In [3]:
```
import pandas as pd
```

In [5]:
```
raw_data=pd.read_excel(r'C:\Users\user\Documents\Rawdata.xlsx')
raw_data
```

Out[5]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience#$	34 years	Mumbai	5^00#0	2+
1	Teddy^	Testing	45' yr	Bangalore	10%%000	<3
2	Uma#r	Dataanalyst^^#	NaN	NaN	1$5%000	4> yrs
3	Jane	Ana^^lytics	NaN	Hyderbad	2000^0	NaN
4	Uttam*	Statistics	67-yr	NaN	30000-	5+ year
5	Kim	NLP	55yr	Delhi	6000^$0	10+

In [7]:
```
id(raw_data)
```

Out[7]:
```
2258201618016
```

In [9]:
```
raw_data.columns
```

Out[9]:
```
Index(['Name', 'Domain', 'Age', 'Location', 'Salary', 'Exp'], dtype='object')
```

In [11]:
```
raw_data.shape
```

Out[11]:
```
(6, 6)
```

In [13]:
```
raw_data.head()
```

Out[13]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience#$	34 years	Mumbai	5^00#0	2+
1	Teddy^	Testing	45' yr	Bangalore	10%%000	<3
2	Uma#r	Dataanalyst^^#	NaN	NaN	1$5%000	4> yrs
3	Jane	Ana^^lytics	NaN	Hyderbad	2000^0	NaN
4	Uttam*	Statistics	67-yr	NaN	30000-	5+ year

In [15]:
```
raw_data.tail()
```

Out[15]:

	Name	Domain	Age	Location	Salary	Exp
1	Teddy^	Testing	45' yr	Bangalore	10%%000	<3
2	Uma#r	Dataanalyst^^#	NaN	NaN	1$5%000	4> yrs
3	Jane	Ana^^lytics	NaN	Hyderbad	2000^0	NaN
4	Uttam*	Statistics	67-yr	NaN	30000-	5+ year
5	Kim	NLP	55yr	Delhi	6000^$0	10+

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Name      6 non-null      object
 1   Domain    6 non-null      object
 2   Age       4 non-null      object
 3   Location  4 non-null      object
 4   Salary    6 non-null      object
 5   Exp       5 non-null      object
dtypes: object(6)
memory usage: 420.0+ bytes
```

In [19]:
```
raw_data.isnull()
```

Out[19]:

	Name	Domain	Age	Location	Salary	Exp
0	False	False	False	False	False	False
1	False	False	False	False	False	False
2	False	False	True	True	False	False
3	False	False	True	False	False	True
4	False	False	False	True	False	False
5	False	False	False	False	False	False

In [21]:
```
raw_data.isna() # same as isnull()
```

Out[21]:

	Name	Domain	Age	Location	Salary	Exp
0	False	False	False	False	False	False
1	False	False	False	False	False	False
2	False	False	True	True	False	False
3	False	False	True	False	False	True
4	False	False	False	True	False	False
5	False	False	False	False	False	False

In [23]:
```
raw_data.isnull().sum()
```

Out[23]:
```
Name        0
Domain      0
Age         2
Location    2
Salary      0
Exp         1
dtype: int64
```

In [25]:
```
raw_data
```

Out[25]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience#$	34 years	Mumbai	5^00#0	2+
1	Teddy^	Testing	45' yr	Bangalore	10%%000	<3
2	Uma#r	Dataanalyst^^#	NaN	NaN	1$5%000	4> yrs
3	Jane	Ana^^lytics	NaN	Hyderbad	2000^0	NaN
4	Uttam*	Statistics	67-yr	NaN	30000-	5+ year
5	Kim	NLP	55yr	Delhi	6000^$0	10+

DATA CLEANING AND DATA CLEASING

In [28]:
```
raw_data['Name']=raw_data['Name'].str.replace(r'\W','',regex=True) #  \W capture
raw_data['Name'] # '' This is the replacement string. Here, it's an empty string
```

Out[28]:
```
0     Mike
1    Teddy
2     Umar
3     Jane
4    Uttam
5      Kim
Name: Name, dtype: object
```

In [30]:
```
raw_data['Domain']
```

Out[30]:
```
0     Datascience#$
1           Testing
2    Dataanalyst^^#
3       Ana^^lytics
4        Statistics
5               NLP
Name: Domain, dtype: object
```

In [32]:
```
raw_data['Domain']=raw_data['Domain'].str.replace(r'\W','',regex=True)
```

In [34]:
```
raw_data['Domain']
```

Out[34]:
```
0    Datascience
1        Testing
2    Dataanalyst
3      Analytics
4     Statistics
5            NLP
Name: Domain, dtype: object
```

In [36]:
```
raw_data['Age']=raw_data['Age'].str.replace(r'\W','',regex=True)
raw_data['Age']
```

Out[36]:
```
0    34years
1       45yr
2        NaN
3        NaN
4       67yr
5       55yr
Name: Age, dtype: object
```

In [68]:
```
raw_data['Age']=raw_data['Age'].str.extract('(\d+)') # \d+: \d matches any digit
raw_data['Age']
```

