Simple line plot is used without to

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ecop truck of finitude.

simple Line plot: # import matglotilib import mat plotlib. pyplot as plt # sample data 2 = [1,2,3,4,5] y=[10,12,5,8,9] 5A # create a line plot ptt. plot (x,y) Linestyl = : , # customize the plat - lolor="blue", black pt. title ('Sample Line plot') printe plt. x abel ('x-axis!) plt. y label ('y-axis') # Show the plot Plt. show () sample Line plat 12 3.0

taid will styrile Scatter plat 3 The relationship Blatistates total total or more Variable. atab express the It represents slater, on Cartosian plane, [9,8,3,11,017-8 It works based on two sondition. 19. 19 10 1 19 1 19. > or depotolate gentlemen + 多元、新州军人了新州市、阿州中国 pst. Mahil ("x-amis") plt. ylobel ('Y-anie') to hethe ward # per whow ()

simple seatter plots: import matplotlib. Pyplot as plt/ x = (1, 2, 3, 4,5) y=[10,12,5,8,9]. # create a scatter plot plt. scatter (x,y) abil = ' Data points', colour='blue marker = '0') # coustomize the plot. put. title ('simple scatter plot') plt. xlabel ('x-axis') pet · y label ('y-anis') J AMA pet · legend () ~ plt. show () simple is cattle plot. a cata points 14 13 10 9 8 T 6 2.0 1.5 2.5 3.0 3.5 4.0 4.5 5.0

Bon chart - the so topped dilbertan trooped to Bans can be categorized horizontally of ventrally of bearing with the share to prout to 2 me patients the said of all of a latters. He ('e' = nutrony to latters to be a latter of the latter of

pit. alabel ('x-oncis')

pit . 4 label (14-ancis)

Pit . Sugard ()

() works. Klg

Bar chart simple imput matplotlib . pyplat as plt # sample data parte = ['wegate', 'Repro', 'closeup', Doubur red'] Salus = [120, 80, 40, 180] # weate a dolumn chart pet. bar (parti, Sales, color = 'green') Plt. title (' simple rolumn chart') pet . x abel ('paste') pet . y abel ('sales') Alt. show() simple rolumn chart 200 -125 50. 25 -0 colgate Doubur oud closup

paste

Trade Bus chart

they are talogy. Itselften trugmi

sample date

Paste = [valgati , legers , " chapter , bester ted]

Salve = [120, 80, 40, 180]

It want a down Hort

ptt. bar (part, salue, war = gruen)

Pits, stitle (simple robuser short!)

ps . xlabel (puster)

pet . ylabel ('sales')

() was the

Visualizing errors:

your data is isential for understanding the unwestaintly or variability associated with your measurements.

nedicards not its

- > Matplotlib provides various ways to visualize errors, and one dommon; approach us to use error bours.
 - measurements report to the lack of exact knowledge about a quantity or value.
 - It represents the range of possible values that a measurement or data point might have due to factors such as measurement errors, variations, or measurement errors, variations, or limitations in data vollection processes.
 - type of unurtainty you want to dommunicate.

Error Bars:

y Erver bars are a lommon way to visualize unustainly - 16 99 will gift out to

They can be added to data points in plots. It to represent the range of possible values or the standard deviation of the data.

(Line, ban, scatter plats)

Told waster #

sample node for Errorbari. impart matplotlib. pyplot as plt import numpy las up bet But the file of the state of the # sample data

maxif np. arange (d. 6). war william oriland y = np. array ((10,12,5,8,9]) y_uvi = np. array ((1,2,1,2,1)) # Eg. arros values. # Create a simple line plot with verror bars delivery to record of pota points of pota points of pota points of pota points pet . everbar (x,y, your = y_ver, fmt = 0, # customize the plot has a find with plt. title ('Data with Error Boxs') pet. xlabel. (ix-anis) structure la equi pet. ylabel ('y-onis') . itsiliumali # show the plot Establ Runs: pet. show () women a son sond rome? yetten was be added to data points in plate. to employ the owner of possible yalues on the standard deviation of the data.

Data with Error Bars. insprinciples that can range from 16on anthon to another E 3 TEMPERATURE OF WEIGHT. 2. Eignets data hat a United but of I Your Land nonths, such as countable to granderst what in Ic alassesson, 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 γ - are γ > This is usually used un scientific & error (or) einivitainity per visulation. distribution of data points. Distribution: The Distribution repers to how the data is clustered around urtain values or ranges. we have a stoney toly watrale gain insights into the characteristics and patture of the data --> making informed to declisions in and predictions. There are laught F.g.: Mushon maps, Tomproture distributions

1. Continuous data is a type of information that can vange from one entreme to another.

Eg: Temperature or weight.

