Name: Rajesh Bisht , Batch-8

Email Id: rbisht.india@gmail.com

Assignment-4

Git Hub : https://github.com/RajeshBisht28/Assignment4_ML.git

Question-1: Import the attached Indian_food.csv file in Jupyter notebook and perform following data cleaning operations through operations using Pandas and visualizations using Matplotlib, Seaborn and Plotly

Data Source- Indian_food.csv

Load Indian_food.csv

In [50]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import os

df = pd.read_csv("Indian_food.csv")
num_columns = df.shape[1]
print(f"Total columns: {num_columns}")
num_rows = df.shape[0]
print(f"Total rows: {num_rows}")
df.head()
```

```
Total columns: 8
Total rows: 253
```

Out[50]:

	Name	Ingredients	Diet	cook_time	flavor_profile	course	state	region
0	Balu shahi	Maida flour, yogurt, oil, sugar	vegetarian	25	sweet	dessert	West Bengal	East
1	Boondi	Gram flour, ghee, sugar	vegetarian	30	sweet	dessert	Rajasthan	West
2	Gajar ka halwa	Carrots, milk, sugar, ghee, cashews, raisins	vegetarian	60	sweet	dessert	Punjab	North
3	Ghevar	Flour, ghee, kewra, milk, clarified butter, su...	vegetarian	30	sweet	dessert	Rajasthan	West
4	Gulab jamun	Milk powder, plain flour, baking powder, ghee,...	vegetarian	40	sweet	dessert	West Bengal	East

In [ ]:

Question-1: a) In the state column, replace the -1 with the mode of state column.

In [52]:

```
# Calculate the mode of the "state" column.
# The mode is the most frequently occurring value in that column.
#
mode_state = df['state'].mode()[0]
print(f"Mode value of State: {mode_state}")
# Replace -1 with the mode value
## with updated DataFrame
df['state'] = df['state'].replace(-1, mode_state)
```

```
Mode value of State: Gujarat
```

In [ ]:

Question-1: b) Whatever the state you got in previous question,

fill the corresponding region in the region column

In [59]:

```
## All Region list of mode state
## mode_state : from previous question
```

```
mode_State_all_regions = df.loc[df['state'] == mode_state, 'region']
## Get first value of state
fr_region = mode_State_all_regions.iloc[0]
## Region of mode_state
df.loc[df['state'] == mode_state, 'region'] = fr_region
print(f"Region of mode region state is {fr_region}")
```

```
Region of mode region state is West
```

In [ ]:

Question-1: c) Replace the -1 with mean for cook time variable.

In [60]:

```
## Replace the -1 with mean for cook time variable.
mode_cook_time = df['cook_time'].mode()[0]
print(f"Mode value of cook_time: {mode_cook_time}")
# Replace -1 with the cook_time mode value
## with updated DataFrame
df['cook_time'] = df['cook_time'].replace(-1, mode_cook_time)
```

```
Mode value of cook_time: 30
```

After performing these data cleaning steps, perform the below visualizations. You can use any of the 3 libraries (Matplotlib, seaborn, Plotly)

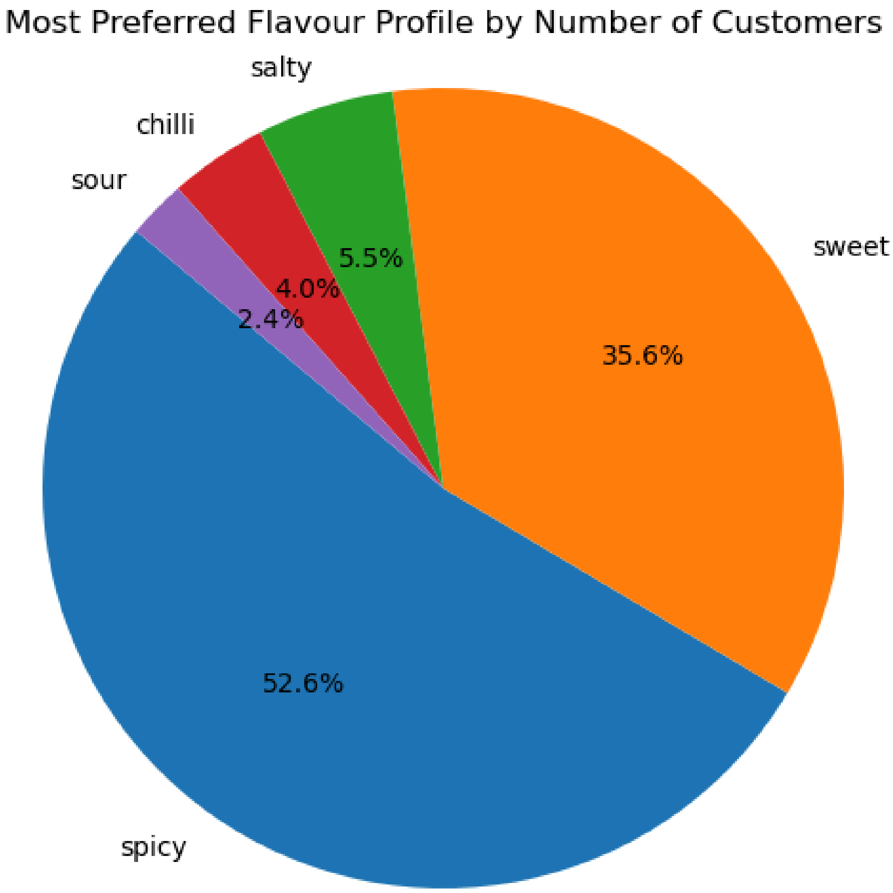
Question-1: d) Most preferred flavours by number of customers using pie chart.

In [ ]:

In [37]:

```
 # Get List of  flavour_profile
flavor_profile_list = df['flavor_profile'].tolist()
#Count the occurrences of each flavor_profile
flavour_profile_counts = df['flavor_profile'].value_counts()
print(flavour_profile_counts)
print(flavour_profile_counts.index)
## Labels for pie chart - name of flavor_profile
flavor_labels = flavour_profile_counts.index
# Create a pie chart based on flavour_profile_counts
# Figure sixe 8*6 Inches
plt.figure(figsize=(8, 6))
# LAbels are : flavour_profile_counts.index
plt.pie(flavour_profile_counts, labels=flavor_labels, autopct='%1.1f%%', startangle
plt.title('Most Preferred Flavour Profile by Number of Customers')
# Equal aspect ratio : pie is drawn as a circle.
plt.axis('equal')
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'PieChart_flavour_profile_numfF_customers.png'))
# Display the pie chart
plt.show()
```

