AI-Driven Exploration and Prediction of Company Registration Trends with (RoC)

Phase 3 – Development Part 1
Document submission

Project Title :

AI – Driven Exploration and prediction

Phase 3 Topic :

Read (loading) and Preprocessing given dataset

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Introduction

AI-Driven Exploration and Prediction of Company Registration Trends with the Registrar of Companies (RoC) involves leveraging artificial intelligence (AI) methodologies to analyze data related to company registrations maintained by the Registrar of Companies. The Registrar of Companies is an authoritative entity responsible for overseeing and maintaining the registry of companies within a specific jurisdiction.

By employing AI algorithms, this approach aims to extract valuable insights and forecast patterns from the data compiled by the RoC. These insights can aid in understanding trends, emerging patterns, and other significant aspects of company registrations, empowering stakeholders to make informed decisions in the business landscape.

The utilization of AI in this domain encompasses data collection, processing, exploratory data analysis, machine learning modeling, and predictive analytics to anticipate future trends in company registrations. Ultimately, this AI-driven approach enables proactive decision-making and strategic planning based on comprehensive analyses of registration trends and associated data.

Overview

For Phase 3

1.Data collecting

2.Data Preprocessing

Analyzing Data

Statistics Summary

3.Exploratory Data Analysis (EDA)

Univariate Analysis

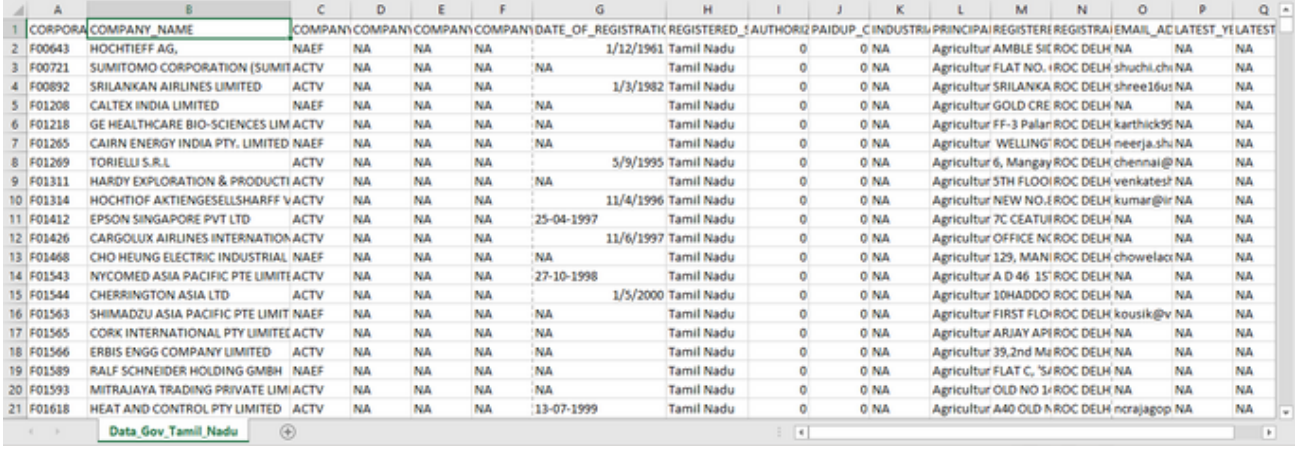
Bivariate Analysis

Multivariate Analysis

Data Collecting

AI-Driven Exploration and Prediction of Company Registration Trends with the Registrar of Companies (RoC), the process of collecting data involves gathering relevant information from given sources to create a comprehensive dataset for analysis and modeling

Given Data



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	CORPORA	COMPANY_NAME	COMPAN	COMPAN	COMPAN	COMPAN	DATE_OF_REGISTRATI	REGISTERED_S	AUTHORIZ	PAIDUP_C	INDUSTRI	PRINCIPAI	REGISTERE	REGISTRAI	EMAIL_AD	LATEST_YE	LATEST
2	F00643	HOCHTIEFF AG,	NAEF	NA	NA	NA	1/12/1961	Tamil Nadu	0	0	NA	Agricultur	AMBLE SII	ROC DELH	NA	NA	NA
3	F00721	SUMITOMO CORPORATION (SUMIT	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	FLAT NO.	ROC DELH	shuchi.chi	NA	NA
4	F00892	SRILANKAN AIRLINES LIMITED	ACTV	NA	NA	NA	1/3/1982	Tamil Nadu	0	0	NA	Agricultur	SRILANKA	ROC DELH	shree16us	NA	NA
5	F01208	CALTEX INDIA LIMITED	NAEF	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	GOLD CRE	ROC DELH	NA	NA	NA
6	F01218	GE HEALTHCARE BIO-SCIENCES LIM	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	FF-3 Palar	ROC DELH	karthick95	NA	NA
7	F01265	CAIRN ENERGY INDIA PTY. LIMITED	NAEF	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	WELLING	ROC DELH	neerja.shi	NA	NA
8	F01269	TORIELLI S.R.L	ACTV	NA	NA	NA	5/9/1995	Tamil Nadu	0	0	NA	Agricultur	6, Mangay	ROC DELH	chennai@	NA	NA
9	F01311	HARDY EXPLORATION & PRODUCTI	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	5TH FLOO	ROC DELH	venkatesh	NA	NA
10	F01314	HOCHTIOF AKTIENGESELLSHARFF V	ACTV	NA	NA	NA	11/4/1996	Tamil Nadu	0	0	NA	Agricultur	NEW NO.(	ROC DELH	kumar@ir	NA	NA
11	F01412	EPSON SINGAPORE PVT LTD	ACTV	NA	NA	NA	25-04-1997	Tamil Nadu	0	0	NA	Agricultur	7C CEATUI	ROC DELH	NA	NA	NA
12	F01426	CARGOLUX AIRLINES INTERNATION	ACTV	NA	NA	NA	11/6/1997	Tamil Nadu	0	0	NA	Agricultur	OFFICE NC	ROC DELH	NA	NA	NA
13	F01468	CHO HEUNG ELECTRIC INDUSTRIAL	NAEF	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	129, MAN	ROC DELH	chowelac	NA	NA
14	F01543	NYCOMED ASIA PACIFIC PTE LIMITE	ACTV	NA	NA	NA	27-10-1998	Tamil Nadu	0	0	NA	Agricultur	A D 46 1S	ROC DELH	NA	NA	NA
15	F01544	CHERRINGTON ASIA LTD	ACTV	NA	NA	NA	1/5/2000	Tamil Nadu	0	0	NA	Agricultur	10HADDO	ROC DELH	NA	NA	NA
16	F01563	SHIMADZU ASIA PACIFIC PTE LIMIT	NAEF	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	FIRST FLO	ROC DELH	kousik@v	NA	NA
17	F01565	CORK INTERNATIONAL PTY LIMITEI	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	ARJAY API	ROC DELH	NA	NA	NA
18	F01566	ERBIS ENGG COMPANY LIMITED	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	39,2nd M	ROC DELH	NA	NA	NA
19	F01589	RALF SCHNEIDER HOLDING GMBH	NAEF	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	FLAT C, 'S	ROC DELH	NA	NA	NA
20	F01593	MITRAJAYA TRADING PRIVATE LIM	ACTV	NA	NA	NA	NA	Tamil Nadu	0	0	NA	Agricultur	OLD NO 1	ROC DELH	NA	NA	NA
21	F01618	HEAT AND CONTROL PTY LIMITED	ACTV	NA	NA	NA	13-07-1999	Tamil Nadu	0	0	NA	Agricultur	A40 OLD N	ROC DELH	ncrajagop	NA	NA