2. Discrete data how a limited set of Values and ranges, such as countable

Eg: student wunt in a classroom,

Density plot and sontour plot:

pensity plot: two-dimensional roburnap

A density plot is a graphical representation of data density to visualize the distribution. of data points.

Eg: heat maps at 20 histograms.

cortour plot: " when he ware I beneficial.

A contour plot represents a threedimensional surface by showing lines (contours) at lonstant values of the third dimension reisualizing juretons of two variables

Eg: elevation maps, Temperature distributions.

To display thru - dimensional data in two d'mensions. using contours or color-coded regions.

pensity and nontour plots are commonly used in data visualization to represent the distribution of data points: in 2-D space.

plt. contourf pt. Imshow

np. mesh grid dunction, which builds two - dimensional grids from one-dimensional array.

np. random. sed (0)

pt. histed (x

() morrely to

pet . With ("Deraity plat")

pet . xiahet ("x-ora")

(0001) monator maborer (1000)

- > résualizing data density
 - > Identifying trunds /
 - > spotting patturns /

Python provides several librarus, including Matplotlib and seabours, For weating density and uontour plots

Density plot program: or will - will program Alteritors. With autour or enter adea and ent import numpy as np import matplotlib. pyplot as plt # benerate random data for demonstration put a contained np. random. seed (0) working . Hy x = np. vandom. vando (1000) y = pp. vandam. vanda (1000) # weste a density plot (20 histogram) Plt. hist2d (x, y; bins = (40,40), cmap = 'Blues') GOTTING OF THE BUTHER OF MANTERS plt. colorbar() the Hata priplitule I pet. Hells ('Density plot') Ernathed britteding pet. xlabel ('x-axis') pet . yabel (y - anis') Putter printer mount pet: show () griderity fist was our bio diltelytan Salt Fyalray \$ 5 +

meshgrid: 1 th 1 A import matplotlib. pyplot as plt pet. style. use ('seabouro-white') rd. without (x import numpy as no del f(x,4) i por sine np. cos (15+4.4x) * return np. sup(x) ** 12+ chrom dans at onp. cos (x) x = np. l'nespare (0,5,30) it in relations Piet diagram. y = np. linespace (0,5,60) x, y = np. meshgrid (x,y) Lugare Mi . It] contours = pt. contour (x, y, z, 3, college) to according pet. nontour (x, y. 2, colours = '6(ue'); 10 darg put pu?! wattour (x, V; Z, 20, Chap = "Blue"); last colon into 5 P 10 = 1 6/1/4 / - Quad of ha

relief, the the montown As the same coding, add, Plt. contourf (x, Y, z, 20, cmap = Blues) # blue regions are "peaks" pet. color bar (): · white regions are 17. COST (E+ 1.7K) M + sill balleys!". The remiter. (In simple words, show the rolor Dork Ilnes vou peaks Variation in the Dotted olines are valleys.) Plot . diagram . 9- 11/2 Litespens (0,5,60) (y.x) bispham. qn = K,X PSt. im show: contours = plt. contour (x, y, z, 3, colors = blue) pet. clabel (nontours, Inline = True, fontsize = 10) pet, inshow (Z, extent = [0,7,0,7], origin = 'lower', c map = Blues', alpha = 0.7) put . Lobor banco; It is my to show To inay in semi-

Transporent.

outil in interpolation in and some some at the married in distribution refers to the way data in spread for organized within a adataset.

abley soon also be used for Histograms, box plots, density plots, and quantitlequantitle (Q-Q) plots are dommonly used Visualizations to understand and orepresent data distributions.

Distributions are unidely used in various fields including strance, engineering; social sciences, biology, and more, to model and analyze of fight tologet. oreal - world data.

Histogram:

> A histogram is a graphical representation of the distribution of a dataset.