```
flavor_profile
spicy     133
sweet      90
salty      14
chilli     10
sour        6
Name: count, dtype: int64
Index(['spicy', 'sweet', 'salty', 'chilli', 'sour'], dtype='object', name='flavor_pr
ofile')
```



In [35]:
```
pwd
```

Out[35]:
```
'E:\\IIT_GUWAHATI\\Assignment4\\Assignment4_Final'
```

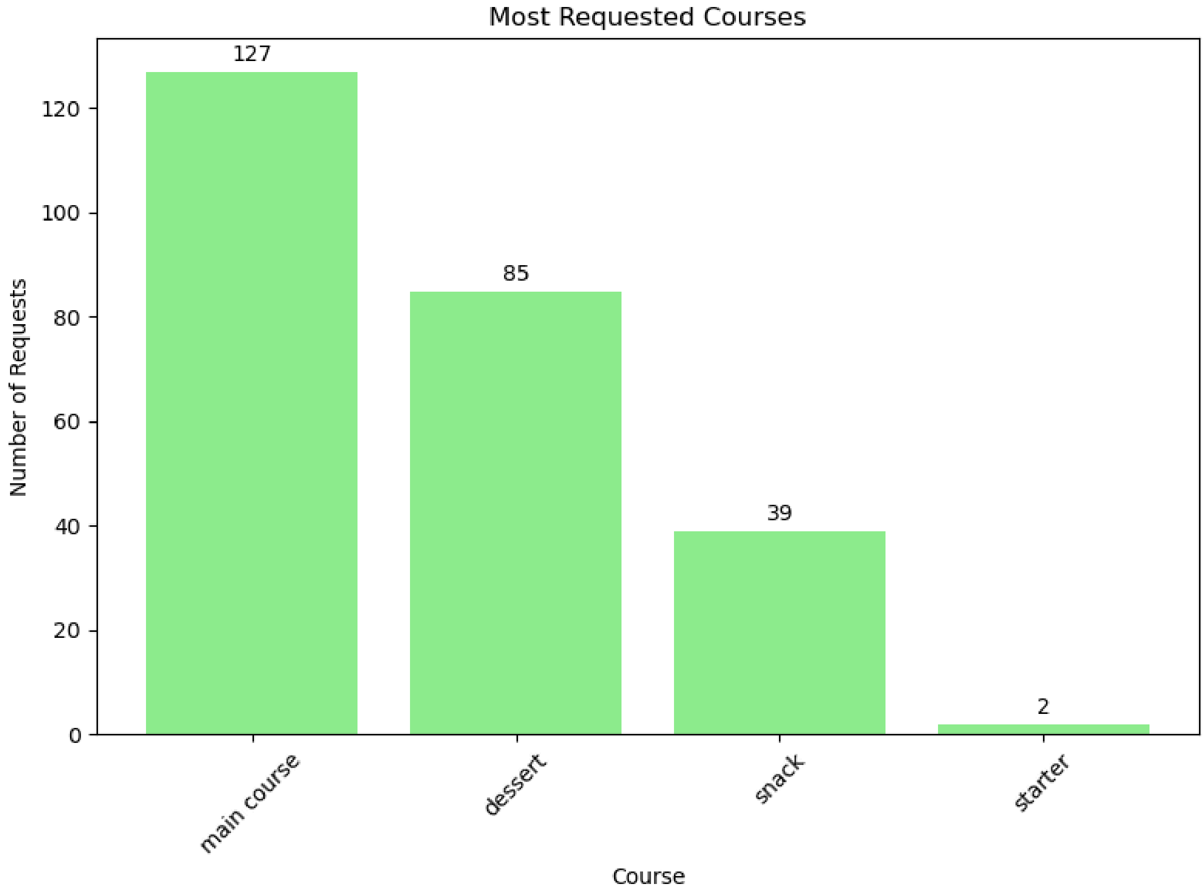
Question-1: e) Most requested course by customers using Bar chart.

Print the labels also on the top of each bar. Then sort the bar chart in descending order.

In [38]:
```
# Fetch Course category
#course_categories = df['course'].unique()
#print(course_categories)
course_category_counts = df['course'].value_counts()
print(type(course_category_counts))
```

```
sorted_data = course_category_counts.sort_values(ascending=False)
print(sorted_data)
# Plotting as Bar chart
plt.figure(figsize=(8, 6))
bars = plt.bar(sorted_data.index, sorted_data.values, color='lightgreen')
# Adding labels on top of bars
for bar in bars:
    yval = bar.get_height()
    plt.text(bar.get_x() + bar.get_width()/2, yval + 1, yval, ha='center', va='bott

plt.xlabel('Course')
plt.ylabel('Number of Requests')
plt.title('Most Requested Courses')
plt.xticks(rotation=45)
plt.tight_layout()
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'BarChart_most_request_courses.png'))
plt.show()
```

```
<class 'pandas.core.series.Series'>
course
main course    127
dessert         85
snack           39
starter          2
Name: count, dtype: int64
```

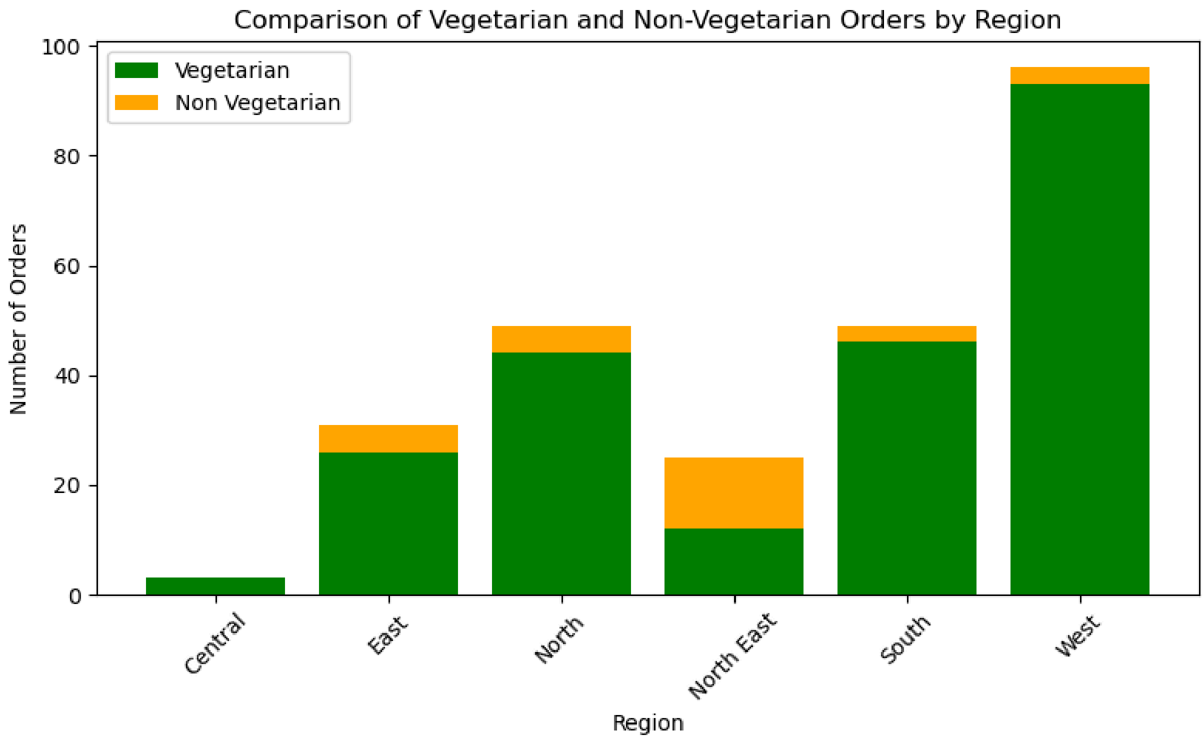


In [ ]:

Question-1: f) Comparison between Vegetarians and Non-Veg orders in each region.

In [40]:

```python
# Set mean value for Region
mode_region = df['region'].mode()[0]
# Replace -1 with the mode value
## with updated DataFrame
df['region'] = df['region'].replace('-1', mode_region)
 #Create a new column for count and group by 'region' and 'Diet'
df['Count'] = 1

# Reset index
agg_data = df.groupby(['region', 'Diet']).sum().reset_index()

# Pivot Data: index== 'region' , column 'Diet' , value counts
pivot_data = agg_data.pivot(index='region', columns='Diet', values='Count').fillna(

# Set vegeterian values
vegetarian = pivot_data['vegetarian'] if 'vegetarian' in pivot_data.columns else 0

# Set non vegeterian values
non_vegetarian = pivot_data['non vegetarian'] if 'non vegetarian' in pivot_data.col

# Plotting - Stacked bar chart
plt.figure(figsize=(8, 5))
plt.bar(pivot_data.index, vegetarian, label='Vegetarian', color='green')
plt.bar(pivot_data.index, non_vegetarian, bottom=vegetarian, label='Non Vegetarian'

# Adding labels, title, and legend
plt.xlabel('Region')
plt.ylabel('Number of Orders')
plt.title('Comparison of Vegetarian and Non-Vegetarian Orders by Region')
plt.legend()
plt.xticks(rotation=45)
plt.tight_layout()
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'StackBarChart_veg_nonVeg.png'))
plt.show()
```



In [ ]:

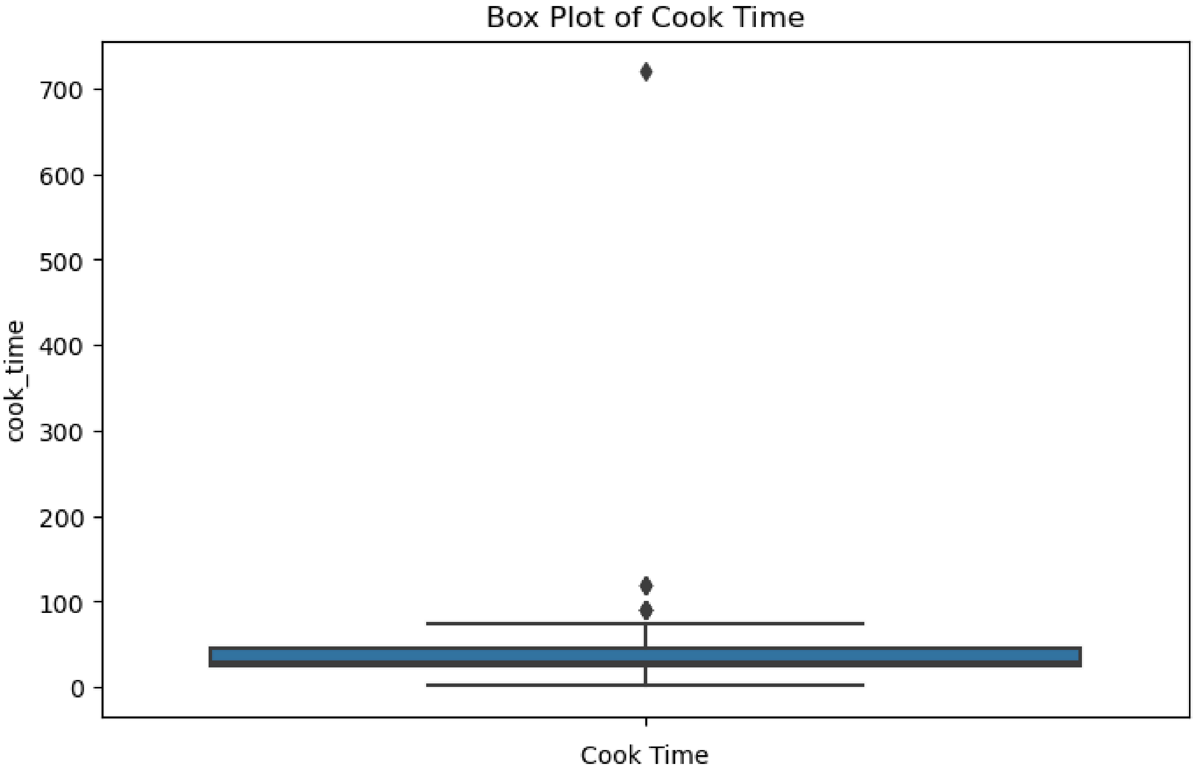
Question-1: g) Create the box plot for Order cooking time to see the distribution.

Also check if there are any outliers in this column.

In [153…

```
# Data values of  the 'cook_time' column
cook_time_data = df['cook_time']
# Create the box plot
plt.figure(figsize=(8, 5))
sns.boxplot(y=cook_time_data)
# Adding labels and title
plt.xlabel('Cook Time')
plt.title('Box Plot of Cook Time')
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'BoxChart_CookTime.png'))
plt.show()

# Calculate Q1 (25th percentile) and Q3 (75th percentile)
Q1 = cook_time_data.quantile(0.25)
Q3 = cook_time_data.quantile(0.75)

# Calculate IQR
IQR = Q3 - Q1

# Define the lower and upper bounds for outliers
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
```

```
# Identify the outliers
outliers = cook_time_data[(cook_time_data < lower_bound) | (cook_time_data > upper_

# Display the outliers
print("Outliers in 'cook_time':")
print(outliers)
```



```
Outliers in 'cook_time':
27     120
34      90
62     720
75     120
83      90
114    120
115     90
128     90
130     90
142     90
144     90
Name: cook_time, dtype: int64
```

In [ ]:

Question-2 : Import the attached Billionaires_Stats.csv file in Jupyter notebook, and perform following operations using Pandas and Data visualization:

Data Sorce: Billionaires_Stats.csv

In [42]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import os

df = pd.read_csv("Billionaires_Stats.csv")
num_columns = df.shape[1]
num_columns
```

Out[42]:

```
10
```

Question-2 a) Create a dataframe which will have the billionaires whose age is greater than or equal to 30.