```
<>:1: SyntaxWarning: invalid escape sequence '\d'
<>:1: SyntaxWarning: invalid escape sequence '\d'
C:\Users\user\AppData\Local\Temp\ipykernel_1852\2837976887.py:1: SyntaxWarning: i
nvalid escape sequence '\d'
  raw_data['Age']=raw_data['Age'].str.extract('(\d+)') # \d+: \d matches any digi
t (0-9), and the + means "one or more" digits.
```

Out[68]:
```
0     34
1     45
2    NaN
3    NaN
4     67
5     55
Name: Age, dtype: object
```

In [70]:
```
raw_data
```

Out[70]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [72]:
```
raw_data['Location']=raw_data['Location'].str.replace(r'\W','',regex=True)
raw_data
```

Out[72]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [74]:
```
raw_data['Salary']=raw_data['Salary'].str.replace(r'\W','',regex=True)
raw_data
```

Out[74]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [76]:
```
raw_data['Exp']=raw_data['Exp'].str.extract('(\d+)')
raw_data
```

```
<>:1: SyntaxWarning: invalid escape sequence '\d'
<>:1: SyntaxWarning: invalid escape sequence '\d'
C:\Users\user\AppData\Local\Temp\ipykernel_1852\206955048.py:1: SyntaxWarning: in
valid escape sequence '\d'
  raw_data['Exp']=raw_data['Exp'].str.extract('(\d+)')
```

Out[76]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [78]:
```
clean_data=raw_data.copy()
```

In [80]:
```
clean_data
```

Out[80]:

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