> bata is divided into intervals or "bins", and

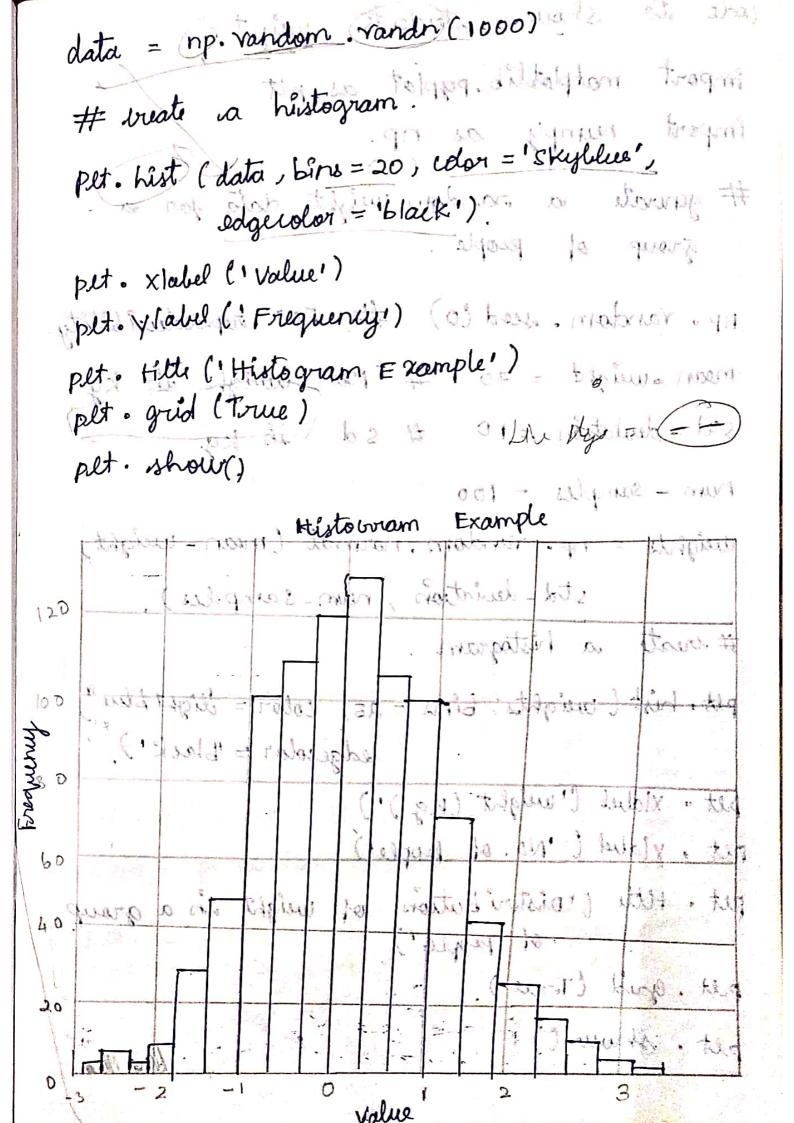
the number of data points that tall into each bin is orepresented as bours or rectangles.

B-LOTABLE WOLLD

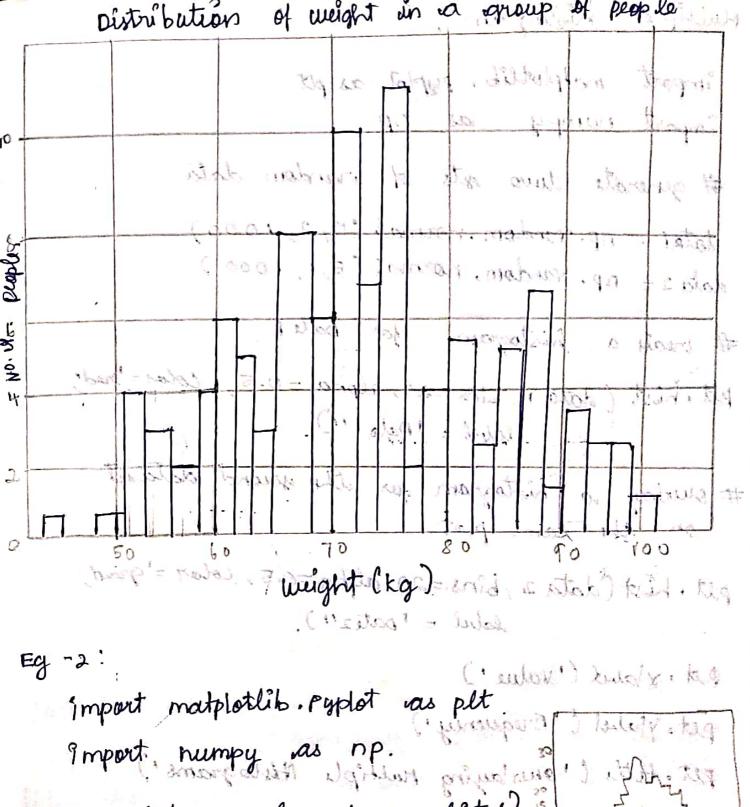
Bins: The range of data values is divided into several sintervals for bins.

