Assignment_1_Jose_Zacarias

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0.1 Examine the dataset and use the most effective visualization graph to address the following questions. Provide your answers and analyses for each question alongside the visualizations.

- **How Does the Funding Ecosystem changes with respect to Time?**
- **What is the General Amount that Startups get in India?**
- **Which Kind of Industries are more preferred for Startups?**
- **Does Location also play a role, In determining the Growth of a Startup?**
- **Who plays the main role in Indian Startups Ecosystem?**
- **What are the different Types of Funding for Startups?**

[1]:
```
import pandas as pd
import numpy as np
import re
from datetime import datetime
import matplotlib.pyplot as plt
```

[2]:
```
df =  pd.read_csv('startup_funding.csv')
df.tail()
```

[2]:

	Sr No	Date dd/mm/yyyy	Startup Name	Industry Vertical	SubVertical	City	Location	Investors Name	InvestmentnType	Amount in USD	Remarks
3039	3040	29/01/2015	Printvenue	NaN	NaN	NaN	NaN	Asia Pacific Internet Group	Private Equity		
3040	3041	29/01/2015	Graphene	NaN	NaN	NaN	NaN	KARSEMVEN Fund	Private Equity		
3041	3042	30/01/2015	Mad Street Den	NaN	NaN	NaN	NaN	Exfinity Fund, GrowX Ventures.	Private Equity		
3042	3043	30/01/2015	Simplotel	NaN	NaN	NaN	NaN	MakeMyTrip	Private Equity		
3043	3044	31/01/2015	couponmachine.in	NaN	NaN	NaN	NaN	UK based Group of Angel Investors	Seed Funding		

```
3039     45,00,000                                  NaN
3040      8,25,000                 Govt backed VC Fund
3041     15,00,000                                  NaN
3042           NaN  Strategic Funding, Minority stake
3043      1,40,000                                  NaN
```

0.2 Cleaning and formatting the dataset

[3]:
```
# replacing all the values with 'N/A', None, '', 'undisclosed' with Nan
df = df.replace(['N/A', None, '', 'undisclosed', 'Undisclosed',  'unknown'], np.
 ↪nan)
# Droping two lines manually because is too much code to handle this and is␣
 ↪only 2 lines
df = df.drop(2571)
df = df.drop(2606)
```

0.2.1 Lets see the empty values per column

[4]:
```
for columnName in df.columns:
    column = df[columnName]
    missing_values = column.isna().sum()
    print(columnName, missing_values)
```

```
Sr No 0
Date dd/mm/yyyy 0
Startup Name 0
Industry Vertical 171
SubVertical 934
City  Location 180
Investors Name 35
InvestmentnType 4
Amount in USD 967
Remarks 2623
```

Lets check the unique values

[5]:
```
print(df.nunique())
print('The length of data is',len(df))
```

```
Sr No               3042
Date dd/mm/yyyy     1033
Startup Name        2457
Industry Vertical    819
SubVertical         1942
City  Location       112
Investors Name      2409
InvestmentnType       55
Amount in USD        467
Remarks               72
```

```
dtype: int64
The length of data is 3042
```

Some values in the column Date need formatting, lets format them

[6]:
```
def clean_date(date_str):
    # Remove unwanted characters
    date_str = date_str.replace('.', '/')
    date_str = date_str.replace('//', '/')
    date_str = date_str.replace('\\xc2\\xa0', '')
    date_str = re.sub(r'^\xc2\xa0', '', date_str)
    date_str = re.sub(r'[^\d/]', '/', date_str)


    # Add missing slashes for dates like 05/072018 to 05/07/2018
    date_str = re.sub(r'(\d{2})/(\d{2})(\d{4})', r'\1/\2/\3', date_str)

    # Handle cases where the year is in two digits
    if len(date_str.split('/')[-1]) == 2:
        date_str = date_str[:-2] + '20' + date_str[-2:]

    # Convert to datetime object and format correctly
    try:
        date_obj = datetime.strptime(date_str, '%d/%m/%Y')
    except ValueError:
        try:
            date_obj = datetime.strptime(date_str, '%d/%m/%y')
        except ValueError:
            return None  # or handle the error as needed

    return date_obj.strftime('%d/%m/%Y')

# Apply the cleaning function to the date column, creating a new column and␣
 ↪dropping the old one
df['date'] = df['Date dd/mm/yyyy'].apply(clean_date)
df.drop(columns=['Date dd/mm/yyyy'], inplace=True)
```

