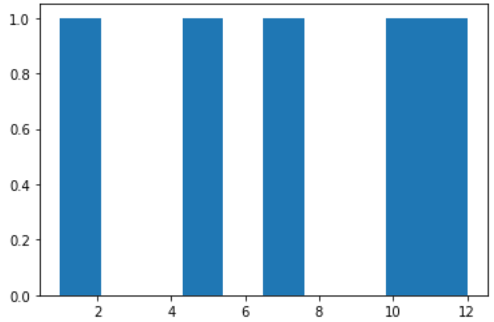
```
[<matplotlib.lines.Line2D at 0x7f8c18842a10>]
```



```
plt.figure(figsize=(5,5),dpi=200)#size and dpi
plt.plot(x,y)
plt.savefig("my graph.jpg",dpi=300)
```

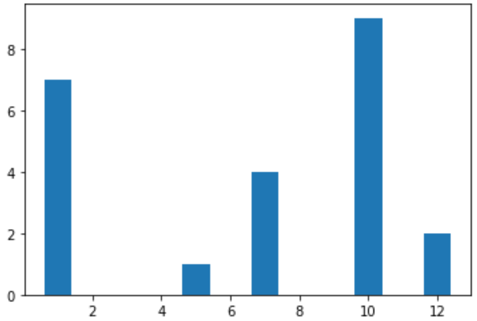
```
plt.hist(x)#histrogram
```

```
(array([1., 0., 0., 1., 0., 1., 0., 0., 1., 1.]),
 array([ 1. ,  2.1,  3.2,  4.3,  5.4,  6.5,  7.6,  8.7,  9.8, 10.9, 12. ]),
 <a list of 10 Patch objects>)
```

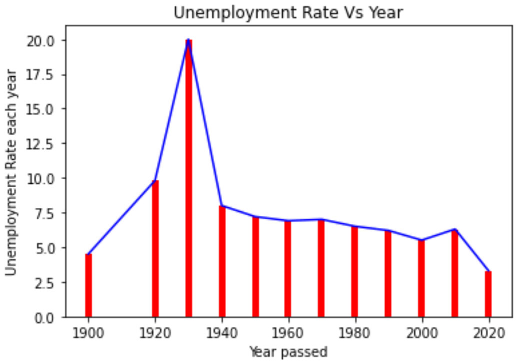


```
plt.bar(x,y)#bar chart
```

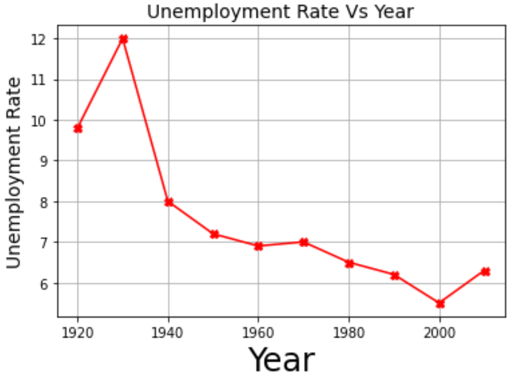
```
<BarContainer object of 5 artists>
```

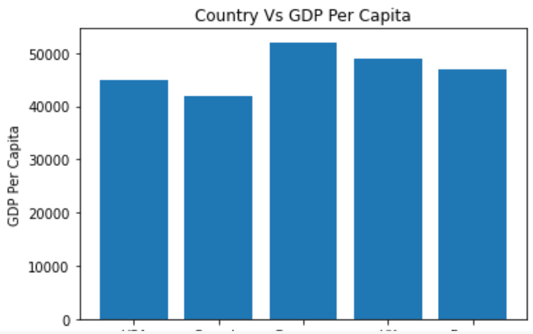


```
import matplotlib.pyplot as plt

Year = [1900,1920,1930,1940,1950,1960,1970,1980,1990,2000,2010,2020]
Unemployment_Rate = [4.5,9.8,20,8,7.2,6.9,7,6.5,6.2,5.5,6.3,3.3]

plt.title('Unemployment Rate Vs Year')
plt.xlabel('Year passed')
plt.ylabel('Unemployment Rate each year')

plt.plot(Year,Unemployment_Rate, color="blue")
plt.bar(Year, Unemployment_Rate,color="red",width=2)

plt.show()
```