Frequency: The height of each bar or rectangle in the histogram.

dontinuous, Histograms are commonly used Data to represent continuous datas such as measurements, but they can also be used for - attil war hardistricte of data. Daly rod amongolasty for thether (B-B) I bis and laminorly used west remajore his biolished at motheridamin > gaining insights into the distribution it ab > i dentifying patterns (cos) outliers > understanding the dentral tendency and spread of the dataset. who biron - loss Various fields: Histog-our: a Statistico assertire bridge a in mayorist A distribution of a dataset. data analysis data visualization to atte behind in stood? er watergies. # sample tode for histogram: acuh bin Emport numpy as np # Gunerate 7000 random data it : warmper ?



```
code to show students weight.
 import matplotlib. pyplot as plt
 Proport, rumpy as np.
# generate a random weight data for a
    group of people.
                          pet. Mobil: "Value")
 np. random. seed (0) # For reproduci billy.
 mean - weight = 70 9 4 Man Duright an kg 9
 std-devlation = 10 # sd in kg
 rum - samples = 100
 weights = np. random. normal (mean - weight,
           std-deviation, num-samples).
 # treate a histogram
 pet. hist ( weights, birs = 25, color = dight blue,
                       edgerolor = black').
pet . xlabel ('weight (kg)')
pet. x (abel ( 'No. of people')
pet. Hette l'Distribution of weight in a group
             of people")
pet grid (True).
pet. show ()
```