Then create a scatter plot to show the relationship between age and net worth

Handle : age and net worth - missing values

In [44]:

```
missing_age = df['age'].isnull()
mode_age = df['age'].mode()[0]
print(f"Mode value of Age: {mode_age}")
# Replace age blank / empty with the mode value
## with updated DataFrame
df['age'] = df['age'].replace("", mode_age)
df['age'].fillna(mode_age, inplace=True)
missing_age_values = df['age'].isnull()
print(f"Missing age values count: {missing_age.sum()}")
print(f"Missing age values count after replace: {missing_age_values.sum()}")
#Find missing net worth
missing_worth = df['finalWorth'].isnull()
print(f"Missing net Worth values count: {missing_worth.sum()}")
```

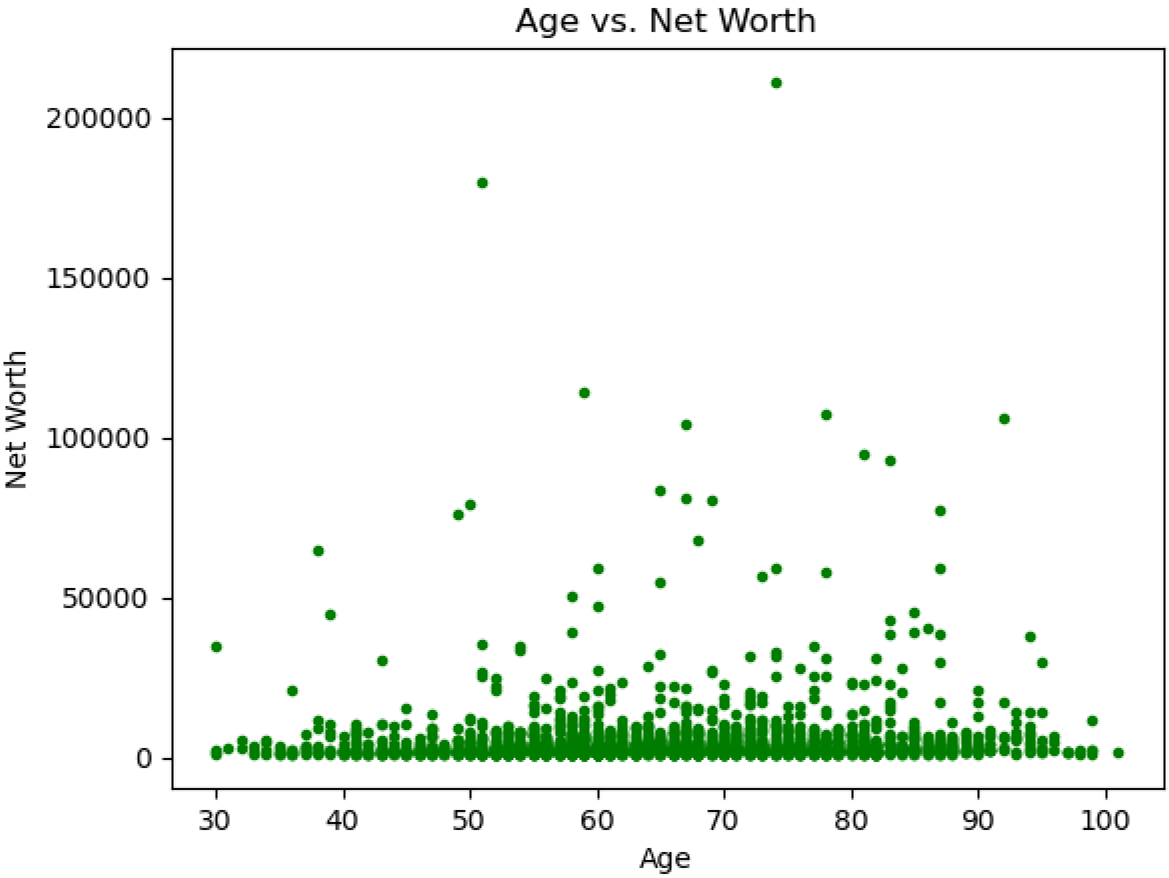
```
Mode value of Age: 60.0
Missing age values count: 0
Missing age values count after replace: 0
Missing net Worth values count: 0
```

Round age value : create scattered age vs net worth

In [45]:

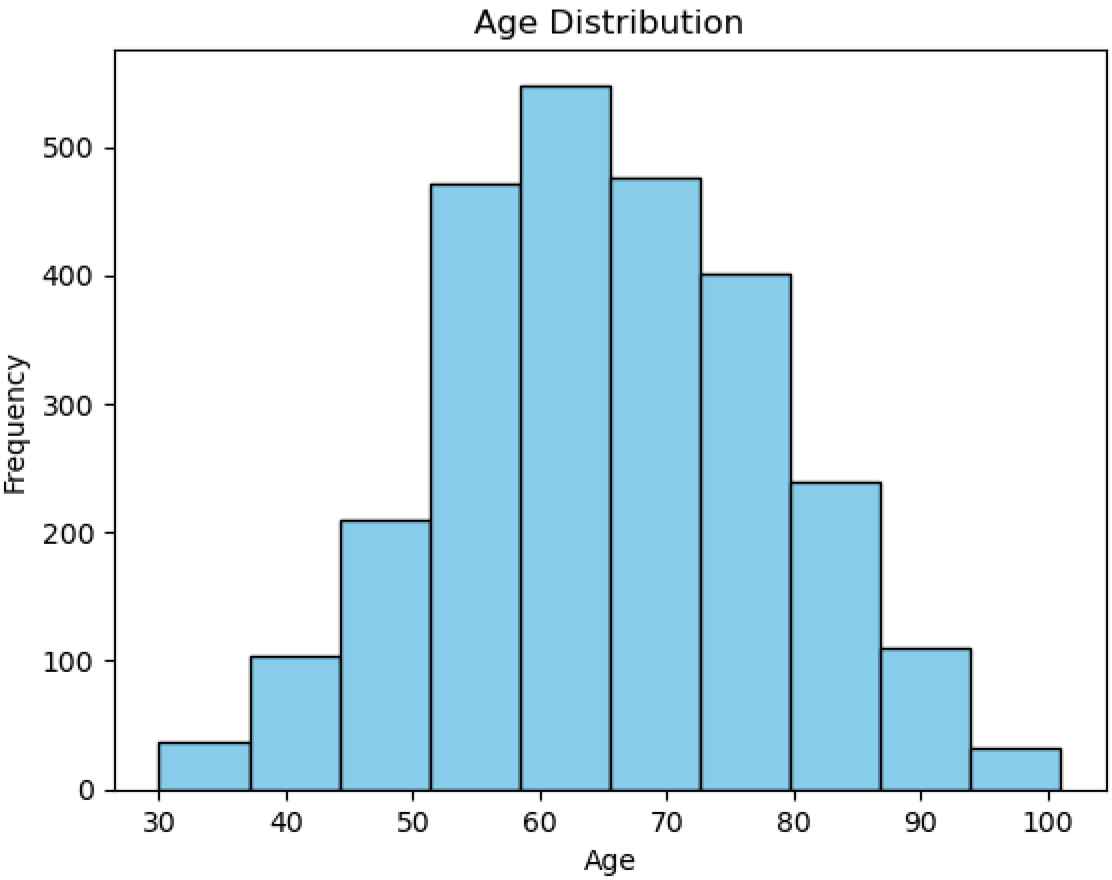
```
## round age value
df['age'] = df['age'].astype(int)
df['age'] = df['age'].round(0)
df_a = df[df['age'] >=30]
age_values = df_a['age']
worth_values = df_a['finalWorth']
plt.scatter(age_values, worth_values, color='green', marker='.')
plt.xlabel('Age')
plt.ylabel('Net Worth')
plt.title('Age vs. Net Worth')
pwd = os.getcwd()
# Save the plot to a file in the current working directory
```

```
plt.savefig(os.path.join(pwd, 'ScatterdChart_AgeVsNtWorth.png'))
# Show the plot
plt.show()
```



Question-2 b)Create a histogram to see the distribution of ages.

In [46]:
```
age_values = df_a['age']
# Create the histogram
plt.hist(age_values, bins=10, color='skyblue', edgecolor='black')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Age Distribution')
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'HistogramChart_ages.png'))
plt.show()
```

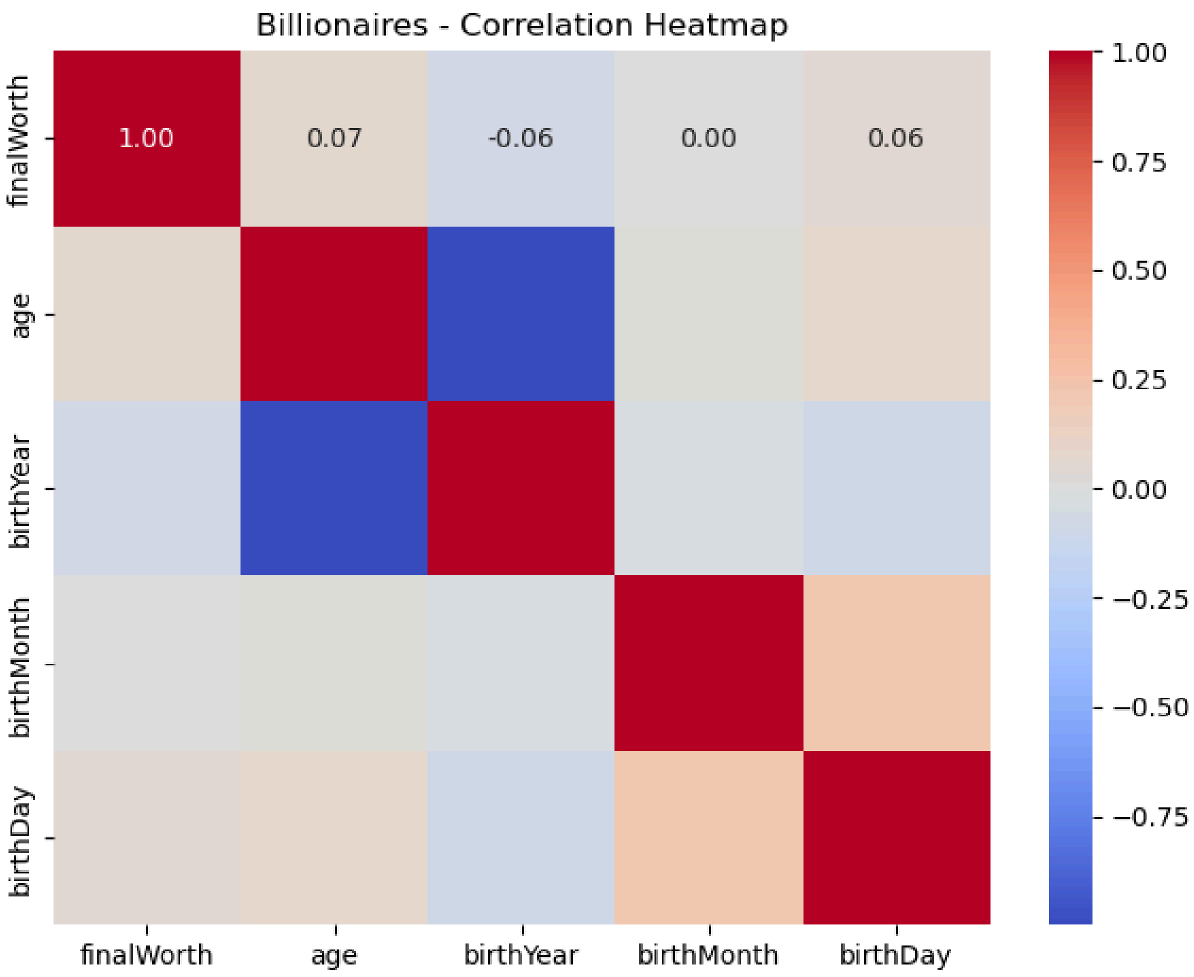


```
In [ ]:
```

Question-2 c) Create a heatmap and see the correlation between all the numeric variables.

Print the correlation value also in the heatmap

```
In [47]: # consider number columns only
number_df = df_a.select_dtypes(include='number')
corr_matrix = number_df.corr()
# Create the heatmap
plt.figure(figsize=(8, 6))  # Adjust the figure size if needed
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', fmt='.2f')
plt.title('Billionaires - Correlation Heatmap')
pwd = os.getcwd()
# Save the plot to a file in the current working directory
plt.savefig(os.path.join(pwd, 'HeatMap_Billionaires_numericValues.png'))
plt.show()
```



In [ ]:
```
## file_path = os.path.join(pwd, 'correlation_matrix_heatmap.png')
## plt.savefig(file_path)
```

In [ ]:

Question-3 Name any 5 types of charts you are familiar with (using any of 3 libraries).

Write the sample code also to create those charts using random data.

In [ ]:

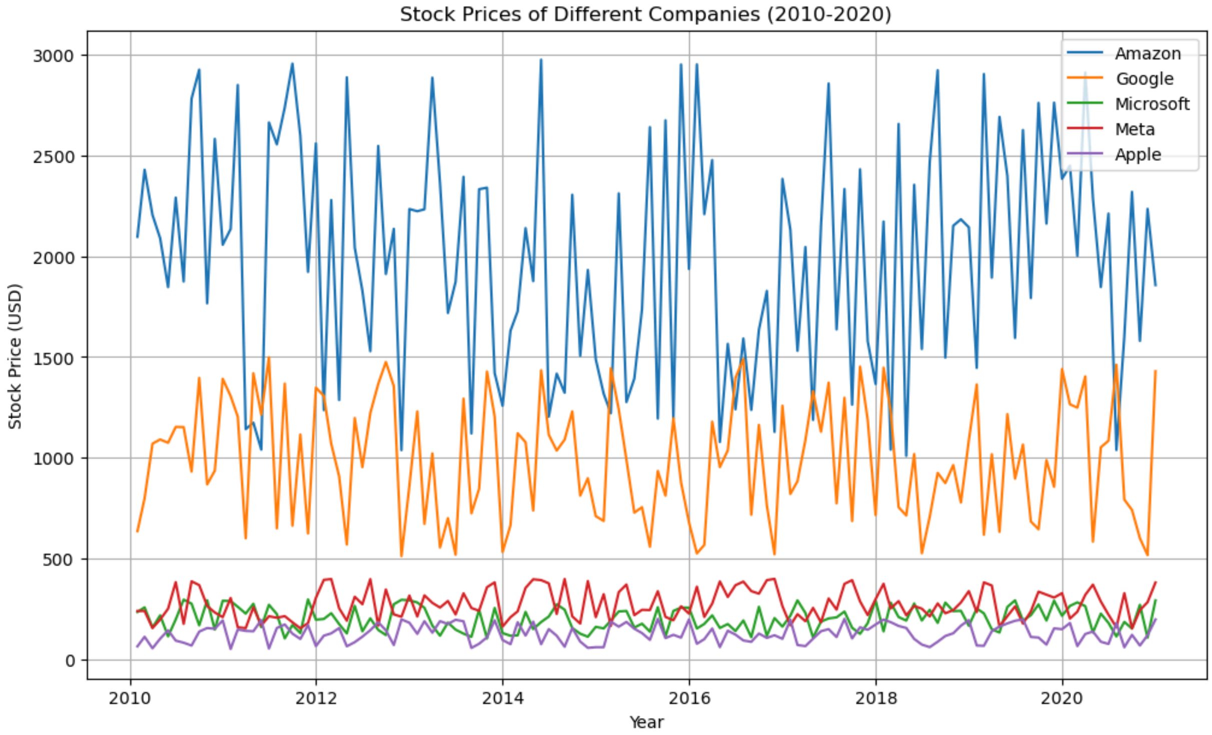
1: Line Chart : matplotlib

Stock prices over a year with different company ? Year range : 2010 - 2020 ,

company name: Amazon, Google, Microsoft, Meta, Apple with random data

In [ ]:

In [14]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# Generate dates
dates = pd.date_range(start='2010-01-01', end='2020-12-31', freq='M')

# Generate random stock prices, usind seed
np.random.seed(0)
# Set random prices for companies
amazon_prices = np.random.uniform(low=1000, high=3000, size=len(dates))
google_prices = np.random.uniform(low=500, high=1500, size=len(dates))
microsoft_prices = np.random.uniform(low=100, high=300, size=len(dates))
meta_prices = np.random.uniform(low=150, high=400, size=len(dates))
apple_prices = np.random.uniform(low=50, high=200, size=len(dates))

# Create a DataFrame
data = {
    'Date': dates,
    'Amazon': amazon_prices,
    'Google': google_prices,
    'Microsoft': microsoft_prices,
    'Meta': meta_prices,
    'Apple': apple_prices
}
df = pd.DataFrame(data)
df.set_index('Date', inplace=True)

# Plot the data
plt.figure(figsize=(12, 7))
plt.plot(df.index, df['Amazon'], label='Amazon')
plt.plot(df.index, df['Google'], label='Google')
plt.plot(df.index, df['Microsoft'], label='Microsoft')
plt.plot(df.index, df['Meta'], label='Meta')
plt.plot(df.index, df['Apple'], label='Apple')

# Set title and labels
plt.title('Stock Prices of Different Companies (2010-2020)')
plt.xlabel('Year')
plt.ylabel('Stock Price (USD)')
plt.legend()
plt.grid(True)
plt.show()
```



In [ ]:

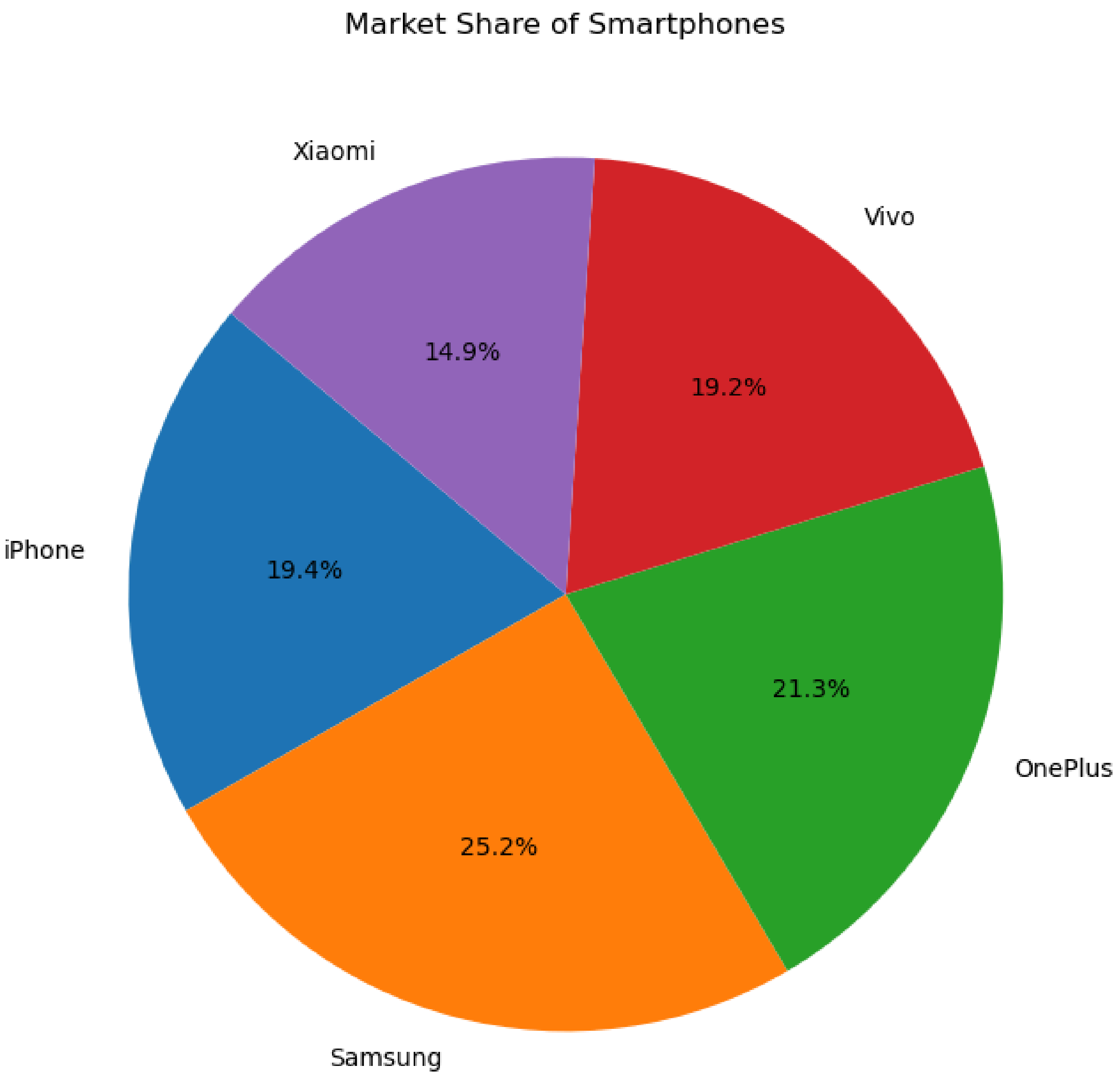
2: Pie chart : matplotlib, random market share values

Market share of different smartphone brands.

brand name: Iphone, Samsung, OnePlus, Vivo, XioMe

In [20]:

```
import matplotlib.pyplot as plt
import numpy as np
# Brand names
brands = ["iPhone", "Samsung", "OnePlus", "Vivo", "Xiaomi"]
np.random.seed(0)

# Generate random market share percentages
market_shares = np.random.rand(len(brands))
market_shares = (market_shares / market_shares.sum()) * 100

#  pie chart - plotting
plt.figure(figsize=(8, 8))
plt.pie(market_shares, labels=brands, autopct='%1.1f%%', startangle=140)
plt.title('Market Share of Smartphones')
plt.show()
```



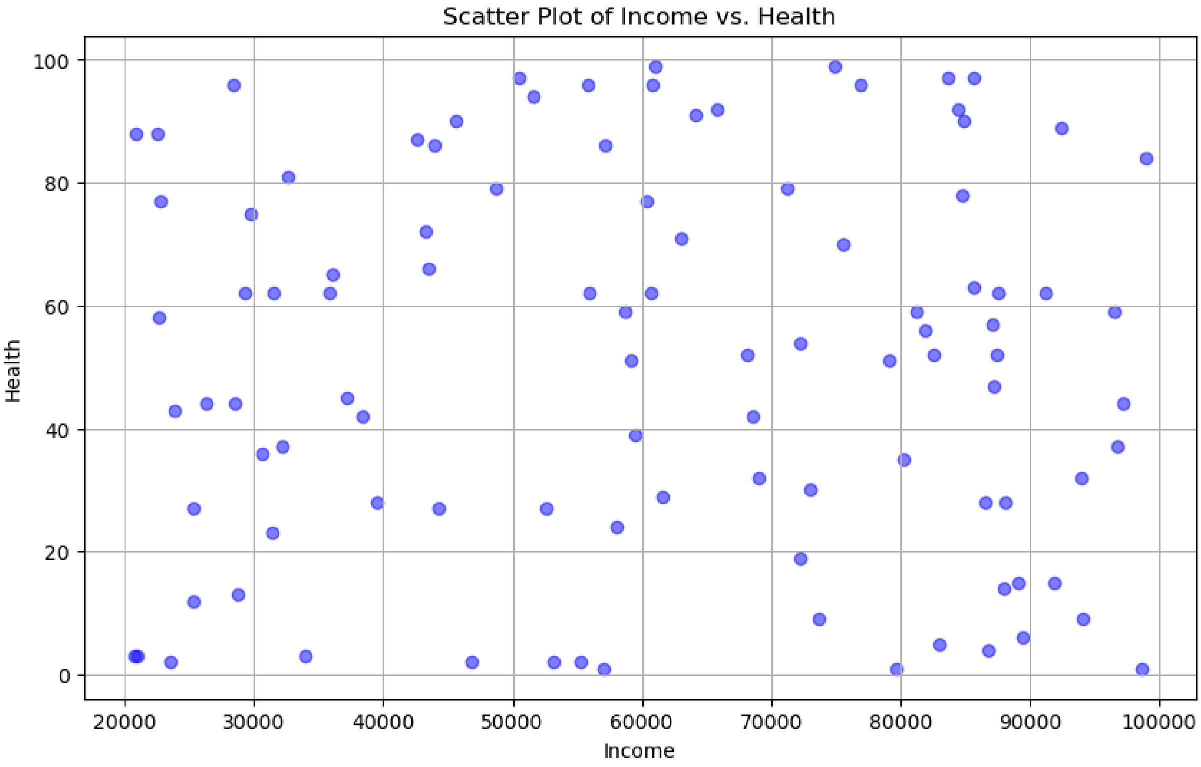
In [ ]:

3: Scattered : Plot (matplotlib)

income vs health , with random data

In [24]:

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

# Generate random data for income and health
np.random.seed(42)  # For reproducibility
income = np.random.randint(20000, 100000, 100)
health = np.random.randint(1, 100, 100)

# Create a scatter plot
plt.figure(figsize=(10, 6))
plt.scatter(income, health, color='blue', alpha=0.5)
plt.title('Scatter Plot of Income vs. Health')
plt.xlabel('Income')
plt.ylabel('Health')
plt.grid(True)
plt.show()
```



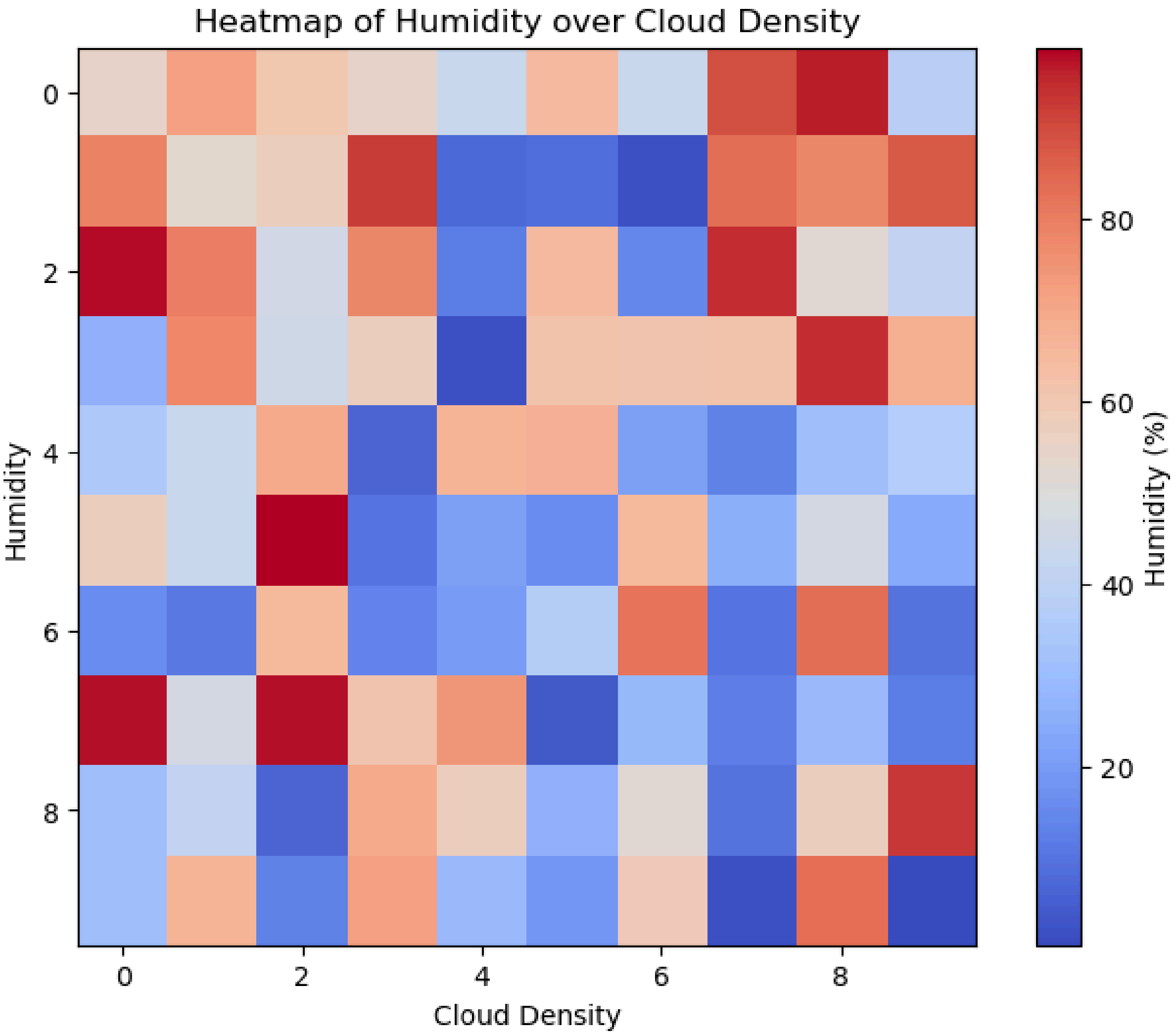
In [ ]:

4: Heatmaps example : humidity over cloud density

matplotlib - random data

In [25]:

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

# Generate random data for humidity and cloud density
np.random.seed(0)
humidity = np.random.rand(10, 10) * 100  # Random humidity values between 0 and 100
cloud_density = np.random.rand(10, 10) * 100  # Random cloud density values between

# Create the heatmap
plt.figure(figsize=(8, 6))
plt.imshow(humidity, cmap='coolwarm', interpolation='nearest')
plt.colorbar(label='Humidity (%)')
plt.title('Heatmap of Humidity over Cloud Density')
plt.xlabel('Cloud Density')
plt.ylabel('Humidity')
plt.show()
```



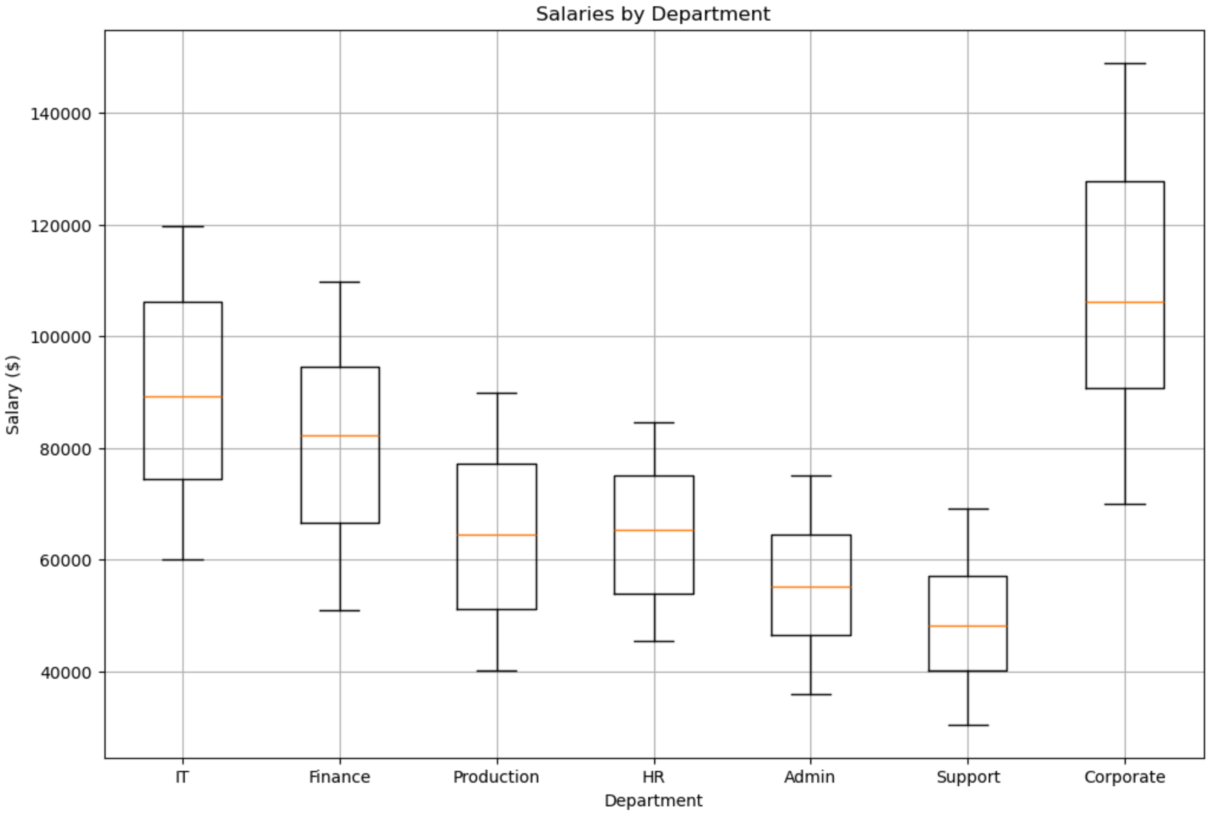
In [ ]:

5: Box Plots : matplotlib

salaries of different department, IT, Finance, Production, HR, Admin, Support, Corporate

In [62]:

```
import numpy as np
import matplotlib.pyplot as plt
import os
# Setting the seed for reproducibility
np.random.seed(20)

# Generating random salary data
departments = ['IT', 'Finance', 'Production', 'HR', 'Admin', 'Support', 'Corporate'
salary_ranges = {
    'IT': (60000, 120000),
    'Finance': (50000, 110000),
    'Production': (40000, 90000),
    'HR': (45000, 85000),
    'Admin': (35000, 75000),
    'Support': (30000, 70000),
    'Corporate': (70000, 150000)
}

salary_data = {dept: np.random.randint(low, high, 100) for dept, (low, high) in sal

# Creating the box plots
plt.figure(figsize=(12, 8))
plt.boxplot(salary_data.values(), labels=departments)
plt.title('Salaries by Department')
plt.xlabel('Department')
plt.ylabel('Salary ($)')
plt.grid(True)
plt.show()
```



```
In [ ]:
```