EDA Techniques

In [83]:
```
clean_data.isnull().sum()
```

Out[83]:
```
Name        0
Domain      0
Age         2
Location    2
Salary      0
Exp         1
dtype: int64
```

In [85]:
```
clean_data['Age']
```

Out[85]:
```
0     34
1     45
2    NaN
3    NaN
4     67
5     55
Name: Age, dtype: object
```

In [87]:
```
import numpy as np
```

In [89]:
```
clean_data['Age']=clean_data['Age'].fillna(np.mean(pd.to_numeric(clean_data['Age
clean_data['Age']
```

Out[89]:
```
0       34
1       45
2    50.25
3    50.25
4       67
5       55
Name: Age, dtype: object
```

In [91]:
```
clean_data['Exp']=clean_data['Exp'].fillna(np.mean(pd.to_numeric(clean_data['Exp
clean_data['Exp']
```

Out[91]:
```
0      2
1      3
2      4
3    4.8
4      5
5     10
Name: Exp, dtype: object
```

In [93]:
```
clean_data['Location'].isnull().sum()
```

Out[93]:
```
2
```

In [105…
```
clean_data['Location']=clean_data['Location'].fillna(clean_data['Location'].mode
clean_data['Location'] # The [0] is used to select the first mode from the Serie
```

Out[105…
```
0       Mumbai
1    Bangalore
2     Hyderbad
3     Hyderbad
4     Hyderbad
5        Delhi
Name: Location, dtype: object
```

In [122…
```
clean_data
```

Out[122…

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50.25	Bangalore	15000	4
3	Jane	Analytics	50.25	Hyderbad	20000	4.8
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [124…
```