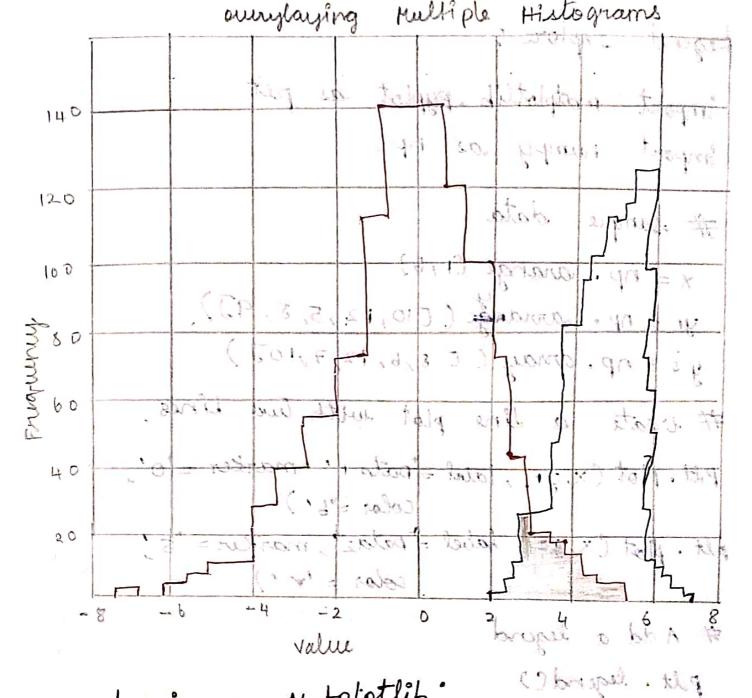


pet. show ().

```
Mulliple histogram:
  import matplotlib, pyplot as plt.
  import numpy as
  # generate two acts of random data.
  data1 = np. random. normal (0,2,-1000)
 data 2 = np. vandom. normal (5,1, 1000)
# breats a histogram. for batte!
 Ptt. hist (data 1, bins = 20, alpha = 0.5, color= red)
               label = 'Data ! ").
# overlay a histogram for its second idataset
   on the same plat.
pet. List (data 2, bins = 20, alpha =0.5, color = greed,
                label = " Date 2"),
 p.t. x label ('Value')
 pet. ylabel ('Erequency')
 pet. title ('ouerlaying Multiple Histograms')
 Pet. legend () = stidu - ovedose! all . Note . The
 pet. grid (True) (coerinber, makerer ogn - whole
 pet: hill ( data, bira 20, deraid, = True () suports = the
      histige = 1 stephilled: solon = " was".
                   (, estable = layer time.)
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. () when a tan

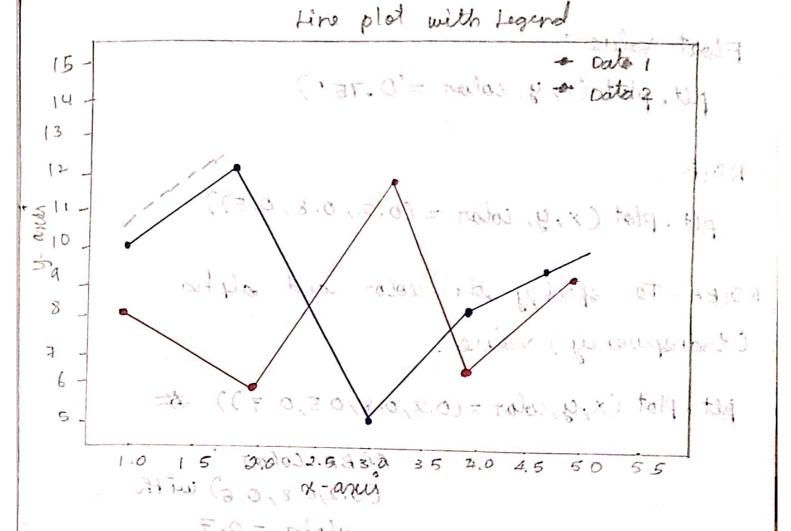


Jegends in a Matplotlib:

Legends in a Matplotlib plot provide additional information about the elements son the plot, such as the meaning of distorent volvers, line styles, or markers to improve the clarity of the plot.

It easier for viewers to understand the data.

```
Legend explore:
 import madplotlib. pyplot as plt
 import numpy as hp.
 # sample data
   x = np. arange (1,6)
   y1 = np. arrange ([10,12,5,8,9]).
  y 2 = np. array ( C 8,6, 12,7,10])
 # vreate a line plot with two lines.
 P.H. plot (x, yr., label = pata 1', marker = '0')
                     color = b')
plt. plot (x, 92, label = Dataz', marker = 's'
                      color = 'v') the
# Add a legend
 Plt. legend () ( idite introvi a in abrupal
plt ... tilti ("Line Plot with Legend")
Flet . * X label & " X - axis () and out trade mather water!
 pet ylabel ( 'y-anis) mile 10 primary its
 pet. show () timed est everyone at environ
It easier for viewers to understand the data.
```



Colors:

In Matplotlib, colors can be specified in several ways,

a should be the stronger of

> by name

> heacidecimal RGB Value

> float value between 0 and 1

> RGBA COLOT.

By Name:

put. plot (x,y, color = 'ored')

Hexadecimal RGB Value

plt. plot (x, y, color = '# FF 5733')

Bayesian Data Analysis!

Problem equilibrian -7 pata collection ->

Model development -> pruos pistribution ->

Data Analysis -> Results communication.

Prices destribution:

Before observing any data, we reed to experitly prior distributions.

Jos ille mode parameters, Lets assume a weakey injuriative prior for o, such as a normal distribution lentered at 0 with moderate

Standard deviation !

$$\frac{56 \times 76}{100} = 35$$
 $\frac{50 \times 30}{100} = 15$

5

configency Table:

-7 Voling presence (A/B) gender (Male / Eumale)

fruit, try

1 1 1 1 1 1 1 1 1	CA-07 TIME	V. Sallander I	
	Voting A	Voting B	Total
Male.	(3,0)	20	50
Female	40 July	101,111	50
Total	70 100	30	100

1. Examine the Table:

> Observe the rounts in each cell, noting the distribution of responses.

2. kow 8 column Margins:

- > Calculate viou & column Totals to i dentify the marginal distributions.
- > Row ranginal (Total in each vow): 50,50 one variable in Protegoration indo the
 - Sudum Margins (1) redumn) in 70,30
- 3. Colculate Percentages:

it then is a preprinced absolute on

interes it worder.

- > compute Reventages For each cell,
 - > tell lementage (eg. Male who voted 4) 30/100 × 100 = 30%.
 - Row Percentage [19, Male who voted;

 A out of Male Total):

 30/50 ×100 = 60%
 - Voted A out of total who voted A):

 30/70 × 100 = 42.867.
- 4. Assess Independence:
 - DE ramine whether the distribution of one variable is independent of the other or is there an association.
 - 5- Uhi-square Test:
 - > use the chi-square test to determin il there is a siegnificant association between the variables.

> calculate the chi-square statistic ? compare it the the tribital value.

6. Interpretation Results:

> If the p-value from the chi -Square test is significant, reject the null hypothesis of independence.

7. Visualization:

Jof = (7-1) X(C-1) > create lisualizations like a clustered

a stacked bar chart bar chart or to Ellestrate the volationships

Visually.

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