Data_Gov_Tamil_Nadu

Import Python library

The first step involved in ML using python is understanding and playing around with our data using libraries

Import all libraries which are required for our analysis, such as Data Loading, Statistical analysis, Visualizations, Data Transformations, Merge and Joins, etc.

Pandas and Numpy have been used for Data Manipulation and numerical Calculations

Matplotlib and Seaborn have been used for Data visualizations.

Program :

```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

(Optional)

# to ignore warnings

import warnings

warnings.filterwarnings('ignore')
```

Reading Dataset

The Pandas library offers a wide range of possibilities for loading data into the pandas DataFrame from files like JSON, .csv, .xlsx, .sql, .pickle, .html, .txt, images etc.

Given data are available in a tabular format of CSV files. It is trendy and easy to access. Using the read_csv() function, data can be converted to a pandas DataFrame.

We have stored the data in the DataFrame data.

Program

```
data=pd.read_csv("Data_Gov_Tamil_Nadu.csv",encoding='latin-1')
```

```
df
```

Out[13]:

	CORPORATE_IDENTIFICATION_NUMBER	COMPANY_NAME	COMPANY_STATUS	COMPANY_CLASS	COMPANY_CATEGORY	COMPANY_SUB_CATEGORY
0	F00643	HOCHTIEFF AG,	NAEF	NaN	NaN	NaN
1	F00721	SUMITOMO CORPORATION (SUMITOMO SHOJI KAISHA LI...	ACTV	NaN	NaN	NaN
2	F00892	SRILANKAN AIRLINES LIMITED	ACTV	NaN	NaN	NaN
3	F01208	CALTEX INDIA LIMITED	NAEF	NaN	NaN	NaN
4	F01218	GE HEALTHCARE BIO-SCIENCES LIMITED	ACTV	NaN	NaN	NaN
...	...	...	...	...	...	...
150866	U74997TN2016PTC112556	QUAD42 MEDIA PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150867	U74997TN2018PTC121491	IYERAATHU FOODS PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150868	U74997TZ2016PTC027802	POLYGAR FARM SOLUTIONS PRIVATE LIMITED	STOF	Private	Company limited by Shares	Non-govt company
150869	U74997TZ2018PTC030177	PANDIYA AGRI SOLUTIONS PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150870	U74997TZ2019PTC032491	NROOT TECHNOLOGIES PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company

150871 rows × 17 columns

Analyzing the Data

```
# head() will display the top 5 observations of the dataset
df.head()
```

In [16]:
```
df.head()
```

Out[16]:

	CORPORATE_IDENTIFICATION_NUMBER	COMPANY_NAME	COMPANY_STATUS	COMPANY_CLASS	COMPANY_CATEGORY	COMPANY_SUB_CATEGORY	DATE
0	F00643	HOCHTIEFF AG,	NAEF	NaN	NaN	NaN	
1	F00721	SUMITOMO CORPORATION (SUMITOMO SHOJI KAISHA LI...	ACTV	NaN	NaN	NaN	
2	F00892	SRILANKAN AIRLINES LIMITED	ACTV	NaN	NaN	NaN	
3	F01208	CALTEX INDIA LIMITED	NAEF	NaN	NaN	NaN	
4	F01218	GE HEALTHCARE BIO-SCIENCES LIMITED	ACTV	NaN	NaN	NaN	

 # tail() will display the last 5 observations of the dataset

df.tail()

```
In [18]: df.tail()
```

Out[18]:

	CORPORATE_IDENTIFICATION_NUMBER	COMPANY_NAME	COMPANY_STATUS	COMPANY_CLASS	COMPANY_CATEGORY	COMPANY_SUB_CATEGORY
150866	U74997TN2016PTC112556	QUAD42 MEDIA PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150867	U74997TN2018PTC121491	IYERAATHU FOODS PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150868	U74997TZ2016PTC027802	POLYGAR FARM SOLUTIONS PRIVATE LIMITED	STOF	Private	Company limited by Shares	Non-govt company
150869	U74997TZ2018PTC030177	PANDIYA AGRI SOLUTIONS PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company
150870	U74997TZ2019PTC032491	NROOT TECHNOLOGIES PRIVATE LIMITED	ACTV	Private	Company limited by Shares	Non-govt company

 # info() helps to understand the data type and information about data, including the number of records in each column, data having null or not null, Data type, the memory usage of the dataset

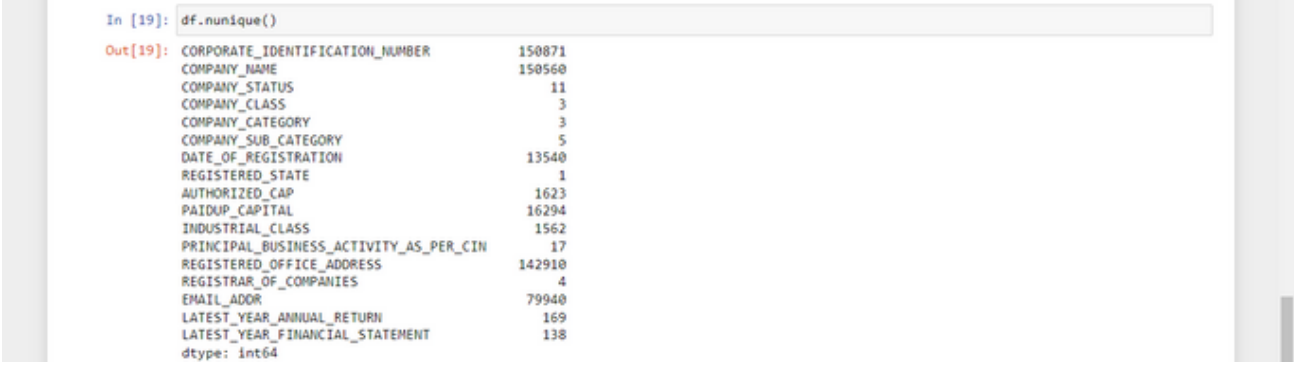
df.info()

```
In [17]: df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150871 entries, 0 to 150870
Data columns (total 17 columns):
 #   Column                                Non-Null Count   Dtype
---  ------                                --------------   -----
 0   CORPORATE_IDENTIFICATION_NUMBER       150871 non-null  object
 1   COMPANY_NAME                          150871 non-null  object
 2   COMPANY_STATUS                        150871 non-null  object
 3   COMPANY_CLASS                         150537 non-null  object
 4   COMPANY_CATEGORY                      150537 non-null  object
 5   COMPANY_SUB_CATEGORY                  150537 non-null  object
 6   DATE_OF_REGISTRATION                  150832 non-null  object
 7   REGISTERED_STATE                      150871 non-null  object
 8   AUTHORIZED_CAP                        150871 non-null  float64
 9   PAIDUP_CAPITAL                        150871 non-null  float64
 10  INDUSTRIAL_CLASS                      150561 non-null  object
 11  PRINCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN  150871 non-null  object
 12  REGISTERED_OFFICE_ADDRESS             150781 non-null  object
 13  REGISTRAR_OF_COMPANIES                150697 non-null  object
 14  EMAIL_ADDR                            112742 non-null  object
 15  LATEST_YEAR_ANNUAL_RETURN             74982 non-null   object
 16  LATEST_YEAR_FINANCIAL_STATEMENT       75089 non-null   object
dtypes: float64(2), object(15)
memory usage: 19.6+ MB
```

Check for Duplication

nunique() based on several unique values in each column and the data description, we can identify the continuous and categorical columns in the data. Duplicated data can be handled or removed based on further analysis

```
df.nunique()
```



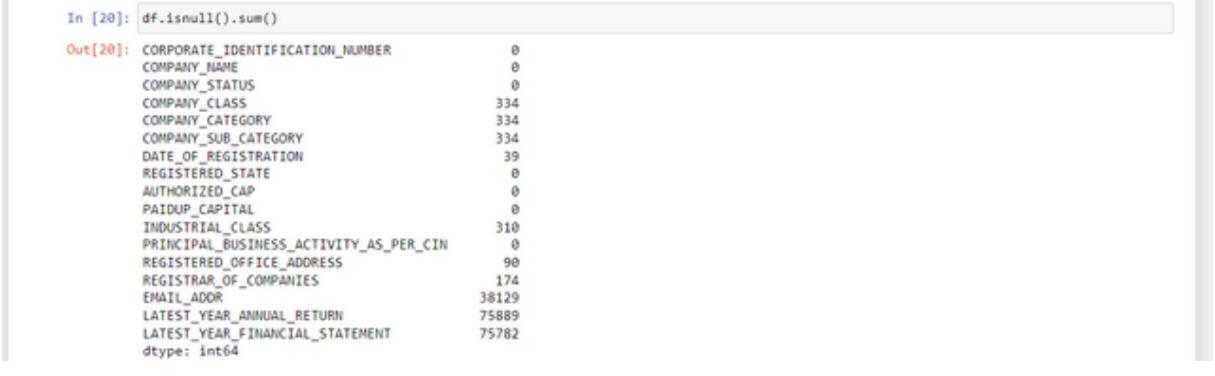
```
In [19]: df.nunique()

Out[19]: CORPORATE_IDENTIFICATION_NUMBER          150871
         COMPANY_NAME                            150560
         COMPANY_STATUS                              11
         COMPANY_CLASS                                3
         COMPANY_CATEGORY                             3
         COMPANY_SUB_CATEGORY                         5
         DATE_OF_REGISTRATION                     13540
         REGISTERED_STATE                             1
         AUTHORIZED_CAP                            1623
         PAIDUP_CAPITAL                           16294
         INDUSTRIAL_CLASS                          1562
         PRINCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN      17
         REGISTERED_OFFICE_ADDRESS                142910
         REGISTRAR_OF_COMPANIES                       4
         EMAIL_ADDR                               79940
         LATEST_YEAR_ANNUAL_RETURN                  169
         LATEST_YEAR_FINANCIAL_STATEMENT            138
         dtype: int64
```

Missing Values Calculation

isnull() is widely been in all pre-processing steps to identify null values in the data

data.isnull().sum() is used to get the number of missing records in each column

```
df.isnull().sum()
```



```
In [20]: df.isnull().sum()

Out[20]: CORPORATE_IDENTIFICATION_NUMBER          0
         COMPANY_NAME                            0
         COMPANY_STATUS                          0
         COMPANY_CLASS                         334
         COMPANY_CATEGORY                      334
         COMPANY_SUB_CATEGORY                  334
         DATE_OF_REGISTRATION                   39
         REGISTERED_STATE                        0
         AUTHORIZED_CAP                          0
         PAIDUP_CAPITAL                          0
         INDUSTRIAL_CLASS                      310
         PRINCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN    0
         REGISTERED_OFFICE_ADDRESS              90
         REGISTRAR_OF_COMPANIES                174
         EMAIL_ADDR                          38129
         LATEST_YEAR_ANNUAL_RETURN           75889
         LATEST_YEAR_FINANCIAL_STATEMENT     75782
         dtype: int64
```

Statistics Summary

describe() function gives all statistics summary of data

```
In [4]: df.describe().T
```

Out[4]:

	count	mean	std	min	25%	50%	75%	max
AUTHORIZED_CAP	150871.0	3.522781e+07	1.408554e+09	0.0	100000.0	800000.0	2000000.0	3.000000e+11
PAIDUP_CAPITAL	150871.0	2.328824e+07	1.072458e+09	0.0	100000.0	100000.0	685745.0	2.461235e+11

#describe()- Provide a statistics summary of data belonging to numerical datatype such as int, float Can include Count, Mean, Standard Deviation, median, mode, minimum value, maximum value, range, standard deviation, etc.

Exploratory Data Analysis

Exploratory Data Analysis refers to the crucial process of performing initial investigations on data to discover patterns to check assumptions with the help of summary statistics and graphical representations.

EDA can be leveraged to check for outliers, patterns, and trends in the given data.

EDA helps to find meaningful patterns in data.

EDA provides in-depth insights into the data sets to solve our business problems.

EDA gives a clue to impute missing values in the dataset

EDA Univariate Analysis

Analyzing the dataset by taking one variable at a time

Program :

```
# Select the specified columns for analysis

columns_for_analysis = ['CORPORATE_IDENTIFICATION_NUMBER',
'COMPANY_NAME', 'COMPANY_STATUS','COMPANY_CLASS',
'COMPANY_CATEGORY','COMPANY_SUB_CATEGORY','DATE_OF_REGISTRATION','REGI
STERED_STATE','AUTHORIZED_CAP','PAIDUP_CAPITAL','INDUSTRIAL_CLASS','PR
INCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN','REGISTERED_OFFICE_ADDRESS','REG
ISTRAR_OF_COMPANIES','EMAIL_ADDR','LATEST_YEAR_ANNUAL_RETURN','LATEST_
YEAR_FINANCIAL_STATEMENT']


# Subset the DataFrame with the selected columns

selected_df = df[columns_for_analysis]


# Display basic statistical summaries for numerical columns

print(selected_df.describe())


# Univariate analysis for categorical columns

for col in selected_df.select_dtypes(include='object'):

    print(f'\n{col} Value
Counts:\n{selected_df[col].value_counts()}\n')
```

OUTPUT :

	AUTHORIZED_CAP	PAIDUP_CAPITAL
count	1.508710e+05	1.508710e+05
mean	3.522781e+07	2.328824e+07
std	1.408554e+09	1.072458e+09
min	0.000000e+00	0.000000e+00
25%	1.000000e+05	1.000000e+05
50%	8.000000e+05	1.000000e+05
75%	2.000000e+06	6.857450e+05
max	3.000000e+11	2.461235e+11

CORPORATE_IDENTIFICATION_NUMBER Value Counts:

CORPORATE_IDENTIFICATION_NUMBER

F00643 1

U72900TN2008PTC067545 1

U72900TN2008PTC067391 1

U72900TN2008PTC067393 1

U72900TN2008PTC067405 1

..

U93090TZ2010PTC016187 1

U93090TZ2011PTC017199 1

U93090TZ2014PTC020864 1

U93090TZ2016NPL027599 1

U74997TZ2019PTC032491 1

Name: count, Length: 150871, dtype: int64

COMPANY_NAME Value Counts:

COMPANY_NAME

PATSEN BIOTEC PRIVATE LIMITED 3

PEARL PLANTATIONS PRIVATE LIMITED 3

SUPER ANALYSERS PRIVATE LIMITED 3

SRI VISHNU MARKETING PRIVATE LIMITED 3

TITAN WIRES PRIVATE LIMITED 3

..

YARYA SEKUR MARK PRIVATE LIMITED 1

ASSORT ENTERPRISES PRIVATE LIMITED 1

JUVAGO PRIVATE LIMITED 1

VGROW FACILITY SERVICES PRIVATE LIMITED 1

NROOT TECHNOLOGIES PRIVATE LIMITED 1

Name: count, Length: 150560, dtype: int64

COMPANY_STATUS Value Counts:

COMPANY_STATUS

ACTV 78689

STOF 64058

UPSO 3531

AMAL 1635

DISD 851

NAEF 732

ULQD 408

LIQD 389

CLLP 291

D455 164

CLLD 123

Name: count, dtype: int64

COMPANY_CLASS Value Counts:

COMPANY_CLASS

Private 137173

Public 11237

Private(One Person Company) 2127

Name: count, dtype: int64

COMPANY_CATEGORY Value Counts:

COMPANY_CATEGORY

Company limited by Shares 149924

Company Limited by Guarantee 598

Unlimited Company 15

Name: count, dtype: int64

COMPANY_SUB_CATEGORY Value Counts:

COMPANY_SUB_CATEGORY

Non-govt company 149181

Subsidiary of Foreign Company 1083

Guarantee and Association comp 140

State Govt company 109

Union Govt company 24

Name: count, dtype: int64

DATE_OF_REGISTRATION Value Counts:

DATE_OF_REGISTRATION

01-04-1956 190

20-09-2018 144

26-03-2019 91

26-02-2016 73

24-03-2016 71

...

23-09-1967 1

27-05-1968 1

07-02-1968 1

15-04-1968 1

06-05-2006 1

Name: count, Length: 13540, dtype: int64

REGISTERED_STATE Value Counts:

REGISTERED_STATE

Tamil Nadu 150871

Name: count, dtype: int64

INDUSTRIAL_CLASS Value Counts:

INDUSTRIAL_CLASS

74999 14809

72900 8121

72200 6093

74900 5232

65991 3934

...

17254 1

15315 1

31504 1

34209 1

24130 1

Name: count, Length: 1562, dtype: int64

PRINCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN Value Counts:

PRINCIPAL_BUSINESS_ACTIVITY_AS_PER_CIN

Real estate renting and business activities 48697

Manufacturing 35757

Financial intermediation 13772

Wholesale and retail trade repair of motor vehicles motorcycles and personal and household goods 13681

Construction 9079

Agriculture & allied 7496

Transport storage and communications 6231

Other community social and personal service activities 4725

Hotels and restaurants 2673

Electricity gas and water supply 2459

Health and social work 2270

Education 1822

Mining and quarrying 1377

Extraterritorial organizations and bodies 781

Public administration and defence compulsory social security 27

Activities of private households as employers and undifferentiated production activities of private households 19

Unclassified 5

Name: count, dtype: int64

REGISTERED_OFFICE_ADDRESS Value Counts:

REGISTERED_OFFICE_ADDRESS

MADRAS 211

Sri sai subhodhaya ApartmentsNo.57/2B, East Coast Road, Thiruvanmiyur 58

Flat No 6J, Century Plaza, 560-562, Anna Salai,Teynampet 54

Times Partner No: 58Perambur Barracks Road 45

"R R LANDMARK"NO.1E-1 NAVA INDIA ROAD 44

...

NO.47, SOUTH REDDY STREET,ATHIPET, AMBATTUR 1

FLAT NO.10, SRI NARAYANA FLATS25, TILAK STREET, T.NAGAR 1

Plot No.52Sidco Industrial Estate,Alathur 1

22/160-AThengapattanam Road 1

139/1BPUDHUKOTTAI ROAD, MAPILLAI NAYAKKANPATTI 1

Name: count, Length: 142910, dtype: int64

REGISTRAR_OF_COMPANIES Value Counts:

REGISTRAR_OF_COMPANIES

ROC CHENNAI 122233

ROC COIMBATORE 28153

ROC DELHI 310

ROC HYDERABAD 1

Name: count, dtype: int64

EMAIL_ADDR Value Counts:

EMAIL_ADDR

ganravi@gmail.com 182

compliance@kanakkupillai.com 176

secretarial@stjohntrack.com 161

smrajunaidu@gmail.com 144

pcschn1@gmail.com 133

...

info@skymaxlogistics.com 1

vishnu2444@yahoo.com 1

rashahuljob@gmail.com 1

baskar.mrl@gmail.com 1

nroottechnologies@gmail.com 1

Name: count, Length: 79940, dtype: int64

LATEST_YEAR_ANNUAL_RETURN Value Counts:

LATEST_YEAR_ANNUAL_RETURN

31-03-2019 44168

31-03-2018 8816

31-03-2017 3149

31-03-2013 2514

31-03-2014 2329

...

24-03-2008 1

15-06-2009 1

30-03-2011 1

30-06-2016 1

31-01-2015 1

Name: count, Length: 169, dtype: int64

LATEST_YEAR_FINANCIAL_STATEMENT Value Counts:

LATEST_YEAR_FINANCIAL_STATEMENT

31-03-2019 44171

31-03-2018 9008

31-03-2017 3122

31-03-2013 2585

31-03-2014 2175

...

10-04-2009 1

24-05-2006 1

31-07-2006 1

24-03-2008 1

31-01-2015 1

Name: count, Length: 138, dtype: int64

EDA Bivariate Analysis

Bivariate Analysis helps to understand how variables are related to each other and the relationship between dependent and independent variables present in the dataset.

For Numerical variables, Pair plots and Scatter plots are widely been used to do Bivariate Analysis.

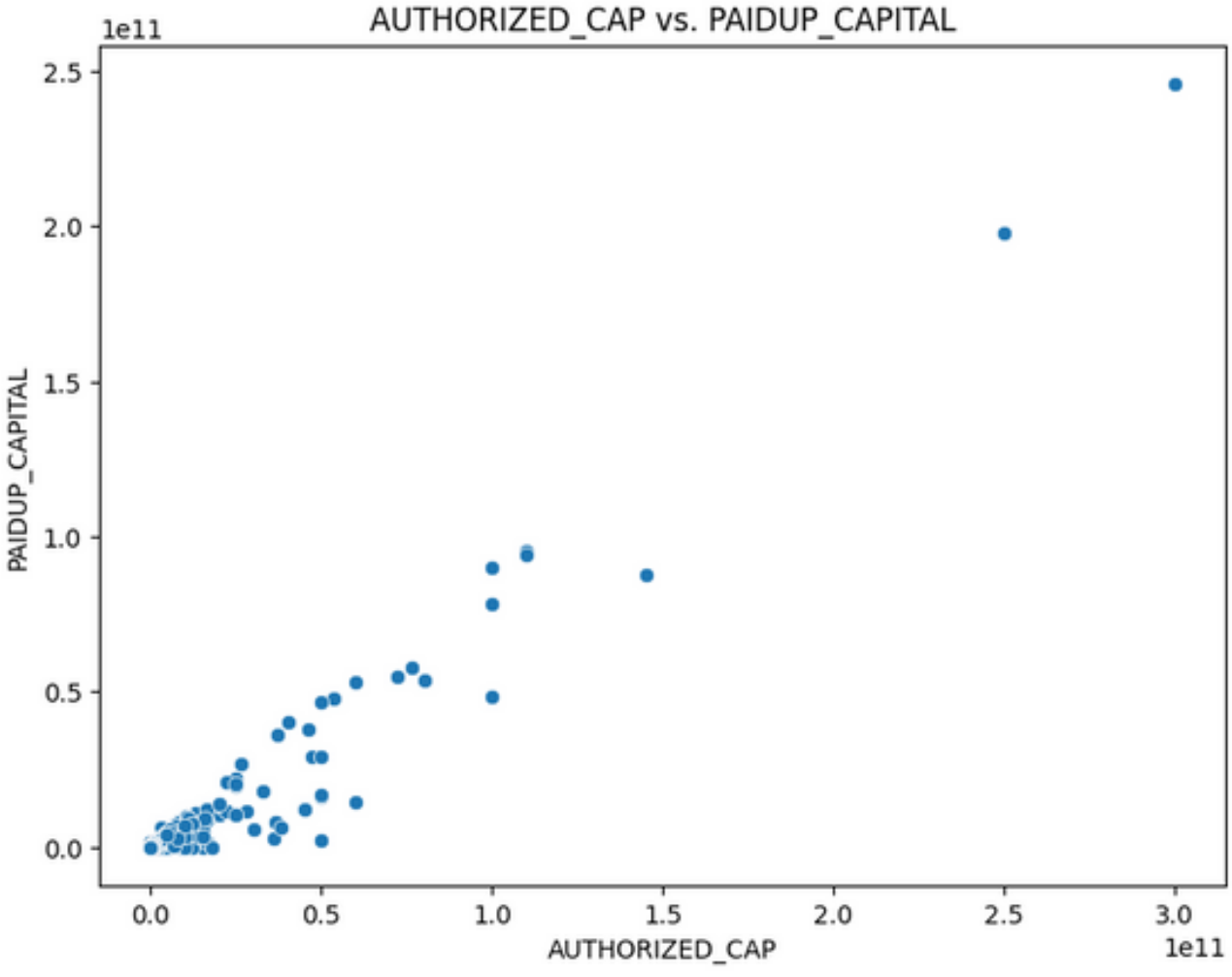
A Stacked bar chart can be used for categorical variables if the output variable is a classifier. Bar plots can be used if the output variable is continuous

In our example, a pair plot has been used to show the relationship between two Categorical variables.

Program :

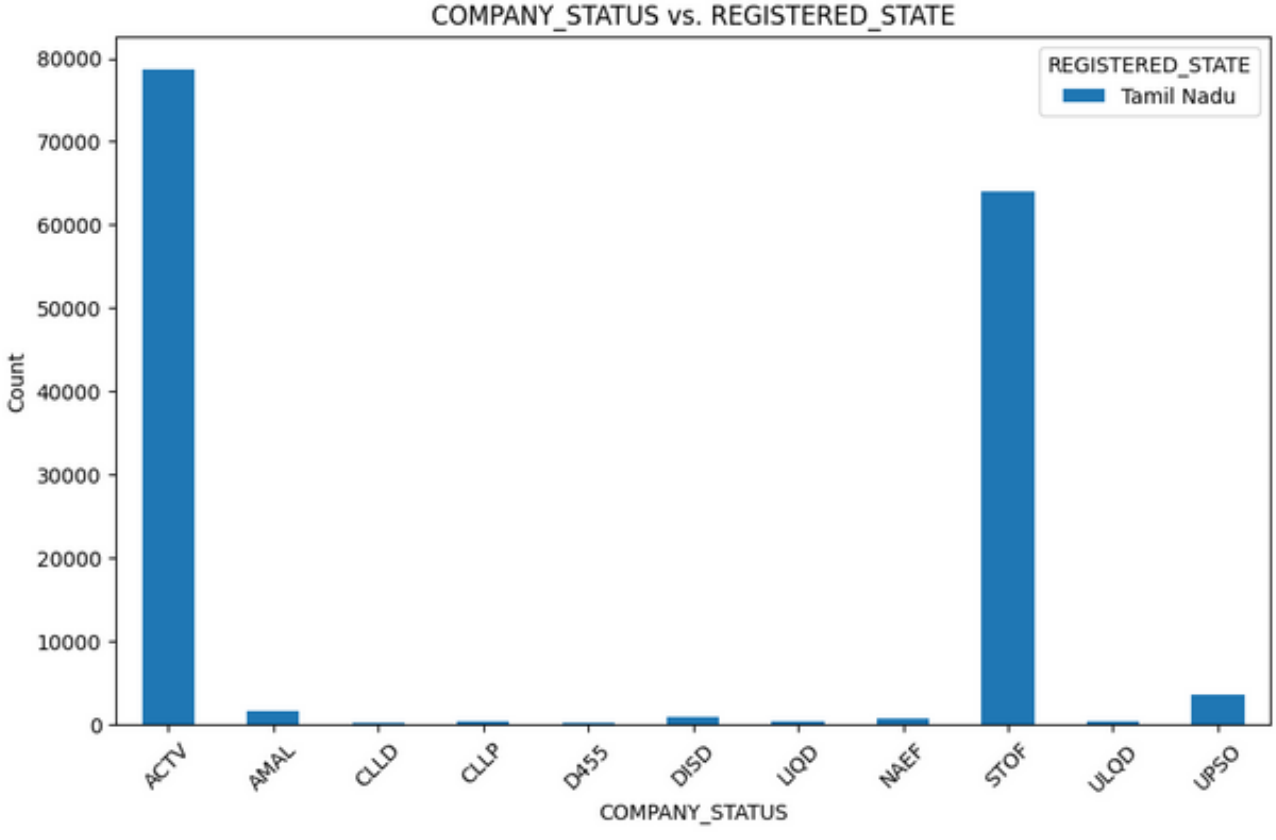
```
# Subset the DataFrame with the selected columns

selected_df = df[columns_for_analysis]


# Bivariate analysis: Numerical vs. Numerical (AUTHORIZED_CAP vs.
PAIDUP_CAPITAL)


plt.figure(figsize=(8, 6))

sns.scatterplot(x='AUTHORIZED_CAP', y='PAIDUP_CAPITAL',
data=selected_df)
```

```
plt.title('AUTHORIZED_CAP vs. PAIDUP_CAPITAL')
plt.xlabel('AUTHORIZED_CAP')
plt.ylabel('PAIDUP_CAPITAL')
plt.show()
```



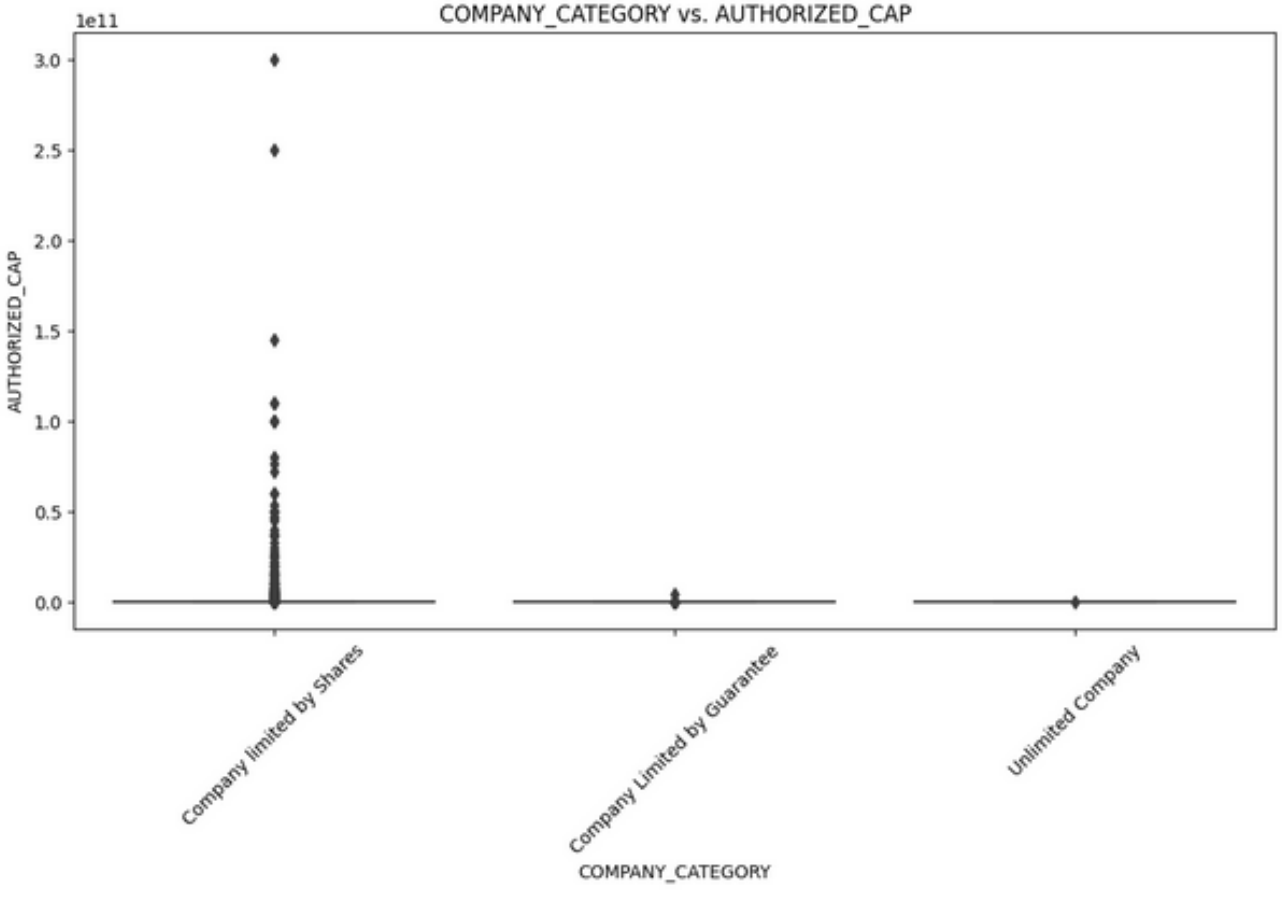

```
# Bivariate analysis: Categorical vs. Categorical (COMPANY_STATUS vs.
```

```
REGISTERED_STATE)

crosstab = pd.crosstab(selected_df['COMPANY_STATUS'],
selected_df['REGISTERED_STATE'])

crosstab.plot(kind='bar', stacked=True, figsize=(10, 6))

plt.title('COMPANY_STATUS vs. REGISTERED_STATE')

plt.xlabel('COMPANY_STATUS')

plt.ylabel('Count')

plt.xticks(rotation=45)

plt.show()
```



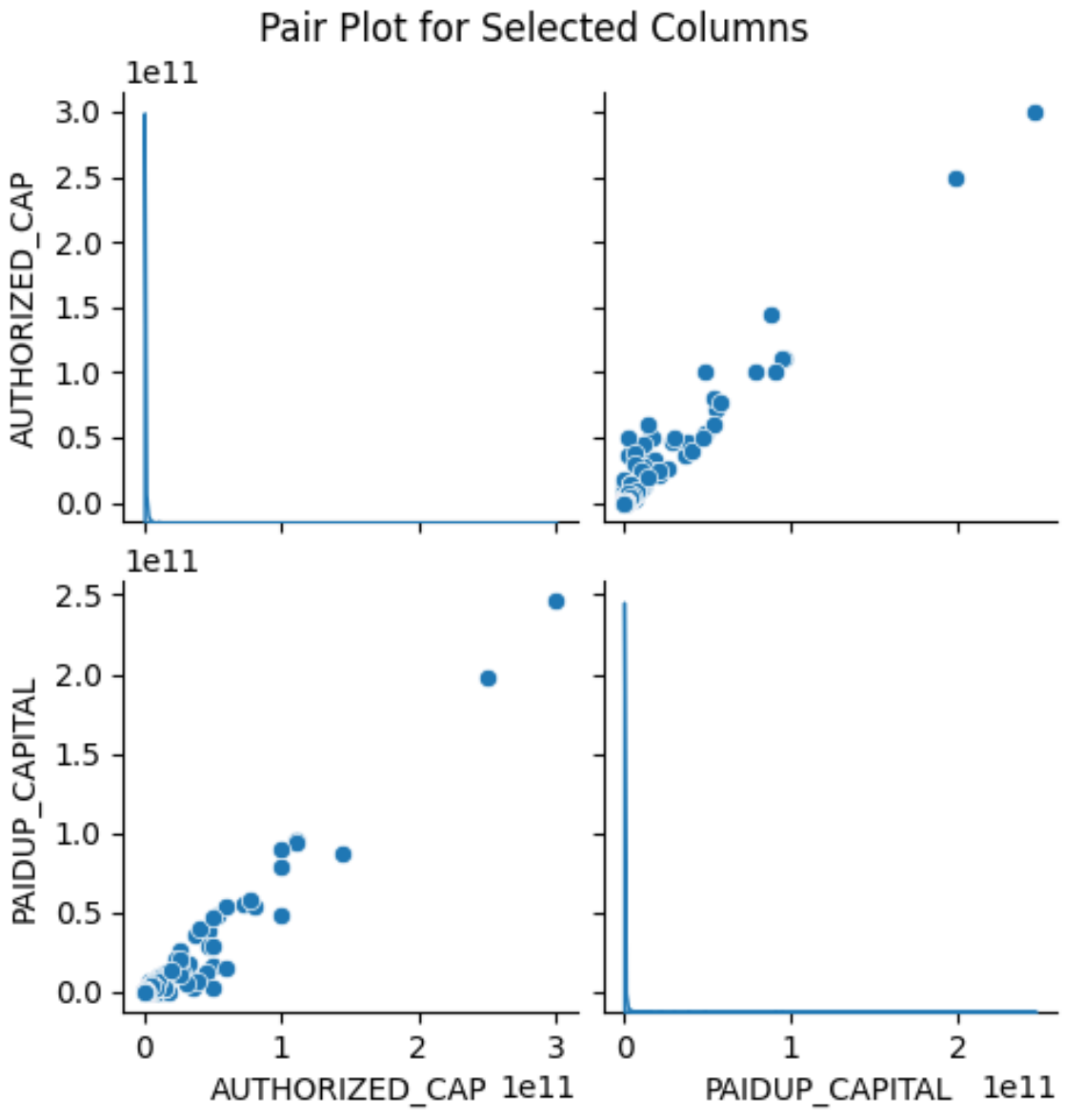

```
# Bivariate analysis: Categorical vs. Numerical (COMPANY_CATEGORY vs.
AUTHORIZED_CAP)

plt.figure(figsize=(12, 6))
```

```
sns.boxplot(x='COMPANY_CATEGORY', y='AUTHORIZED_CAP',
data=selected_df)

plt.title('COMPANY_CATEGORY vs. AUTHORIZED_CAP')

plt.xlabel('COMPANY_CATEGORY')

plt.ylabel('AUTHORIZED_CAP')

plt.xticks(rotation=45)

plt.show()
```




```
# Plot the pair plot

sns.pairplot(selected_df, diag_kind='kde', height=2.5)

plt.suptitle('Pair Plot for Selected Columns', y=1.02)
```

```
plt.show()
```



EDA Multivariate Analysis

Multivariate analysis is one of the most useful methods to determine relationships and analyze patterns for any dataset.

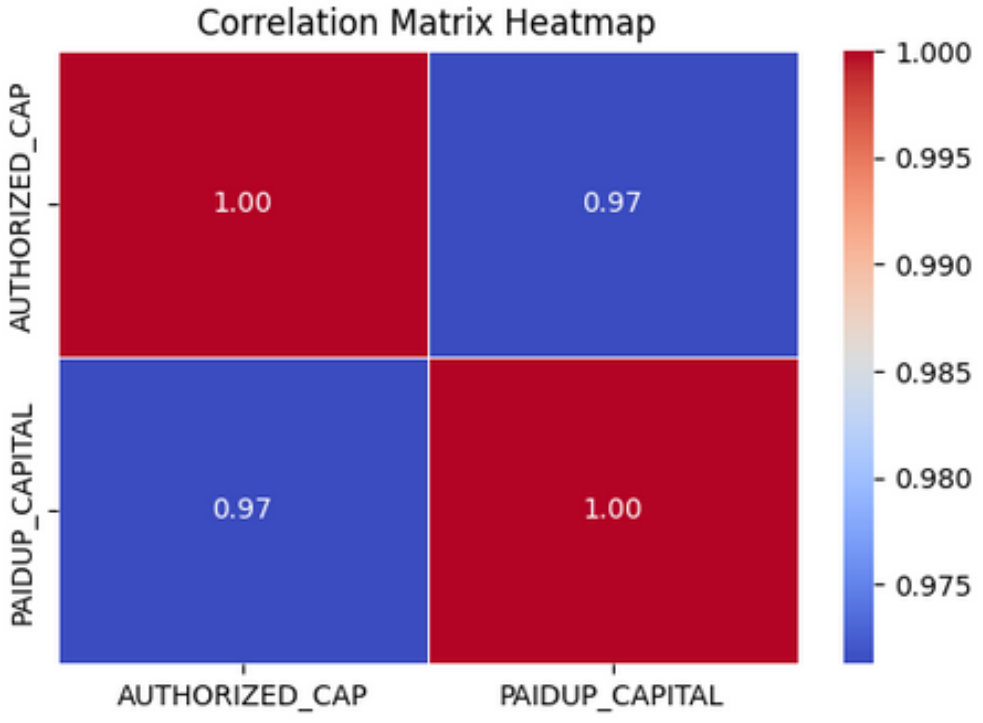
A heat map is widely been used for Multivariate Analysis

Heat Map gives the correlation between the variables, whether it has a positive or negative correlation.

In our example heat map shows the correlation between the variables.

Program :

```
# Select the specified columns for analysis

columns_for_analysis = ['AUTHORIZED_CAP', 'PAIDUP_CAPITAL']


# Subset the DataFrame with the selected columns

selected_df = df[columns_for_analysis]


# Convert columns to numeric (if they're not already)

selected_df = selected_df.apply(pd.to_numeric, errors='coerce')


# Calculate the correlation matrix

correlation_matrix = selected_df.corr()


# Plot the heatmap

plt.figure(figsize=(6, 4))

sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm',
fmt='.2f', linewidths=0.5)

plt.title('Correlation Matrix Heatmap')

plt.show()
```



Conclusion

In the task of exploring and predicting company registration trends using data obtained from the Registrar of Companies (RoC), a comprehensive approach was adopted involving data collection, data preprocessing, and exploratory data analysis (EDA). Initially, data was collected from various sources including RoC records, financial data, industry information, and market indicators. This data encompassed essential attributes such as corporate

identification numbers, company names, registration dates, financial figures, business activities, and more.

The subsequent step involved data preprocessing, where meticulous attention was given to handling missing values and converting data types to ensure consistency and accuracy in the dataset. Techniques such as imputation were utilized to manage missing data, and categorical variables were appropriately encoded to facilitate subsequent analysis. Furthermore, numerical features were scaled to a consistent range, while relevant date columns were transformed for improved insights.

Following data preprocessing, univariate analysis was conducted, scrutinizing individual features to grasp their distributions, frequencies, and unique values. This analysis shed light on the status and characteristics of companies, their registration dates, authorized and paid-up capital, and other crucial aspects. Moving to bivariate analysis, relationships between pairs of variables were explored, offering insights into potential correlations and patterns. Specifically, correlations between authorized capital and paid-up capital were studied, revealing interesting trends.

Finally, multivariate analysis was employed, focusing on understanding the interrelationships between multiple variables. A correlation matrix and heatmap were constructed, illuminating the associations between selected numeric features such as authorized capital and paid-up capital. The heatmap visually represented the strength and direction of these relationships, providing valuable insights for further analysis and predictions.

In conclusion, the seamless integration of data collection, preprocessing, and exploratory analysis enabled a holistic understanding of the company registration landscape. These foundational steps are pivotal in laying the groundwork for subsequent predictive modeling and

informed decision-making in the realm of business and finance.