14/09/2023

Project Title:

Analysis and visualisation of product categories across their market and region using python matplot library

Organisation name:IBM research PVT.LTD

Name:K.Pranavi

Branch:CSE-B

Year:4

Project Guide

Mr. Lokesh B. Sir

Problem Statement

A organisation called product based company publishing in

2011 hackathon now the organisation wants tabular data into visualisation format,as a data science engineer I have to provide solutions for following task

TASK 1: Find out what is the maximum and minimum profit value across sales.It is mandatory data in bar graphs only.

TASK 2; Find out maximum and minimum sales for profit across different categories findout what maximum and minimum sales for profits across different categories all the categories is must in different colors.

TASK 3: In which month sales view highest profit and loss

TASK 4: What is the highest age of employee.Visulaisation must be histogram

Tools:

1. Jupyter Notebook.
2. Python Programing Language.
3. Numpy (Python Libery_)
4. Google Colab.

Visualisation in Python - Matplotlib

You will be working with the sales dataset for an online retailer. The data is collected over a period of three years: 2012 to 2015. It contains the information of sales made by the company.

The products captured belong to three categories:

- Furniture
- Office Supplies
- Technology

Also, the company caters to five different markets:

- USCA
- LATAM
- ASPAC
- EUR
- AFR

Let's get started with the plots. We will be using the '**pyplot**' package of the Matplotlib library.

```
# importing numpy and the pyplot package of matplotlib
import numpy as np
import matplotlib.pyplot as plt
```

```
# Creating an array with product categories
product_categories=np.array(["Furniture","Office Supplies","Technology"])
product_categories
```

```
array(['Furniture', 'Office Supplies', 'Technology'], dtype='<U15')
```

```
# Creating an array with the sales amount
# Furniture: 4110451.90
# Technology: 4744557.50
# Office Supplies: 3787492.52
sales=np.array([4110451.90,4744557.50,3787492.52])
sales
```

```
array([4110451.9 , 4744557.5 , 3787492.52])
```

It is not necessary that you are provided with the aggregated values every time. In such cases, you first need to calculate the values and then build the graphs.

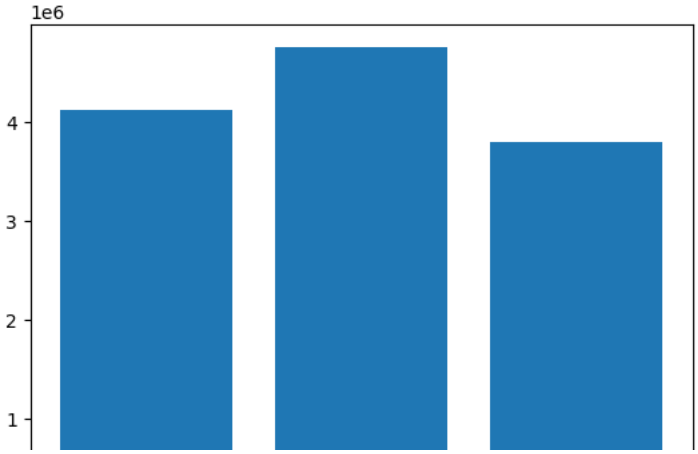
Let's see how to plot a bar graph for the provided values.

Bar Graph: Plotting sales across each product category

- A bar chart uses bars to show comparisons between categories of data.
- One axis will generally have numerical values or measures,
- The other will describe the types of categories being compared or dimensions.