We have to fill all missing values, lets do it one at a time

Industry vertical: Lets fill this one using mode

[7]:
```
mode = df['Industry Vertical'].mode()[0]
print('Industry Vertical mode: ', mode)
df['Industry Vertical'] = df['Industry Vertical'].fillna(mode)
```

```
Industry Vertical mode:  Consumer Internet
```

SubVertical: fill this one using mode as well

[8]:
```
mode = df['SubVertical'].mode()[0]
print('SubVertical mode: ', mode)
df['SubVertical'] = df['SubVertical'].fillna(mode)
```

```
SubVertical mode:  Online Lending Platform
```

City Location, Investors name and remarks lets fill them with just "Not provided"

[9]:
```
# city location column name have 2 spaces in between
df['City  Location'] = df['City  Location'].fillna('Not provided')
df['Investors Name'] = df['Investors Name'].fillna('Not provided')
df['Remarks'] = df['Remarks'].fillna('Not provided')
```

For investment Type lets fill with the mode

[10]:
```
mode = df['InvestmentnType'].mode()[0]
print('InvestmentnType mode: ', mode)
df['InvestmentnType'] = df['InvestmentnType'].fillna(mode)
```

```
InvestmentnType mode:  Private Equity
```

[11]:
```
def indian_to_number(value):
    if pd.isna(value):
        return np.nan
    if isinstance(value, (int, float)):
        return round(value, 2)
    # Remove commas and convert to float
    try:
        return float(str(value).replace(',', ''))
    except ValueError:
        return np.nan

df['Amount in USD'] = df['Amount in USD'].apply(indian_to_number)

# Convert to numeric type (float to handle potential NaN values)
df['Amount in USD'] = pd.to_numeric(df['Amount in USD'], errors='coerce')

# Calculate mean of non-NaN values
mean_value = round(df['Amount in USD'].mean(), 2)

print(f"Mean value: {mean_value}")
df['Amount in USD'] = df['Amount in USD'].fillna(mean_value)

def format_large_number(number):
    if number >= 1000:
        formatted_number = f"{number / 1000:.1f}".rstrip('0').rstrip('.')
    else:
        formatted_number = str(number)
    return float(formatted_number)
```

```
df['Amount in USD'] = df['Amount in USD'].apply(format_large_number)
```

```
Mean value: 18438521.25
```

[12]:
```
# Managing outliers
def adjust_outliers(df, column_name):
    Q1 = df[column_name].quantile(0.25)
    Q3 = df[column_name].quantile(0.75)
    IQR = Q3 - Q1

    min_val = Q1 - 1.5 * IQR
    max_val = Q3 + 1.5 * IQR

    df[column_name] = np.where(df[column_name] < min_val, min_val,␣
 ↪df[column_name])
    df[column_name] = np.where(df[column_name] > max_val, max_val,␣
 ↪df[column_name])
    return df[column_name]


df['Amount in USD'] = adjust_outliers(df, 'Amount in USD')
```

[13]:
```
for columnName in df.columns:
    column = df[columnName]
    missing_values = column.isna().sum()
    print(columnName, missing_values)
```

```
Sr No 0
Startup Name 0
Industry Vertical 0
SubVertical 0
City  Location 0
Investors Name 0
InvestmentnType 0
Amount in USD 0
Remarks 0
date 0
```

If you want to see the result of the data cleaned, run this line without the comment and a CSV file will be generated where you can see the new data