clean_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Name      6 non-null      object
 1   Domain    6 non-null      object
 2   Age       6 non-null      object
 3   Location  6 non-null      object
 4   Salary    6 non-null      object
 5   Exp       6 non-null      object
dtypes: object(6)
memory usage: 420.0+ bytes
```

In [129…
```
clean_data['Age']=clean_data['Age'].astype(int)
clean_data['Age']
```

Out[129…
```
0    34
1    45
2    50
3    50
4    67
5    55
Name: Age, dtype: int32
```

In [131…
```
clean_data['Salary']=clean_data['Salary'].astype(int)
clean_data['Salary']
```

Out[131…
```
0     5000
1    10000
2    15000
3    20000
4    30000
5    60000
Name: Salary, dtype: int32
```

In [133…
```
clean_data['Exp']=clean_data['Exp'].astype(int)
clean_data['Exp']
```

Out[133…
```
0     2
1     3
2     4
3     4
4     5
5    10
Name: Exp, dtype: int32
```

In [135…
```
clean_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Name      6 non-null      object
 1   Domain    6 non-null      object
 2   Age       6 non-null      int32 
 3   Location  6 non-null      object
 4   Salary    6 non-null      int32 
 5   Exp       6 non-null      int32 
dtypes: int32(3), object(3)
memory usage: 348.0+ bytes
```

In [143…
```
clean_data['Name']=clean_data['Name'].astype('category')
clean_data['Location']=clean_data['Location'].astype('category')