Let's start with plotting a bar graph representing the sales across different categories over the period.

```
# plotting the bar graph with product categories on x-axis and sales amount of y-axis
plt.bar(product_categories,sales)
# necessary command to display the created graph
plt.show()
```



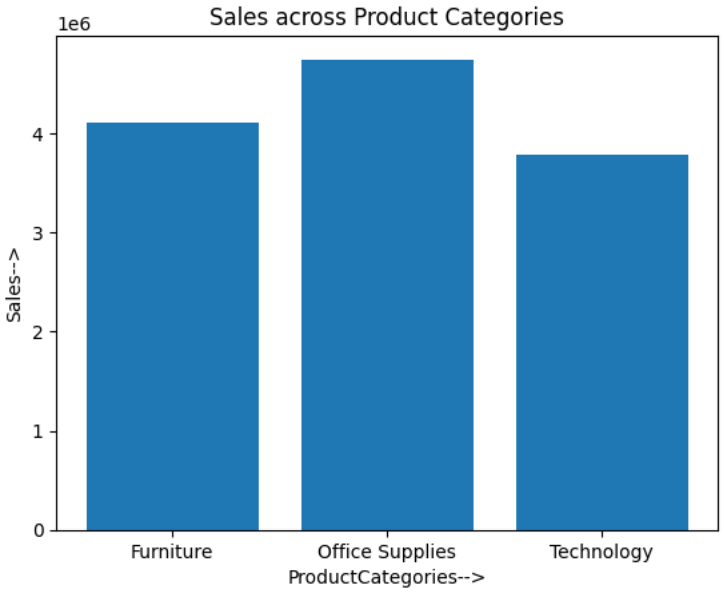
Adding title and labeling axes in the graph

```
# plotting the bar graph with product categories on x-axis and sales amount of y-axis
plt.bar(product_categories,sales)

# adding title to the graph
plt.title("Sales across Product Categories")

# labeling axes
plt.xlabel("ProductCategories-->")
plt.ylabel("Sales-->")

# necessary command to display the created graph
plt.show()
```



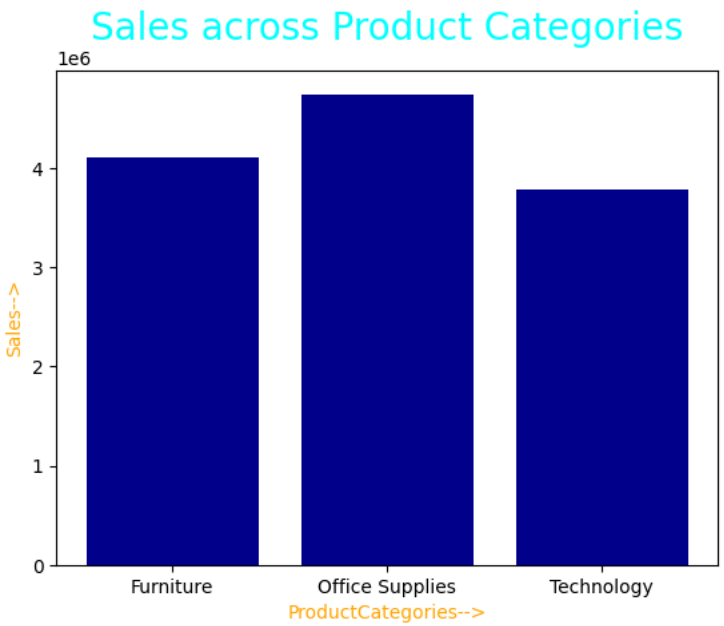
Modifying the bars in the graph

```
# changing color of the bars in the bar graph
# plotting the bar graph with product categories on x-axis and sales amount of y-axis
plt.bar(product_categories,sales,color="darkblue")


# adding title to the graph
plt.title("Sales across Product Categories",{"fontsize":20,"fontweight":5, "color":"cyan"})


# labeling axes
plt.xlabel("ProductCategories-->",{"fontsize":10,"fontweight":5, "color":"orange"})
plt.ylabel("Sales-->",{"fontsize":10,"fontweight":5, "color":"orange"})
```

```
# necessary command to display the created graph
plt.show()
```



Adjusting tick values and the value labels

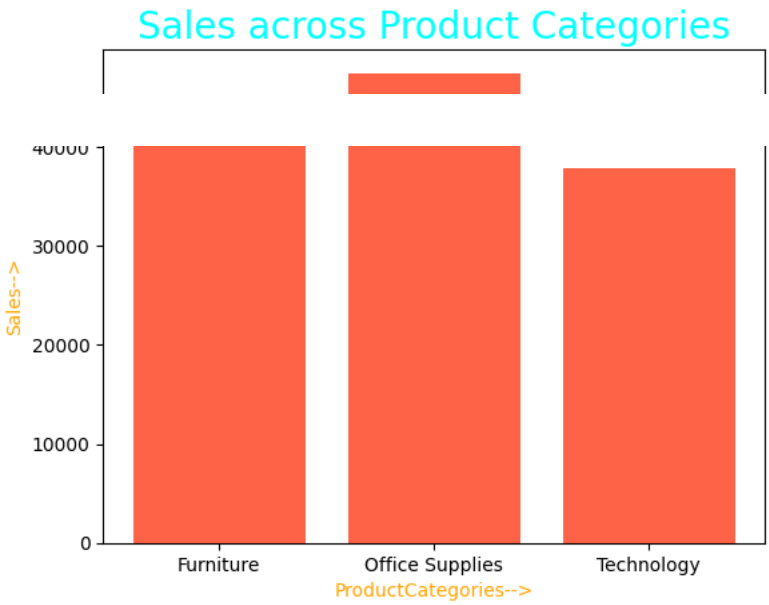
```
# plotting the bar graph with product categories on x-axis and sales amount of y-axis
product_categories=np.array(["Furniture","Office Supplies","Technology"])
sales=np.array([41104,47445,37874])
plt.bar(product_categories,sales,color="tomato")


# adding title to the graph
plt.title("Sales across Product Categories",{"fontsize":20,"fontweight":5, "color":"cyan"})


# labeling axes
plt.xlabel("ProductCategories-->",{"fontsize":10,"fontweight":5, "color":"orange"})
plt.ylabel("Sales-->",{"fontsize":10,"fontweight":5, "color":"orange"})

# Modifying the ticks to show information in (lakhs)
tick_values =np.arange(0,50000,10000)
tick_labels =("0K","10K","20K","30K","40K")

plt.yticks=(tick_values,tick_labels)
# necessary command to display the created graph
plt.show()
```



copy-of-02-scatterplot

September 14, 2023

0.0.1 Scatter Chart: Plotting Sales vs Profits

- Scatter plots are used when you want to show the relationship between two facts or measures.

Now, you have the sales and profit data of different product categories across different countries. Let's try to build scatterplots to visualise the data at hand.

[6]:
```
# importing numpy and the pyplot package of matplotlib
import numpy as np
import matplotlib.pyplot as plt

# Sales and Profit data for different product categories across different␣
↪countries
```

```
sales = np.array ([1013.14, 8298.48, 875.51, 22320.83, 9251.6, 4516.86, 585.16,␣
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```

```
profit = np.array([-1213.46, 1814.13, -1485.7, -2286.73, -2872.12, 946.8, 198.
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```
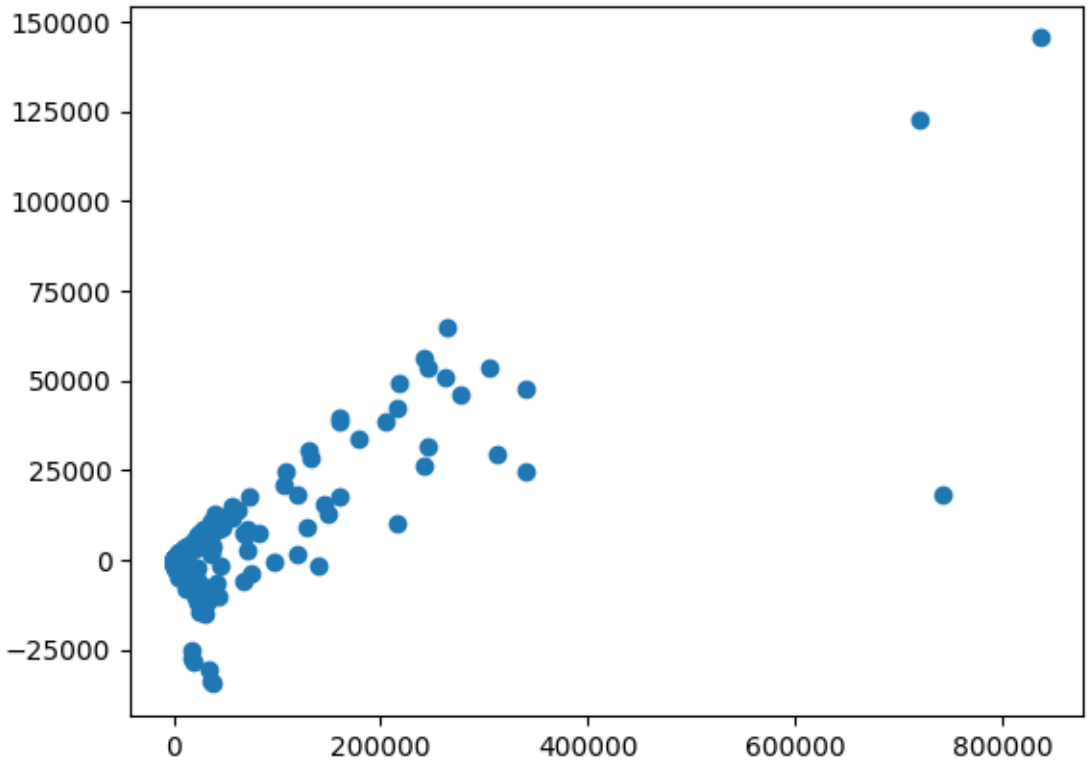

Plotting a scatterplot

[7]:
```
# plotting scatterplot
plt.scatter(sales,profit)

# necessary command to display graph
plt.show()
```