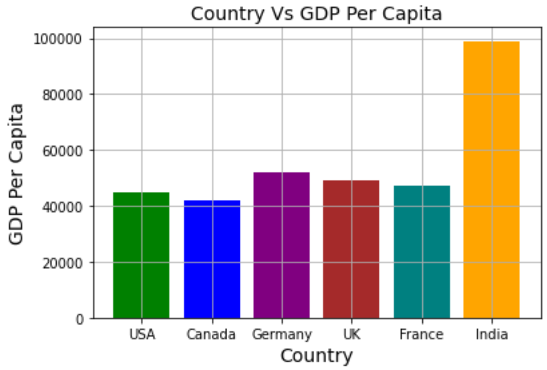


```
import matplotlib.pyplot as plt

Year = [1920,1930,1940,1950,1960,1970,1980,1990,2000,2010]
Unemployment_Rate = [9.8,12,8,7.2,6.9,7,6.5,6.2,5.5,6.3]


plt.title('Unemployment Rate Vs Year', fontsize=14)
plt.xlabel('Year', fontsize=24)
plt.ylabel('Unemployment Rate', fontsize=14)
plt.grid(True)
plt.plot(Year, Unemployment_Rate, color='red', marker='X')
plt.show()
```





```python
import matplotlib.pyplot as plt

Country = ['USA','Canada','Germany','UK','France',"India"]
GDP_Per_Capita = [45000,42000,52000,49000,47000,99000]
New_Colors = ['green','blue','purple','brown','teal',"orange"]

plt.title('Country Vs GDP Per Capita', fontsize=14)
plt.xlabel('Country', fontsize=14)
plt.ylabel('GDP Per Capita', fontsize=14)
plt.grid(True)
plt.bar(Country, GDP_Per_Capita, color=New_Colors)
plt.show()
```



```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-24-b413a0c89064> in <module>()
      4 
      5 my_labels = 'Tasks Pending','Tasks Ongoing','Tasks Completed','up-comming'
----> 6 plt.pie(Tasks,labels=my_labels)
      7 plt.title('My Tasks')
      8 plt.axis('equal')

                              2 frames
/usr/local/lib/python3.7/dist-packages/matplotlib/axes/_axes.py in pie(self, x, explode,
labels, colors, autopct, pctdistance, shadow, labeldistance, startangle, radius,
counterclock, wedgeprops, textprops, center, frame, rotatelabels)
   2927             explode = [0] * len(x)
   2928         if len(x) != len(labels):
-> 2929             raise ValueError("'label' must be of length 'x'")
   2930         if len(x) != len(explode):
   2931             raise ValueError("'explode' must be of length 'x'")

ValueError: 'label' must be of length 'x'
```

SEARCH STACK OVERFLOW

```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving studentdata.csv to studentdata.csv
```

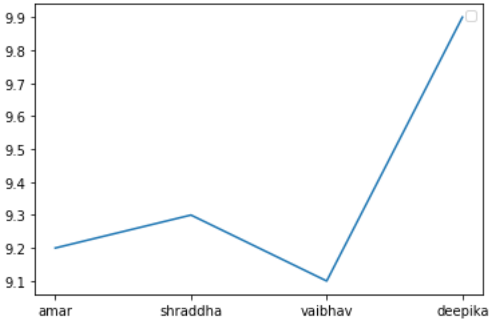
```
import pandas as pd
import io
df= pd.read_csv(io.BytesIO(uploaded['studentdata.csv']))
df
```

	seatno	name	pointer
0	1	amar	9.2
1	2	shraddha	9.3
2	3	vaibhav	9.1
3	4	deepika	9.9

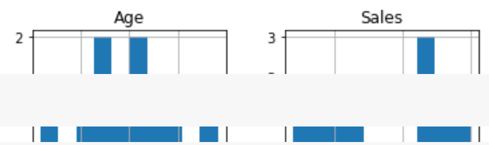
```
import matplotlib.pyplot as plt
import pandas as pd

df= pd.read_csv(io.BytesIO(uploaded['studentdata.csv']))
print(df)

#plt.bar(df["name"],df["contact"], width=.2,color='b',align='edge')
#plt.bar([2005,2012,2017,2018],[80.3,72.4,63.4,61.9], width=.4, label="Mr.B", color='y')
plt.plot(df['name'], df['pointer'])
#plt.bar(df['name'],df['pointer'],width=0.5)
```

```
plt.legend()
plt.show()






```

```
No handles with labels found to put in legend.
   seatno      name  pointer
0       1      amar      9.2
1       2  shraddha      9.3
2       3   vaibhav      9.1
3       4   deepika      9.9
```



```
'''
import matplotlib.pyplot as plt

plt.bar([1,3,5,7,9],[5,2,7,8,2], label="Example one")
plt.bar([2,4,6,8,10],[8,6,2,5,6], label="Example two", color='g')
plt.legend()
plt.xlabel('bar number')
plt.ylabel('bar height')
plt.title('Wow! We Got Our First Bar Graph')
plt.show()
'''
import pandas as pd
import matplotlib.pyplot as plt

# create 2D array of table given above
data = [['E001', 'M', 34, 123, 'Normal', 350],
        ['E002', 'F', 40, 114, 'Overweight', 450],
        ['E003', 'F', 37, 135, 'Obesity', 169],
        ['E004', 'M', 30, 139, 'Underweight', 189],
        ['E005', 'F', 44, 117, 'Underweight', 183],
        ['E006', 'M', 36, 121, 'Normal', 80],
        ['E007', 'M', 32, 133, 'Obesity', 166],
        ['E008', 'F', 26, 140, 'Normal', 120],
        ['E009', 'M', 32, 133, 'Normal', 75],
        ['E010', 'M', 36, 133, 'Underweight', 40] ]

# dataframe created with
# the above data array
df = pd.DataFrame(data, columns = ['EMPID', 'Gender',
                                    'Age', 'Sales',
                                    'BMI', 'Income'] )

# create histogram for numeric data
df.hist()

# show plot
plt.show()



df.plot.bar()

# plot between 2 attributes
plt.bar(df['Age'], df['Sales'])
plt.xlabel("Age")
plt.ylabel("Sales")
plt.show()

# For each numeric attribute of dataframe
df.plot.box()

# individual attribute box plot
plt.boxplot(df['Income'])
plt.show()
plt.pie(df['Age'], labels = {"A", "B", "C",
                             "D", "E", "F",
                             "G", "H", "I", "J"},

autopct ='% 1.1f %%', shadow = True)
plt.show()

plt.pie(df['Income'], labels = {"A", "B", "C",
                                "D", "E", "F",
                                "G", "H", "I", "J"},

autopct ='% 1.1f %%', shadow = True)
plt.show()

plt.pie(df['Sales'], labels = {"A", "B", "C",
                               "D", "E", "F",
                               "G", "H", "I", "J"},
autopct ='% 1.1f %%', shadow = True)
plt.show()





plt.scatter(df['Income'], df['Age'])
plt.show()

# scatter plot between income and sales
plt.scatter(df['Income'], df['Sales'])
plt.show()

# scatter plot between sales and age
plt.scatter(df['Sales'], df['Age'])
plt.show()

```



```python
from google.colab import files
uploaded = files.upload()


```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

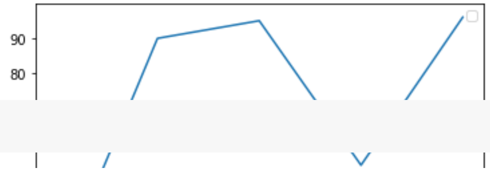
```
Saving student.csv to student (2).csv
```

```python
import matplotlib.pyplot as plt
import pandas as pd
import io

df= pd.read_csv(io.BytesIO(uploaded['student.csv']))
print(df)

```

```
       name Gender         DOB  Maths  ...  Biology  Economics  History  Civics
0      John      M  05-04-1988     55  ...       21         52       89      65
1    Suresh      M  04-05-1987     75  ...       90         61       58       2
2    Ramesh      M  25-05-1989     25  ...       95         87       56      74
3   Jessica      F  12-08-1990     78  ...       54         89       75      45
4  Jennifer      F  02-09-1989     58  ...       96         77       83      53

[5 rows x 11 columns]
```

```python
import matplotlib.pyplot as plt
import pandas as pd
import io

df= pd.read_csv(io.BytesIO(uploaded['student.csv']))
print(df)
#plt.bar(df["name"],df["contact"], width=.2,color='b',align='edge')
#plt.bar([2005,2012,2017,2018],[80.3,72.4,63.4,61.9], width=.4, label="Mr.B", color='y')
#plt.plot(df['name'], df['salary'])
plt.plot(df['name'],df['Biology'])
plt.legend()
plt.show()

```

```
No handles with labels found to put in legend.
       name Gender         DOB  Maths  ...  Biology  Economics  History  Civics
0      John      M  05-04-1988     55  ...       21         52       89      65
1    Suresh      M  04-05-1987     75  ...       90         61       58       2
2    Ramesh      M  25-05-1989     25  ...       95         87       56      74
3   Jessica      F  12-08-1990     78  ...       54         89       75      45
4  Jennifer      F  02-09-1989     58  ...       96         77       83      53

[5 rows x 11 columns]
```



Charting in Colaboratory

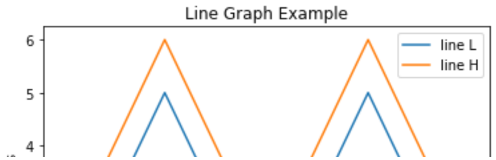
A common use for notebooks is data visualization using charts. Colaboratory makes this easy with several charting tools available as Python imports.

Matplotlib

Matplotlib is the most common charting package, see its documentation for details, and its examples for inspiration.

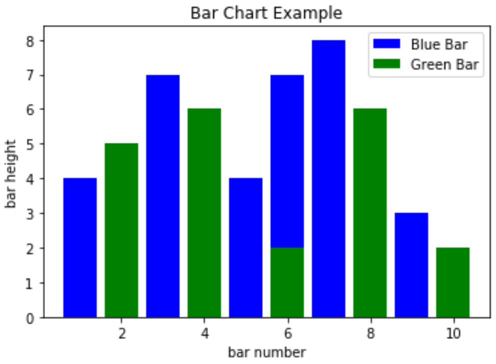
Line Plots

```
import matplotlib.pyplot as plt

x  = [1, 2, 3, 4, 5, 6, 7, 8, 9]
y1 = [1, 3, 5, 3, 1, 3, 5, 3, 1]
y2 = [2, 4, 6, 4, 2, 4, 6, 4, 2]
plt.plot(x, y1, label="line L")
plt.plot(x, y2, label="line H")
plt.plot()

plt.xlabel("x axis")
plt.ylabel("y axis")
plt.title("Line Graph Example")
plt.legend()
plt.show()
```



Bar Plots

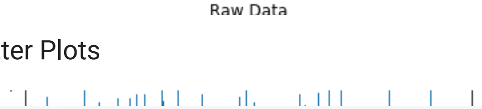
```
import matplotlib.pyplot as plt

# Look at index 4 and 6, which demonstrate overlapping cases.
x1 = [1, 3, 4, 5, 6, 7, 9]
y1 = [4, 7, 2, 4, 7, 8, 3]

x2 = [2, 4, 6, 8, 10]
y2 = [5, 6, 2, 6, 2]

# Colors: https://matplotlib.org/api/colors_api.html

plt.bar(x1, y1, label="Blue Bar", color='b')
plt.bar(x2, y2, label="Green Bar", color='g')
plt.plot()

plt.xlabel("bar number")
plt.ylabel("bar height")
plt.title("Bar Chart Example")
plt.legend()
plt.show()
```



Histograms

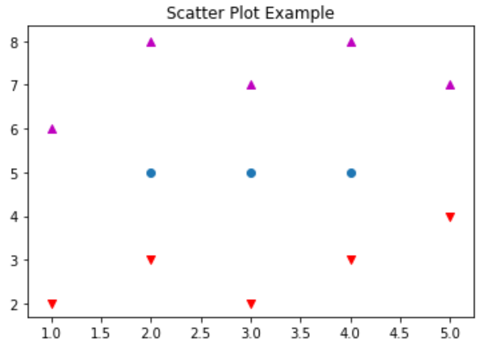
```
import matplotlib.pyplot as plt
import numpy as np

# Use numpy to generate a bunch of random data in a bell curve around 5.
```

```
n = 5 + np.random.randn(1000)

m = [m for m in range(len(n))]
plt.bar(m, n)
plt.title("Raw Data")
plt.show()

plt.hist(n, bins=20)
plt.title("Histogram")
plt.show()

plt.hist(n, cumulative=True, bins=20)
plt.title("Cumulative Histogram")
plt.show()
```



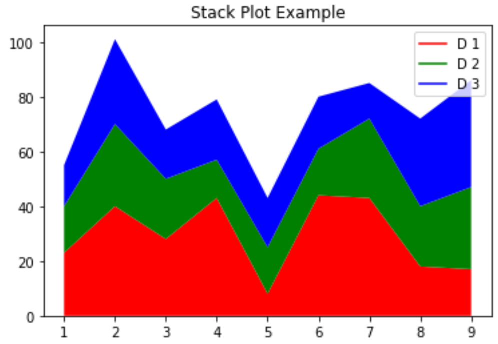
Scatter Plots

```
import matplotlib.pyplot as plt

x1 = [2, 3, 4]
y1 = [5, 5, 5]

x2 = [1, 2, 3, 4, 5]
y2 = [2, 3, 2, 3, 4]
y3 = [6, 8, 7, 8, 7]

# Markers: https://matplotlib.org/api/markers_api.html

plt.scatter(x1, y1)
plt.scatter(x2, y2, marker='v', color='r')
plt.scatter(x2, y3, marker='^', color='m')
plt.title('Scatter Plot Example')
plt.show()
```



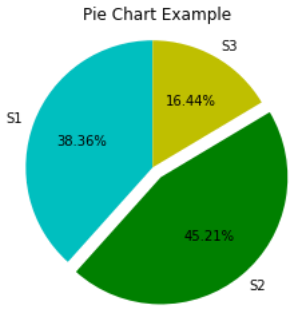
Stack Plots

```
import matplotlib.pyplot as plt

idxes = [ 1,  2,  3,  4,  5,  6,  7,  8,  9]
arr1  = [23, 40, 28, 43,  8, 44, 43, 18, 17]
arr2  = [17, 30, 22, 14, 17, 17, 29, 22, 30]
arr3  = [15, 31, 18, 22, 18, 19, 13, 32, 39]

# Adding legend for stack plots is tricky.
plt.plot([], [], color='r', label = 'D 1')
plt.plot([], [], color='g', label = 'D 2')
plt.plot([], [], color='b', label = 'D 3')

plt.stackplot(idxes, arr1, arr2, arr3, colors= ['r', 'g', 'b'])
plt.title('Stack Plot Example')
plt.legend()
plt.show()
```



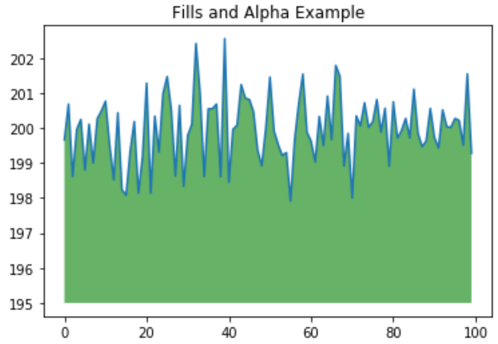
Pie Charts

```
import matplotlib.pyplot as plt

labels = 'S1', 'S2', 'S3'
sections = [56, 66, 24]
colors = ['c', 'g', 'y']

plt.pie(sections, labels=labels, colors=colors,
        startangle=90,
        explode = (0, 0.1, 0),
        autopct = '%1.2f%%')

plt.axis('equal') # Try commenting this out.
plt.title('Pie Chart Example')
plt.show()
```



fill_between and alpha

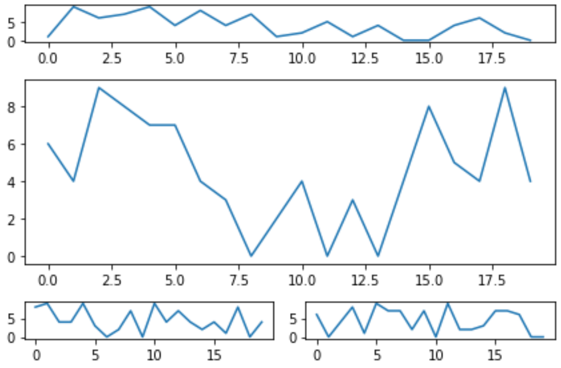
```
import matplotlib.pyplot as plt
import numpy as np

ys = 200 + np.random.randn(100)
x = [x for x in range(len(ys))]

plt.plot(x, ys, '-')
plt.fill_between(x, ys, 195, where=(ys > 195), facecolor='g', alpha=0.6)

plt.title("Fills and Alpha Example")
plt.show()
```



Subplotting using Subplot2grid

```
import matplotlib.pyplot as plt
import numpy as np

def random_plots():
  xs = []
  ys = []

  for i in range(20):
    x = i
    y = np.random.randint(10)

    xs.append(x)
    ys.append(y)

  return xs, ys

fig = plt.figure()
ax1 = plt.subplot2grid((5, 2), (0, 0), rowspan=1, colspan=2)
ax2 = plt.subplot2grid((5, 2), (1, 0), rowspan=3, colspan=2)
ax3 = plt.subplot2grid((5, 2), (4, 0), rowspan=1, colspan=1)
ax4 = plt.subplot2grid((5, 2), (4, 1), rowspan=1, colspan=1)

x, y = random_plots()
ax1.plot(x, y)

```

```
x, y = random_plots()
ax2.plot(x, y)

x, y = random_plots()
ax3.plot(x, y)

x, y = random_plots()
ax4.plot(x, y)

plt.tight_layout()
plt.show()
```



Plot styles

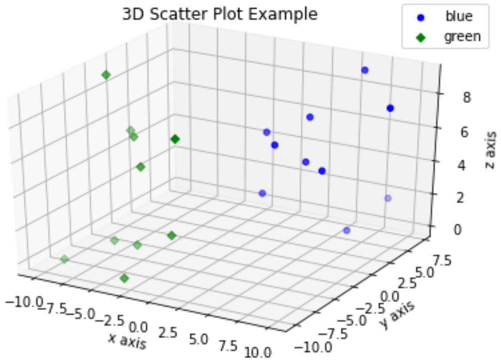
Colaboratory charts use Seaborn's custom styling by default. To customize styling further please see the matplotlib docs.

3D Graphs

3D Scatter Plots

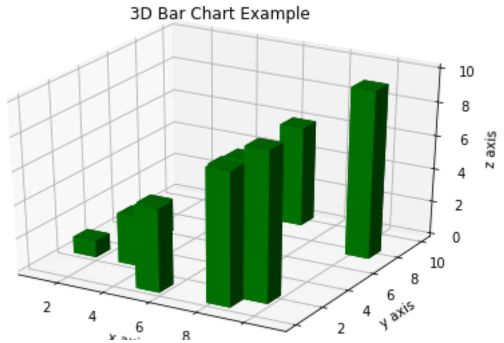
```
import matplotlib.pyplot as plt
import numpy as np
from mpl_toolkits.mplot3d import axes3d

fig = plt.figure()
ax = fig.add_subplot(111, projection = '3d')

x1 = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
y1 = np.random.randint(10, size=10)
z1 = np.random.randint(10, size=10)

x2 = [-1, -2, -3, -4, -5, -6, -7, -8, -9, -10]
y2 = np.random.randint(-10, 0, size=10)
z2 = np.random.randint(10, size=10)
```

```

ax.scatter(x1, y1, z1, c='b', marker='o', label='blue')
ax.scatter(x2, y2, z2, c='g', marker='D', label='green')

ax.set_xlabel('x axis')
ax.set_ylabel('y axis')
ax.set_zlabel('z axis')
plt.title("3D Scatter Plot Example")
plt.legend()
plt.tight_layout()
plt.show()
```



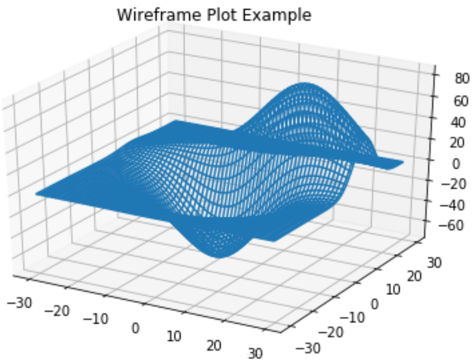
3D Bar Plots

```
import matplotlib.pyplot as plt
import numpy as np

fig = plt.figure()
ax = fig.add_subplot(111, projection = '3d')

x = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
y = np.random.randint(10, size=10)
z = np.zeros(10)

dx = np.ones(10)
dy = np.ones(10)
dz = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

ax.bar3d(x, y, z, dx, dy, dz, color='g')

ax.set_xlabel('x axis')
ax.set_ylabel('y axis')
ax.set_zlabel('z axis')
plt.title("3D Bar Chart Example")
plt.tight_layout()
plt.show()
```



Wireframe Plots

```
import matplotlib.pyplot as plt

fig = plt.figure()
ax = fig.add_subplot(111, projection = '3d')

x, y, z = axes3d.get_test_data()

ax.plot_wireframe(x, y, z, rstride = 2, cstride = 2)

plt.title("Wireframe Plot Example")
plt.tight_layout()
plt.show()
```

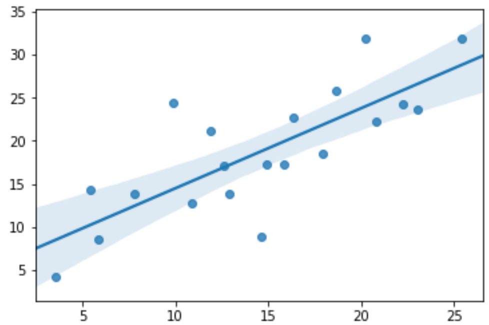


Seaborn

There are several libraries layered on top of Matplotlib that you can use in Colab. One that is worth highlighting is Seaborn:

```
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

```

# Generate some random data
num_points = 20
# x will be 5, 6, 7... but also twiddled randomly
x = 5 + np.arange(num_points) + np.random.randn(num_points)
# y will be 10, 11, 12... but twiddled even more randomly
y = 10 + np.arange(num_points) + 5 * np.random.randn(num_points)
sns.regplot(x, y)
plt.show()
```



That's a simple scatterplot with a nice regression line fit to it, all with just one call to Seaborn's regplot.

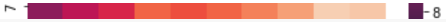
Here's a Seaborn heatmap:

```
import matplotlib.pyplot as plt
import numpy as np

# Make a 10 x 10 heatmap of some random data
side_length = 10
# Start with a 10 x 10 matrix with values randomized around 5
data = 5 + np.random.randn(side_length, side_length)
# The next two lines make the values larger as we get closer to (9, 9)
data += np.arange(side_length)
data += np.reshape(np.arange(side_length), (side_length, 1))
# Generate the heatmap
sns.heatmap(data)
plt.show()
```

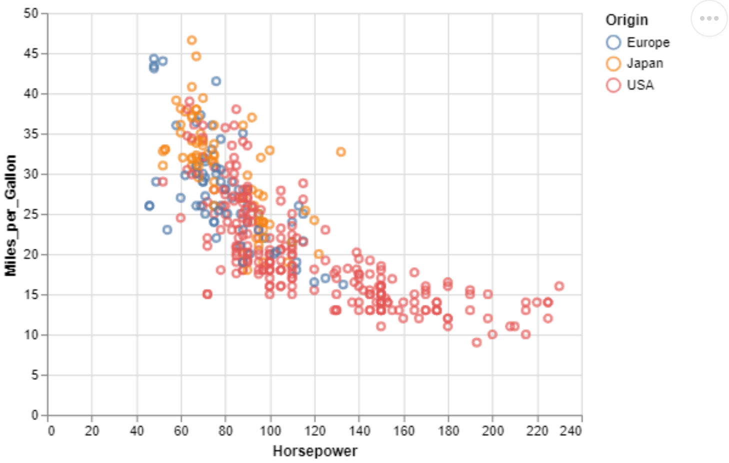
Altair

Altair is a declarative visualization library for creating interactive visualizations in Python, and is installed and enabled in Colab by default.

For example, here is an interactive scatter plot:



```
import altair as alt
from vega_datasets import data
cars = data.cars()

alt.Chart(cars).mark_point().encode(
    x='Horsepower',
    y='Miles_per_Gallon',
    color='Origin',
).interactive()
```

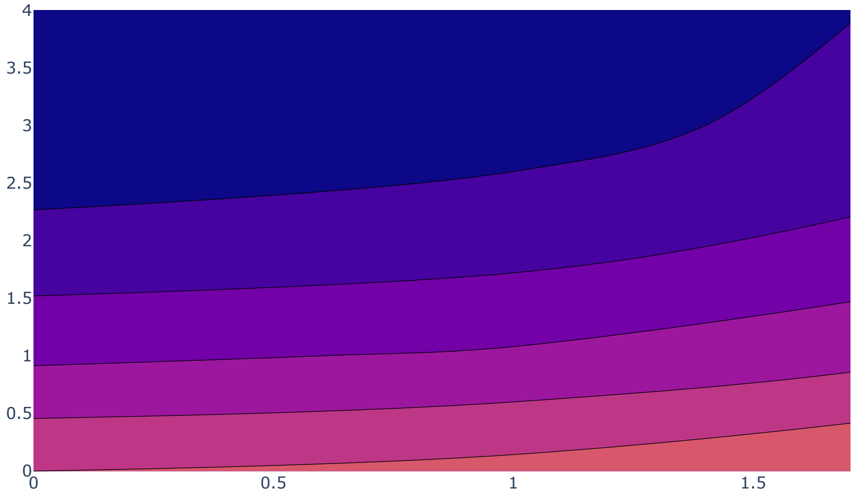


For more examples of Altair plots, see the Altair snippets notebook or the external Altair Example Gallery.

Plotly

Sample

```
from plotly.offline import iplot
import plotly.graph_objs as go

data = [
    go.Contour(
        z=[[10, 10.625, 12.5, 15.625, 20],
           [5.625, 6.25, 8.125, 11.25, 15.625],
           [2.5, 3.125, 5., 8.125, 12.5],
           [0.625, 1.25, 3.125, 6.25, 10.625],
           [0, 0.625, 2.5, 5.625, 10]]
    )
]
iplot(data)
```



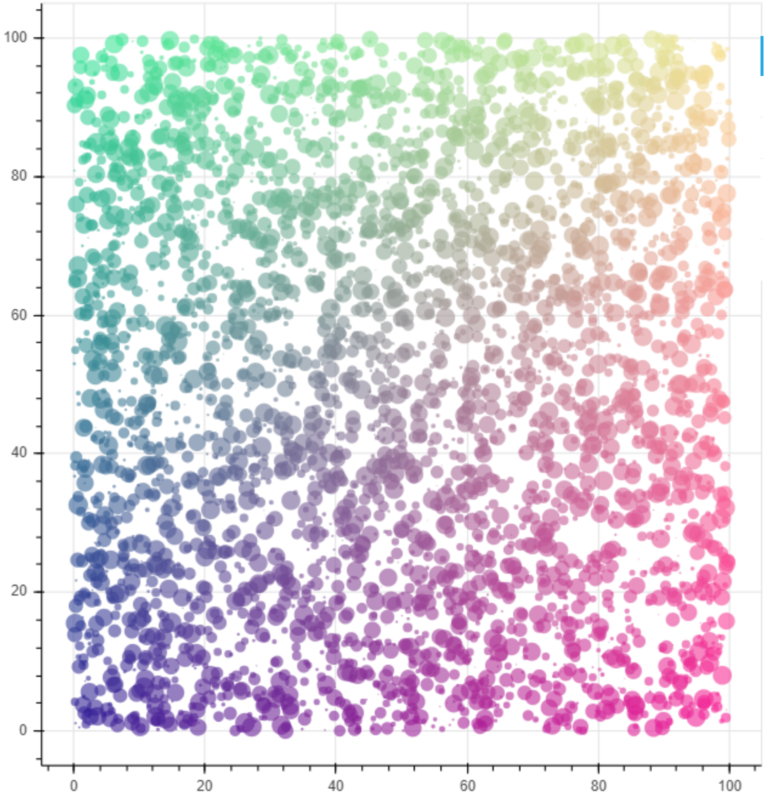
Bokeh

Sample

```
import numpy as np
from bokeh.plotting import figure, show
from bokeh.io import output_notebook

# Call once to configure Bokeh to display plots inline in the notebook.
output_notebook()
```

```
N = 4000
x = np.random.random(size=N) * 100
y = np.random.random(size=N) * 100
```

```
radii = np.random.random(size=N) * 1.5
colors = ["#%02x%02x%02x" % (r, g, 150) for r, g in zip(np.floor(50+2*x).astype(int), np.floor(30+2*y).astype(int))]

p = figure()
p.circle(x, y, radius=radii, fill_color=colors, fill_alpha=0.6, line_color=None)
show(p)
```


100
80
60
40
20
0
0
20
40
60
80
100