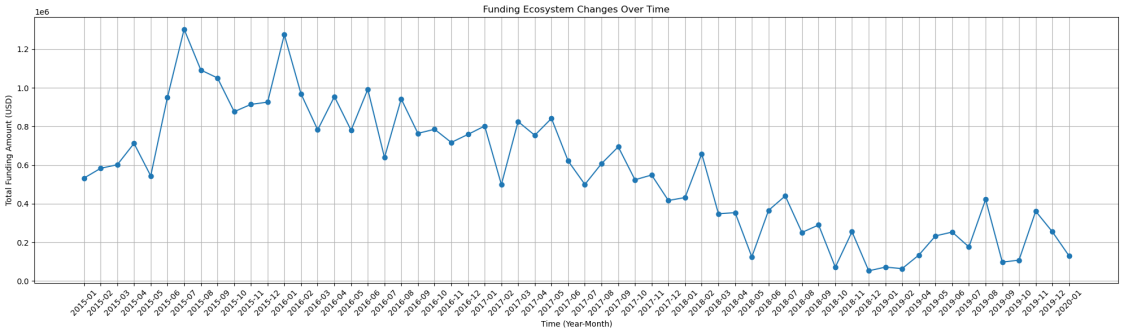
[14]:
```
# df.to_csv('cleaned_data.csv', index=False)
```

0.3 Now we can go with the questions

How Does the Funding Ecosystem changes with respect to Time?

[15]:
```
df['date'] = pd.to_datetime(df['date'], format='%d/%m/%Y', errors='coerce')

# Extract the year and month from the date
```

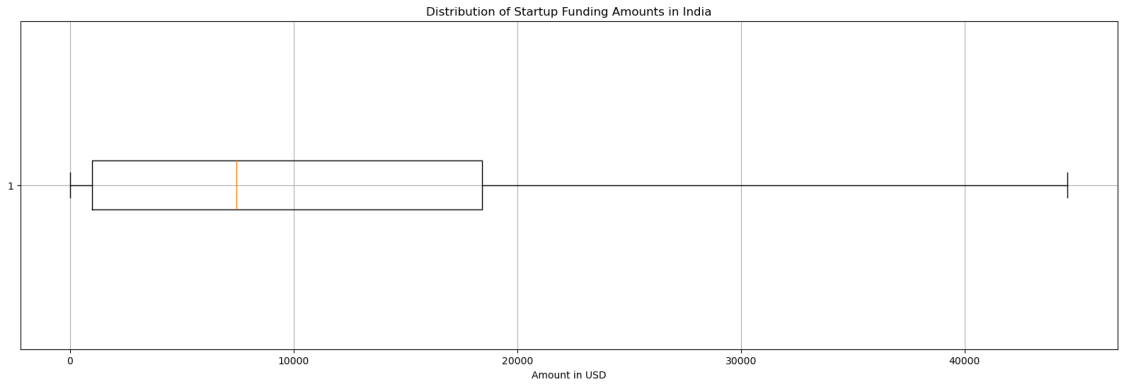
```
df['Year'] = df['date'].dt.year
df['Month'] = df['date'].dt.month

# Group by year and month and sum the funding amounts
monthly_funding = df.groupby(['Year', 'Month'])['Amount in USD'].sum().
 ↪reset_index()
# monthly_funding.head(20)

# Create a new column for Year-Month
monthly_funding['Year-Month'] = monthly_funding['Year'].astype(str) + '-' +␣
 ↪monthly_funding['Month'].astype(str).str.zfill(2)

# Sort by date
monthly_funding = monthly_funding.sort_values(by=['Year', 'Month'])

# Plotting the data
plt.figure(figsize=(20, 6))
plt.plot(monthly_funding['Year-Month'], monthly_funding['Amount in USD'],␣
 ↪marker='o')
plt.xticks(rotation=45)
plt.xlabel('Time (Year-Month)')
plt.ylabel('Total Funding Amount (USD)')
plt.title('Funding Ecosystem Changes Over Time')
plt.grid(True)
plt.tight_layout()

# Show the plot
plt.show()
```



We can see here that the total founding amount **decrease with the time**

0.3.1 What is the General Amount that Startups get in India?

[16]:
```
plt.figure(figsize=(20, 6))
plt.boxplot(df['Amount in USD'], vert=False)
plt.title('Distribution of Startup Funding Amounts in India')
plt.xlabel('Amount in USD')
plt.grid(True)
plt.show()
df['Amount in USD'].describe()
```

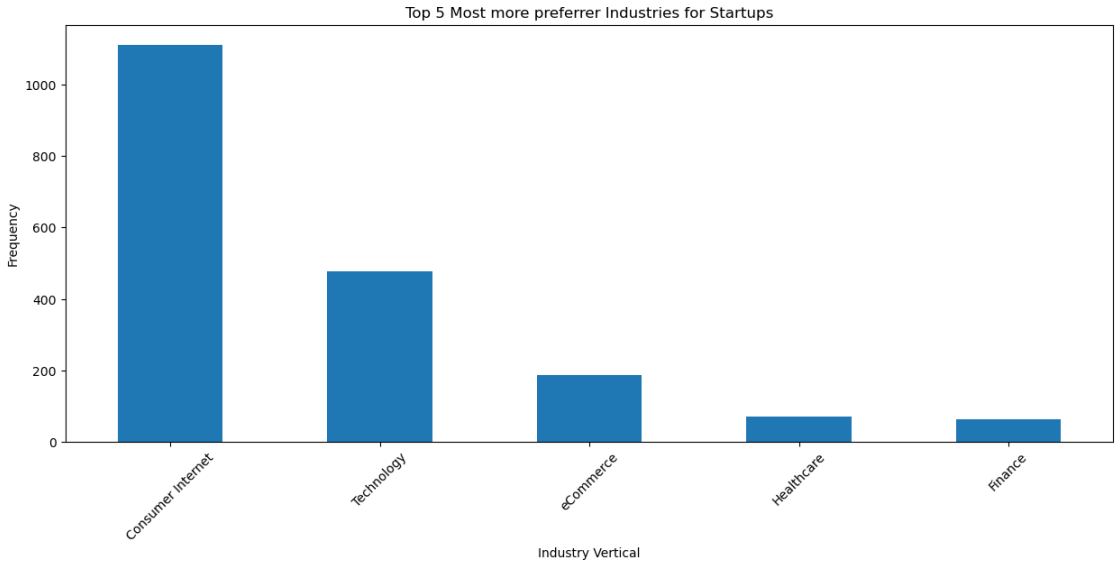


[16]:
```
count     3042.000000
mean     11184.124227
std      11558.283731
min         16.000000
25%       1000.000000
50%       7450.000000
75%      18438.500000
max      44596.250000
Name: Amount in USD, dtype: float64
```

Most startups receive funding amounts between $1,000 and $18,438.50, with the median amount being $7,450. This indicates that half of the startups receive funding below $7,450,

Which Kind of Industries are more preferred for Startups?

[17]:
```
# There are  too many unique values in this column so I will list the top 5
top_5_values = df['Industry Vertical'].value_counts().nlargest(5)
# Plot the histogram
plt.figure(figsize=(15, 6))
top_5_values.plot(kind='bar')
plt.title(f'Top 5 Most more preferrer Industries for Startups')
plt.ylabel('Frequency')
plt.xticks(rotation=45)
plt.show()
```



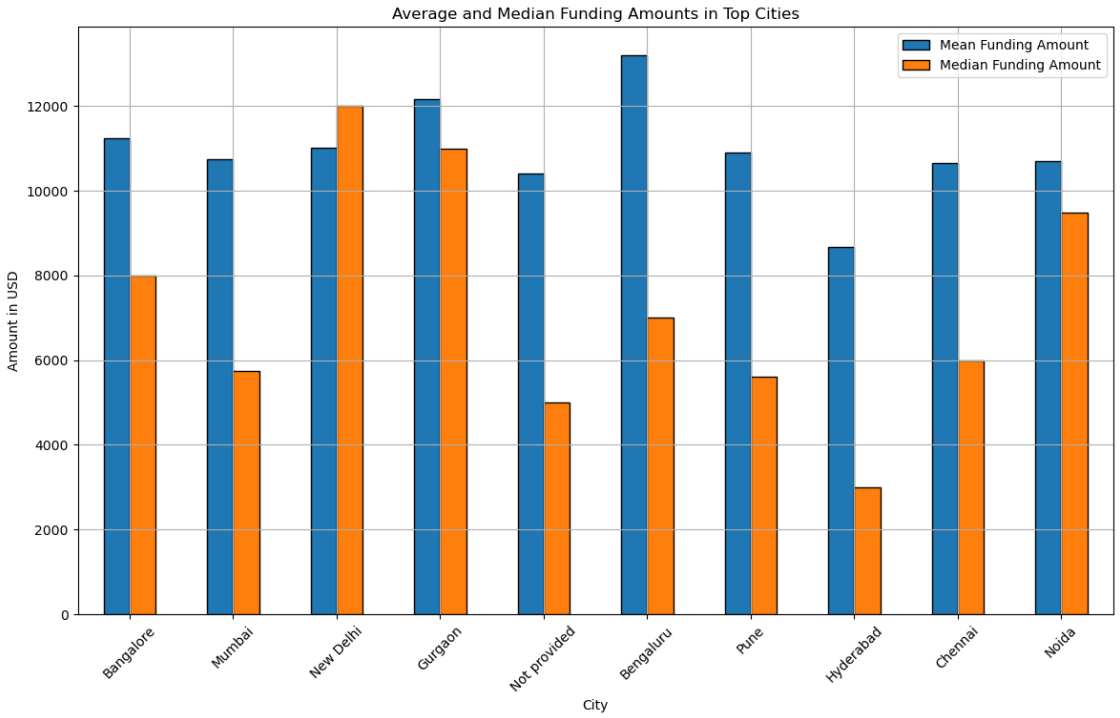
Consumer internet is the most preferred industry by startups

0.3.2 Does Location also play a role, In determining the Growth of a Startup?

Let group the cities and see the mean and media values of the investment amount

[18]:
```
location_stats = df.groupby('City  Location')['Amount in USD'].agg(['mean',␣
 ↪'median', 'count']).sort_values(by='count', ascending=False)

# Select the top 10 cities by the number of startups
top_cities = location_stats.head(10)

# Plot the mean and median funding amount for the top cities
plt.figure(figsize=(14, 8))
top_cities[['mean', 'median']].plot(kind='bar', figsize=(14, 8),␣
 ↪edgecolor='black')
plt.title('Average and Median Funding Amounts in Top Cities')
plt.xlabel('City')
plt.ylabel('Amount in USD')
plt.grid(True)
plt.xticks(rotation=45)
plt.legend(['Mean Funding Amount', 'Median Funding Amount'])
plt.show()

top_cities
```

```
<Figure size 1400x800 with 0 Axes>
```



[18]:

City	Location	mean	median	count
Bangalore		11247.676214	8000.0	700
Mumbai		10749.922261	5750.0	566
New Delhi		11003.558551	12000.0	421
Gurgaon		12168.846516	11000.0	287
Not provided		10399.792500	5000.0	180
Bengaluru		13206.250355	7000.0	141
Pune		10910.176190	5600.0	105
Hyderabad		8676.812626	3000.0	99
Chennai		10643.250000	6000.0	97
Noida		10698.706522	9475.0	92

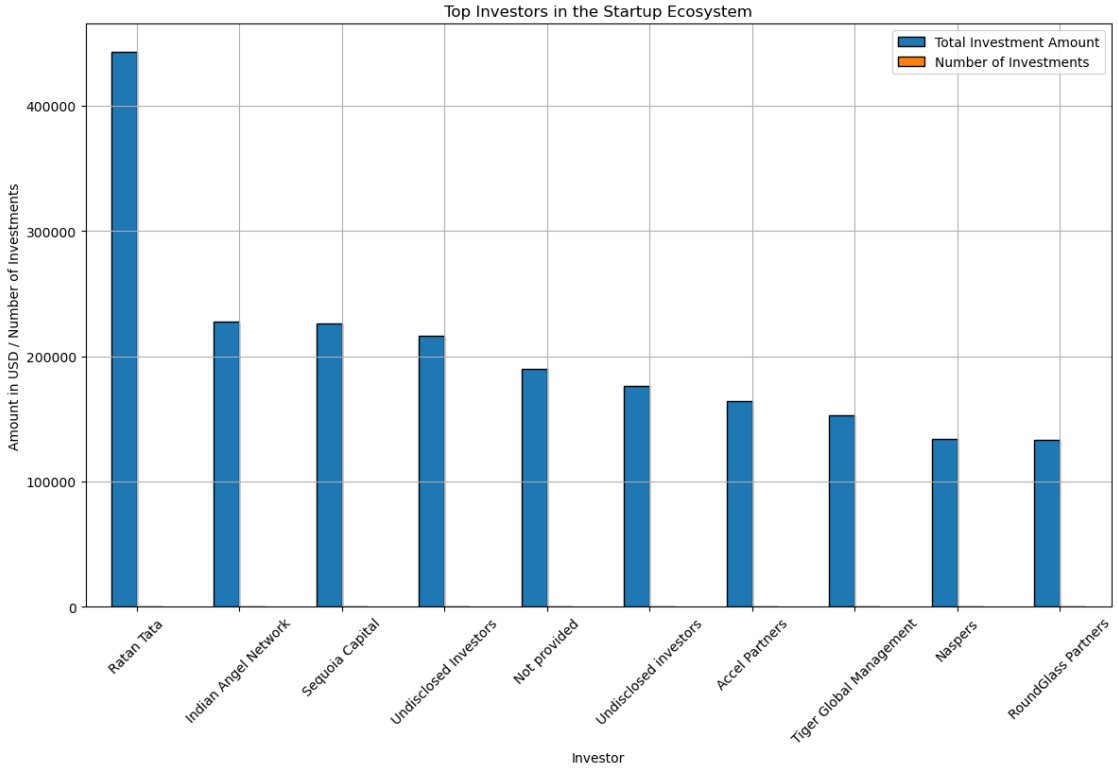
we can see here that the location does play an important role the growth of a startup, as indicated by the variation in the average and median funding amounts across different cities.

0.3.3 Who plays the main role in Indian Startups Ecosystem?

[19]:
```
investor_stats = df.groupby('Investors Name')['Amount in USD'].agg(['sum',␣
↪'count']).sort_values(by='sum', ascending=False)

# top 10 investors by total investment amount
top_investors = investor_stats.head(10)
```

```
plt.figure(figsize=(14, 8))
top_investors.plot(kind='bar', figsize=(14, 8), edgecolor='black')
plt.title('Top Investors in the Startup Ecosystem')
plt.xlabel('Investor')
plt.ylabel('Amount in USD / Number of Investments')
plt.grid(True)
plt.xticks(rotation=45)
plt.legend(['Total Investment Amount', 'Number of Investments'])
plt.show()

top_investors
```

```
<Figure size 1400x800 with 0 Axes>
```



[19]:

Investors Name	sum	count
Ratan Tata	443059.00	25
Indian Angel Network	227572.00	23
Sequoia Capital	226323.25	15
Undisclosed Investors	216491.00	39
Not provided	190059.65	35
Undisclosed investors	176313.25	30

```
Accel Partners            164111.75     12
Tiger Global Management   152692.50      7
Naspers                   133788.75      3
RoundGlass Partners       133069.50     10
```

Ratan tata is the one who invest more in startups so he plays the main role

0.3.4 What are the different Types of Funding for Startups?

[20]:
```
funding_types = df['InvestmentnType'].value_counts()
funding_types
```

[20]:
```
InvestmentnType
Private Equity                1360
Seed Funding                  1353
Seed/ Angel Funding             60
Seed / Angel Funding            47
Seed\\nFunding                  30
Debt Funding                    25
Series A                        24
Seed/Angel Funding              23
Series B                        20
Series C                        14
Series D                        12
Angel / Seed Funding             8
Seed Round                       7
Private Equity Round             4
Pre-Series A                     4
Seed                             4
Seed / Angle Funding             3
Equity                           2
Venture Round                    2
pre-Series A                     2
Series E                         2
Corporate Round                  2
Series F                         2
Seed Funding Round               1
Private                          1
Private Funding                  1
Series H                         1
Series G                         1
Seed funding                     1
Structured Debt                  1
Series B (Extension)             1
Term Loan                        1
PrivateEquity                    1
Angel Funding                    1
```

```
Pre-series A                    1
Private\\nEquity                1
Crowd funding                   1
Equity Based Funding            1
Mezzanine                       1
Single Venture                  1
Debt-Funding                    1
Venture                         1
Pre Series A                    1
Debt                            1
Funding Round                   1
Inhouse Funding                 1
Debt and Preference capital     1
Bridge Round                    1
Venture - Series Unknown        1
Angel Round                     1
Series J                        1
Angel                           1
Maiden Round                    1
pre-series A                    1
Crowd Funding                   1
Name: count, dtype: int64
```

0.3.5 We can see here the different types of investment, I didn't use a graph for this because this way is more readable.