clean_data['Domain']=clean_data['Domain'].astype('category')
clean_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype   
---  ------    --------------  -----   
 0   Name      6 non-null      category
 1   Domain    6 non-null      category
 2   Age       6 non-null      int32   
 3   Location  6 non-null      category
 4   Salary    6 non-null      int32   
 5   Exp       6 non-null      int32   
dtypes: category(3), int32(3)
memory usage: 866.0 bytes
```

In [146…
```
clean_data
```

Out[146…

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50	Bangalore	15000	4
3	Jane	Analytics	50	Hyderbad	20000	4
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [148…
```
import os
os.getcwd()
```

Out[148…
```
'C:\\Users\\user'
```

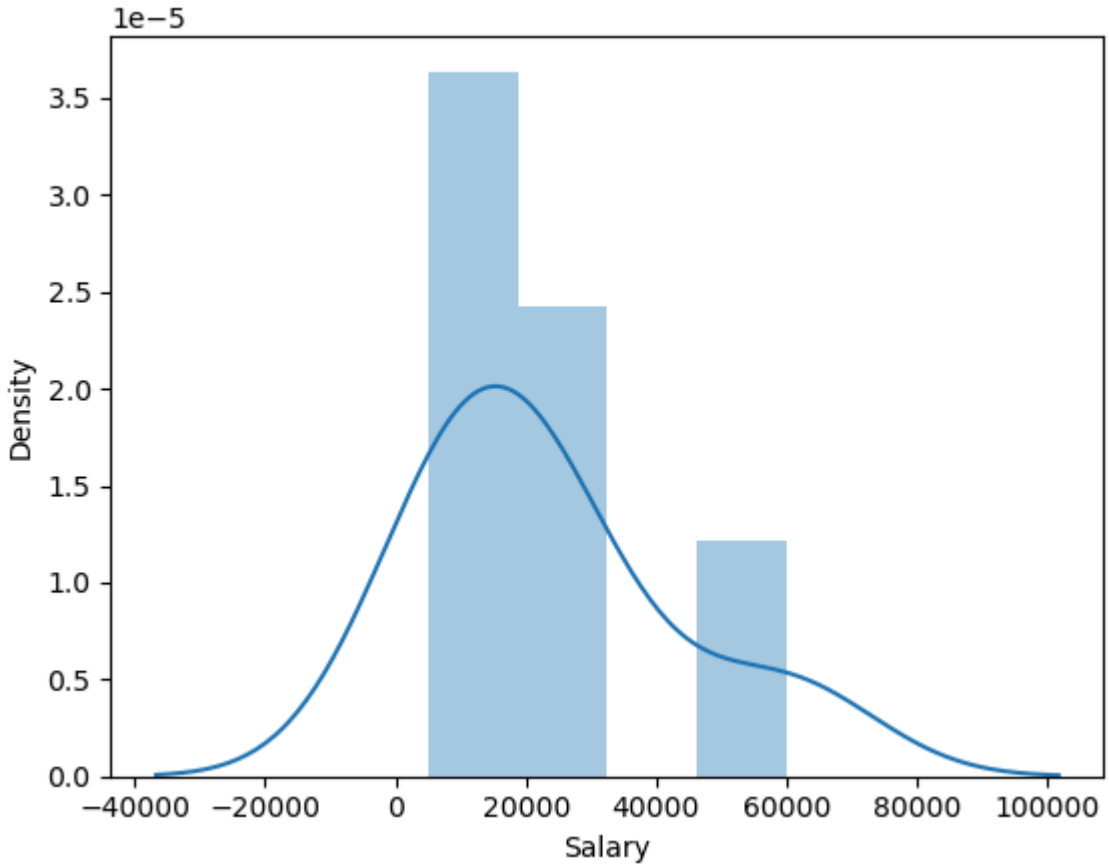
In [150…
```
import matplotlib.pyplot as plt # visualization
import seaborn as sns
```

In [152…
```
import warnings
warnings.filterwarnings('ignore')
```

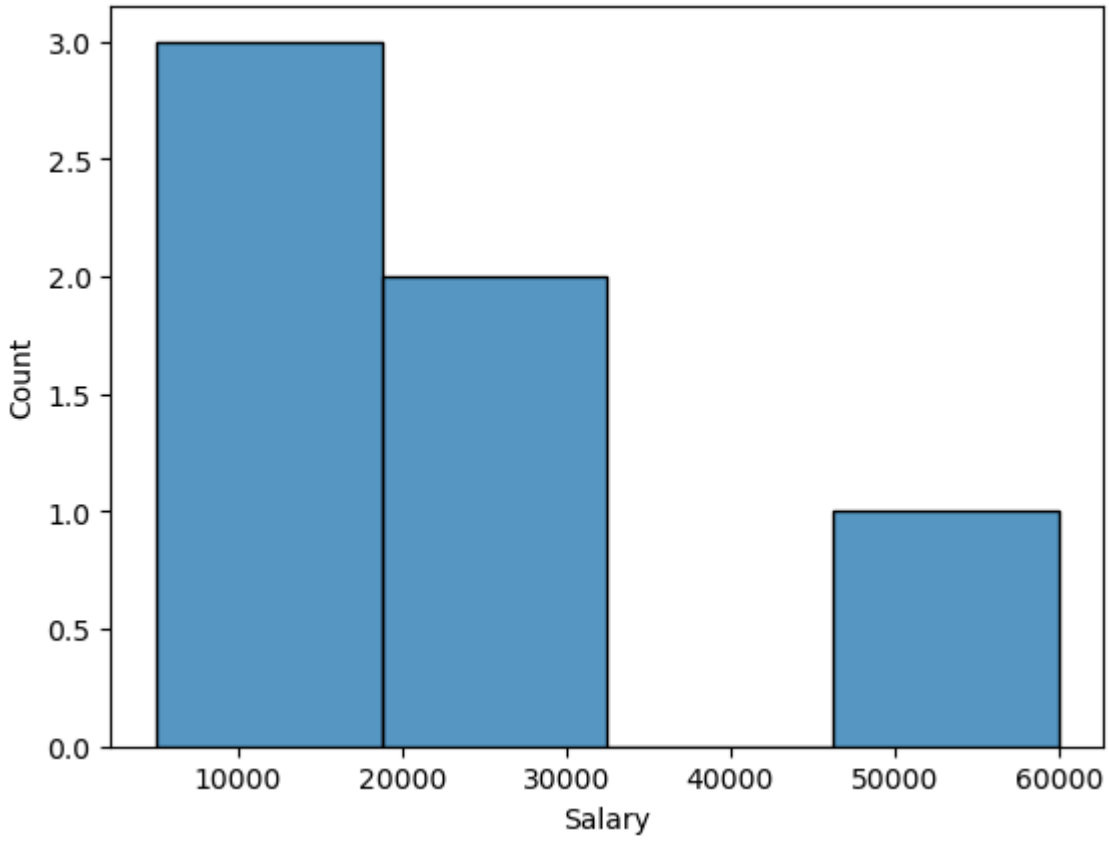
In [154…
```
clean_data['Salary']
```

Out[154…
```
0     5000
1    10000
2    15000
3    20000
4    30000
5    60000
Name: Salary, dtype: int32
```

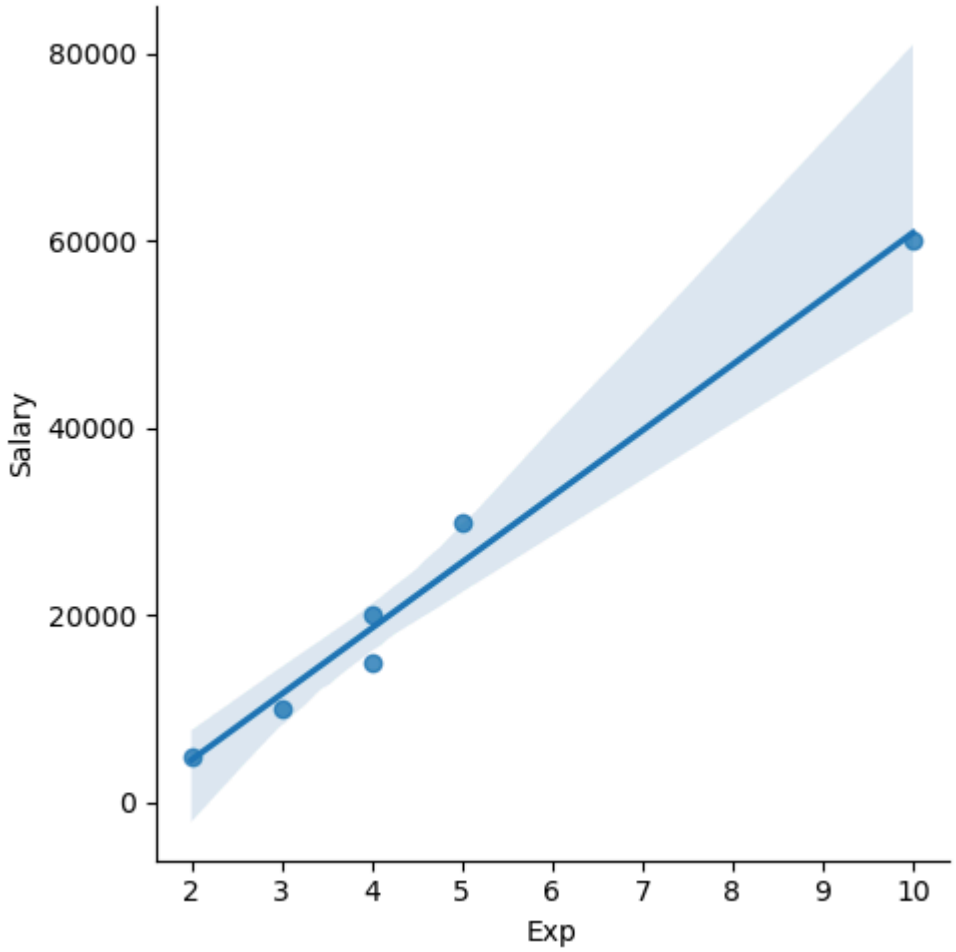
In [156…
```
vis1=sns.distplot(clean_data['Salary'])
```



In [158…
```
vis2=sns.histplot(clean_data['Salary'])
```

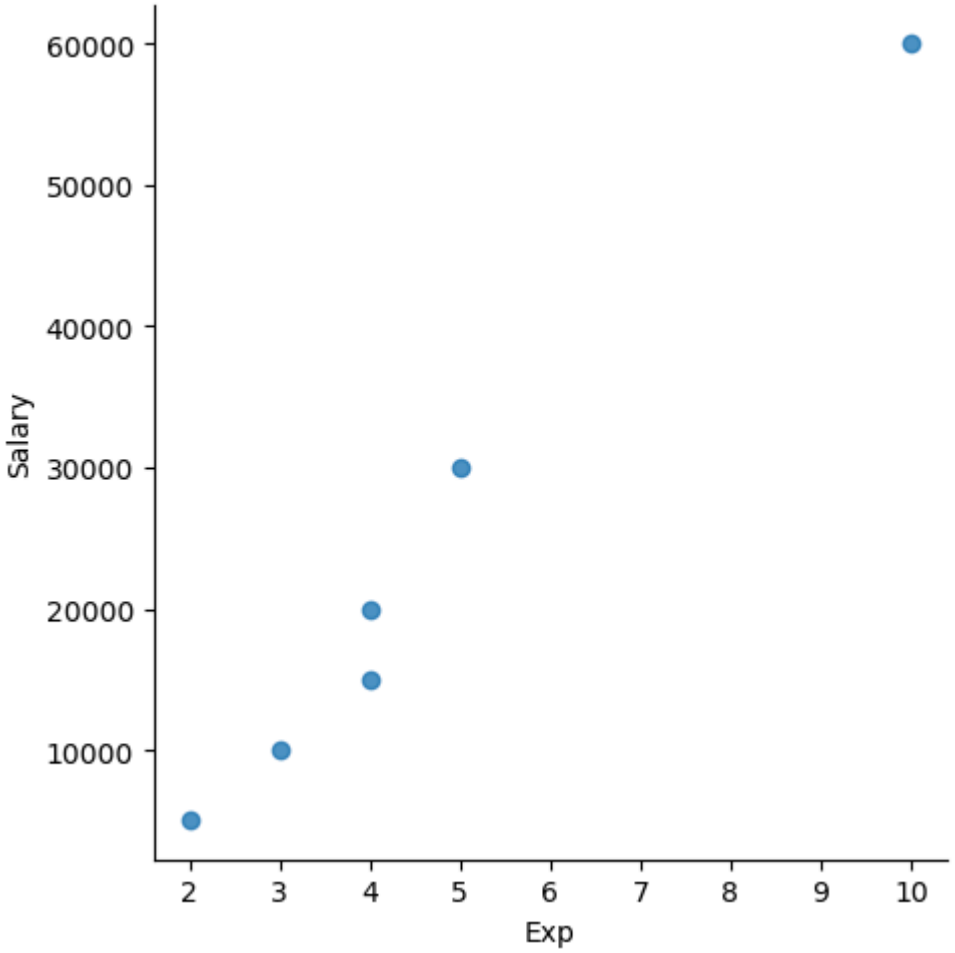


In [160…
```
vis3=sns.lmplot(data=clean_data,x='Exp',y='Salary')
```



In [162…