[8]:
```
# Sales and Profit data for different product categories across different␣
↪countries
```

```
sales = np.array ([1013.14, 8298.48, 875.51, 22320.83, 9251.6, 4516.86, 585.16,␣
 ↪836154.03, 216748.48, 174.2, 27557.79, 563.25, 558.11, 37117.45, 357.36,␣
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 ↪06, 304763.54, 6101.31, 729.6, 896.07, 17.82, 26.22, 46429.78, 31167.27,␣
 ↪2455.94, 37714.3, 1506.93, 3812.78, 25223.34, 3795.96, 437.31, 41278.86,␣
 ↪2091.81, 6296.61, 468.82, 23629.64, 160435.53, 9725.46, 1317.03, 1225.26,␣
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 ↪45, 35352.57, 245783.54, 20.49, 13471.06, 8171.16, 14075.67, 611.82, 3925.
 ↪56, 981.84, 10209.84, 156.56, 243.06, 21287.52, 7300.51, 434.52, 6065.0,␣
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 ↪445.5, 71860.82, 14840.45, 24712.08, 1329.9, 1180.44, 85.02, 10341.63, 690.
 ↪48, 1939.53, 20010.51, 914.31, 25223.82, 12804.66, 2124.24, 602.82, 2961.66,␣
 ↪15740.79, 74138.35, 7759.39, 447.0, 2694.84, 22358.95, 21734.53, 4223.73,␣
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 ↪20269.44, 246.12, 668.13, 768.93, 215677.35, 899.16, 2578.2, 4107.99, 20334.
 ↪57, 366.84, 3249.27, 98.88, 3497.88, 3853.05, 786.75, 1573.68, 458.36, 1234.
```

```
profit = np.array([-1213.46, 1814.13, -1485.7, -2286.73, -2872.12, 946.8, 198.
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↪92, 14941.58, 348.93, 1944.06, -5.51, 7026.84, 46114.92, 2361.86, 2613.24,␣
```
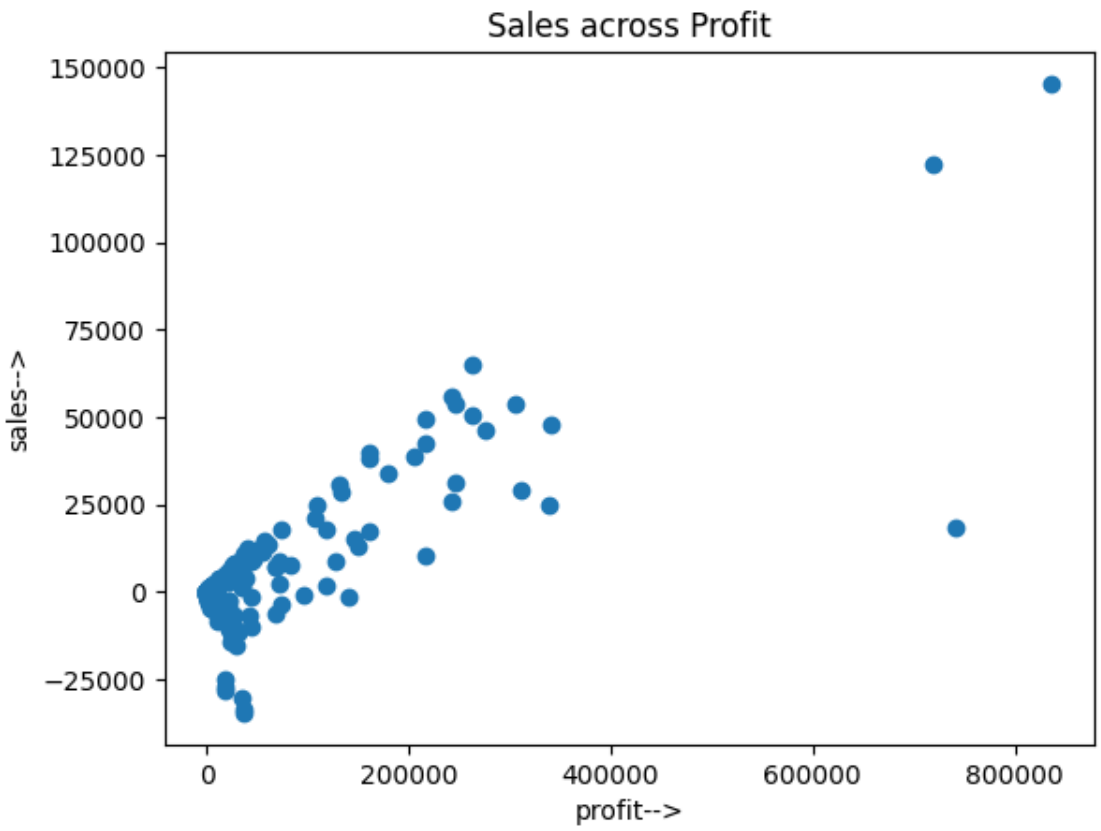

```
# corresponding category and country value to the above arrays
```

```
product_category = np.array(['Technology', 'Technology', 'Technology',␣
↪'Technology', 'Technology', 'Technology', 'Technology', 'Technology',␣
```

Adding title and labeling axes

[9]:
```
# plotting scatter chart
plt.scatter(sales,profit)



# Adding and formatting title
plt.title("Sales across Profit")

# Labeling Axes
plt.xlabel("profit-->")
plt.ylabel("sales-->")
plt.show()
```

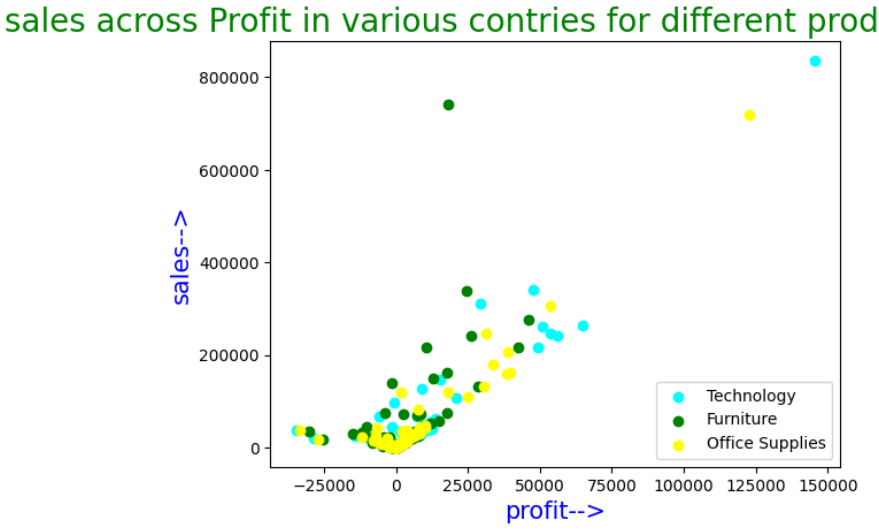
```
 ↪'Taiwan', 'Syria', 'Switzerland', 'Sweden', 'Swaziland', 'Sudan', 'Sri␣
 ↪Lanka', 'Spain', 'South Sudan', 'South Korea', 'South Africa', 'Somalia',␣
 ↪'Singapore', 'Sierra Leone', 'Serbia', 'Senegal', 'Saudi Arabia', 'Rwanda',␣
 ↪'Russia', 'Romania', 'Qatar', 'Portugal', 'Poland', 'Philippines', 'Peru',␣
 ↪'Paraguay', 'Papua New Guinea', 'Panama', 'Pakistan', 'Norway', 'Nigeria',␣
 ↪'Niger', 'Nicaragua', 'New Zealand', 'Netherlands', 'Nepal', 'Namibia',␣
 ↪'Myanmar (Burma)', 'Mozambique', 'Morocco', 'Mongolia', 'Moldova', 'Mexico',␣
 ↪'Mauritania', 'Martinique', 'Mali', 'Malaysia', 'Madagascar', 'Luxembourg',␣
 ↪'Lithuania', 'Libya', 'Liberia', 'Lesotho', 'Lebanon', 'Kyrgyzstan',␣
 ↪'Kenya', 'Kazakhstan', 'Jordan', 'Japan', 'Jamaica', 'Italy', 'Israel',␣
 ↪'Ireland', 'Iraq', 'Iran', 'Indonesia', 'India', 'Hungary', 'Hong Kong',␣
 ↪'Honduras', 'Haiti', 'Guyana', 'Guinea-Bissau', 'Guinea', 'Guatemala',␣
 ↪'Guadeloupe', 'Greece', 'Ghana', 'Germany', 'Georgia', 'Gabon', 'France',␣
 ↪'Finland', 'Ethiopia', 'Estonia', 'Eritrea', 'Equatorial Guinea', 'El␣
 ↪Salvador', 'Egypt', 'Ecuador', 'Dominican Republic', 'Djibouti', 'Denmark',␣
 ↪'Democratic Republic of the Congo', 'Czech Republic', 'Cuba', 'Croatia',␣
 ↪"Cote d'Ivoire", 'Costa Rica', 'Colombia', 'China', 'Chile', 'Central␣
 ↪African Republic', 'Canada', 'Cameroon', 'Cambodia', 'Burkina Faso',␣
 ↪'Bulgaria', 'Brazil', 'Bosnia and Herzegovina', 'Bolivia', 'Benin',␣
 ↪'Belgium', 'Belarus', 'Barbados', 'Bangladesh', 'Bahrain', 'Azerbaijan',␣
```



Representing product categories using different colors

[13]:
```
product_categories = np.array(["Technology", "Furniture", "Office Supplies"])
colors = np.array(["cyan", "green", "yellow"])

# plotting the scatterplot with color coding the points belonging to different␣
 ↪categories
for color,category in zip(colors,product_categories):
  sales_category=sales[product_category==category]
  profit_category=profit[product_category==category]
  plt.scatter(profit_category,sales_category,c=color,label=category)

# Adding and formatting title
plt.title("sales across Profit in various contries for different product␣
 ↪categories",fontdict={'fontsize':20,'fontweight':5,'color':'green'})

# Labeling Axes
plt.xlabel("profit-->",fontdict={'fontsize':15,'fontweight':3,'color':'blue'})
plt.ylabel("sales-->",fontdict={'fontsize':15,'fontweight':3,'color':'blue'})
```

```
# Adding legend for interpretation of points
plt.legend()

plt.show()
```



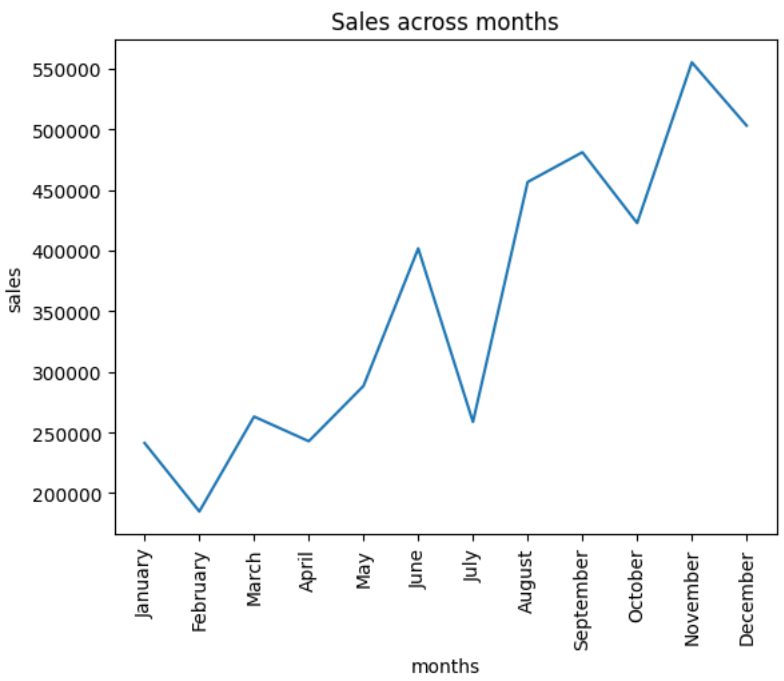
[ ]:

Visualisation in Python - Matplotlib

Line Chart: Trend of sales over the 12 months

- Can be used to present the trend with time variable on the x-axis
- In some cases, can be used as an alternative to scatterplot to understand the relationship between 2 variables

```
# importing the required libraries
import numpy as np
import matplotlib.pyplot as plt

# Sales data across months
months = np.array(['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August', 'September', 'October', 'November', 'December'])
sales = np.array([241268.56, 184837.36, 263100.77, 242771.86, 288401.05, 401814.06, 258705.68, 456619.94, 481157.24, 422766.63, 555279.03, 50


# plotting a line chart
plt.plot(months,sales)

# adding title to the chart
plt.title("Sales across months")

# labeling the axes
plt.xlabel("months")
plt.ylabel("sales")
# rotating the tick values of x-axis
plt.xticks(rotation=90)

# displating the created plot
plt.show()
```



Visualisation in Python - Matplotlib

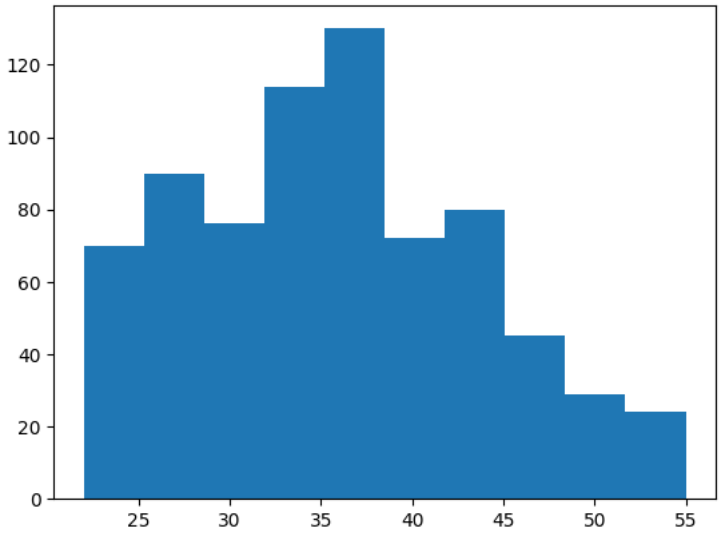
Histogram: Distibution of employees across different age groups

- Useful in checking the distribution of data range
- Builds a bar corresponding to each element in the data range showing its frequency

```
# importing the required libraries - numpy, matplotlib.pyplot
import numpy as np
import matplotlib.pyplot as plt

# data corresponding to age of the employees in the company
age = np.array([23, 22, 24, 24, 23, 23, 22, 23, 24, 24, 24, 22, 24, 23, 24, 23, 22, 24, 23, 23, 22, 23, 23, 24, 23, 24, 23, 22, 24, 22, 23, 2

# Checking the number of employees
len(age)
```

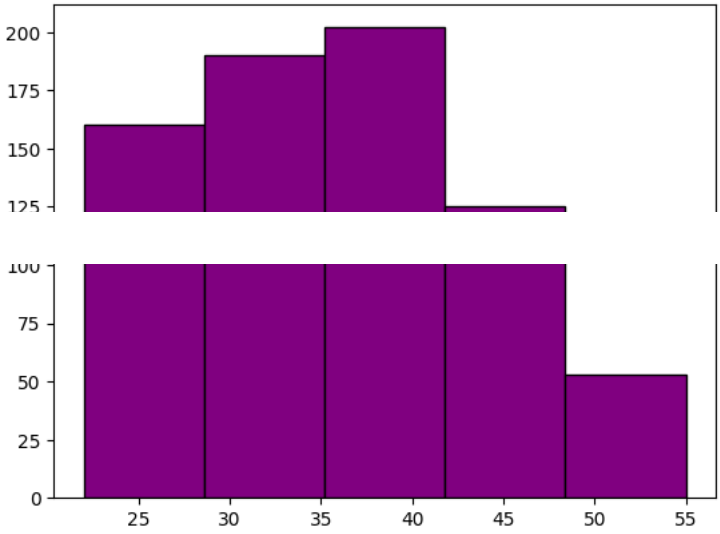
```
730
```

```
# plotting a histogram
plt.hist(age)

plt.show()
```



Plotting a histogram with fixed number of bins

```
# plotting a histogram
plt.hist(age,bins=5,color="purple",edgecolor="black")

plt.show()
```



Visualisation in Python - Matplotlib

Box plot: Understanding the spread of sales across different countries

- Useful in understanding the spread of the data
- Divides the data based on the percentile values
- Helps identify the presence of outliers

```
# importing numpy and the pyplot package of matplotlib
import numpy as np
import matplotlib.pyplot as plt

# Creating arrays with sales in different countries across each category: 'Furniture', 'Technology' and 'Office Supplies'
sales_technology = np.array ([1013.14, 8298.48, 875.51, 22320.83, 9251.6, 4516.86, 585.16, 174.2, 27557.79, 563.25, 558.11, 37117.45, 357.36,
sales_office_supplies = np.array ([1770.13, 7527.18, 1433.65, 423.3, 21601.72, 10035.72, 2378.49, 3062.38, 345.17, 30345.78, 300.71, 940.81,
sales_furniture = np.array ([981.84, 10209.84, 156.56, 243.06, 21287.52, 7300.51, 434.52, 6065.0, 224.75, 28953.6, 757.98, 528.15, 34922.41,
```

+ Code + Text

```
# plotting box plot for each category
category=np.array([sales_technology,sales_office_supplies,sales_furniture])
plt.boxplot(category)

# adding title to the graph
plt.title("Sales across categories")

# labeling the axes
plt.xlabel("Categories")
plt.ylabel("Sales")
# Replacing the x ticks with respective category
ticks_label=(0,3,1)
ticks_values=(["Technology","office supplies","furniture"])
plt.xticks(ticks_label,ticks_values)

plt.show()
```

```
<ipython-input-18-bbc275f9608a>:2: VisibleDeprecationWarning: Creating an ndarray from r
  category=np.array([sales_technology,sales_office_supplies,sales_furniture])
```