```
vis4=sns.lmplot(data=clean_data,x='Exp',y='Salary',fit_reg=False)
```



In [166…
```
clean_data[:]
```

Out[166…

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50	Bangalore	15000	4
3	Jane	Analytics	50	Hyderbad	20000	4
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [168…
```
clean_data[0:6:2]
```

Out[168…

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
2	Umar	Dataanalyst	50	Bangalore	15000	4
4	Uttam	Statistics	67	Bangalore	30000	5

In [170…
```
clean_data[::-1]
```

Out[170…

	Name	Domain	Age	Location	Salary	Exp
5	Kim	NLP	55	Delhi	60000	10
4	Uttam	Statistics	67	Bangalore	30000	5
3	Jane	Analytics	50	Hyderbad	20000	4
2	Umar	Dataanalyst	50	Bangalore	15000	4
1	Teddy	Testing	45	Bangalore	10000	3
0	Mike	Datascience	34	Mumbai	5000	2

In [172…
```
clean_data.columns
```

Out[172…
```
Index(['Name', 'Domain', 'Age', 'Location', 'Salary', 'Exp'], dtype='object')
```

In [176…
```
x_iv=clean_data[['Name','Domain','Age','Location','Salary','Exp']]
x_iv
```

Out[176…

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50	Bangalore	15000	4
3	Jane	Analytics	50	Hyderbad	20000	4
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [180…
```
y_dv=clean_data['Salary']
y_dv
```

Out[180…
```
0     5000
1    10000
2    15000
3    20000
4    30000
5    60000
Name: Salary, dtype: int32
```

In [182…
```
raw_data
```

Out[182...

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	NaN	NaN	15000	4
3	Jane	Analytics	NaN	Hyderbad	20000	NaN
4	Uttam	Statistics	67	NaN	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [184...
```
clean_data
```

Out[184...

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50	Bangalore	15000	4
3	Jane	Analytics	50	Hyderbad	20000	4
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [186...
```
x_iv
```

Out[186...

	Name	Domain	Age	Location	Salary	Exp
0	Mike	Datascience	34	Mumbai	5000	2
1	Teddy	Testing	45	Bangalore	10000	3
2	Umar	Dataanalyst	50	Bangalore	15000	4
3	Jane	Analytics	50	Hyderbad	20000	4
4	Uttam	Statistics	67	Bangalore	30000	5
5	Kim	NLP	55	Delhi	60000	10

In [188...
```
y_dv
```

Out[188...
```
0     5000
1    10000
2    15000
3    20000
4    30000
5    60000
Name: Salary, dtype: int32
```

In [192...
```
imputation=pd.get_dummies(clean_data) # variable creation
imputation
```

Out[192...

	Age	Salary	Exp	Name_Jane	Name_Kim	Name_Mike	Name_Teddy	Name_Umar
0	34	5000	2	False	False	True	False	False
1	45	10000	3	False	False	False	True	False
2	50	15000	4	False	False	False	False	True
3	50	20000	4	True	False	False	False	False
4	67	30000	5	False	False	False	False	False
5	55	60000	10	False	True	False	False	False

In [ ]: