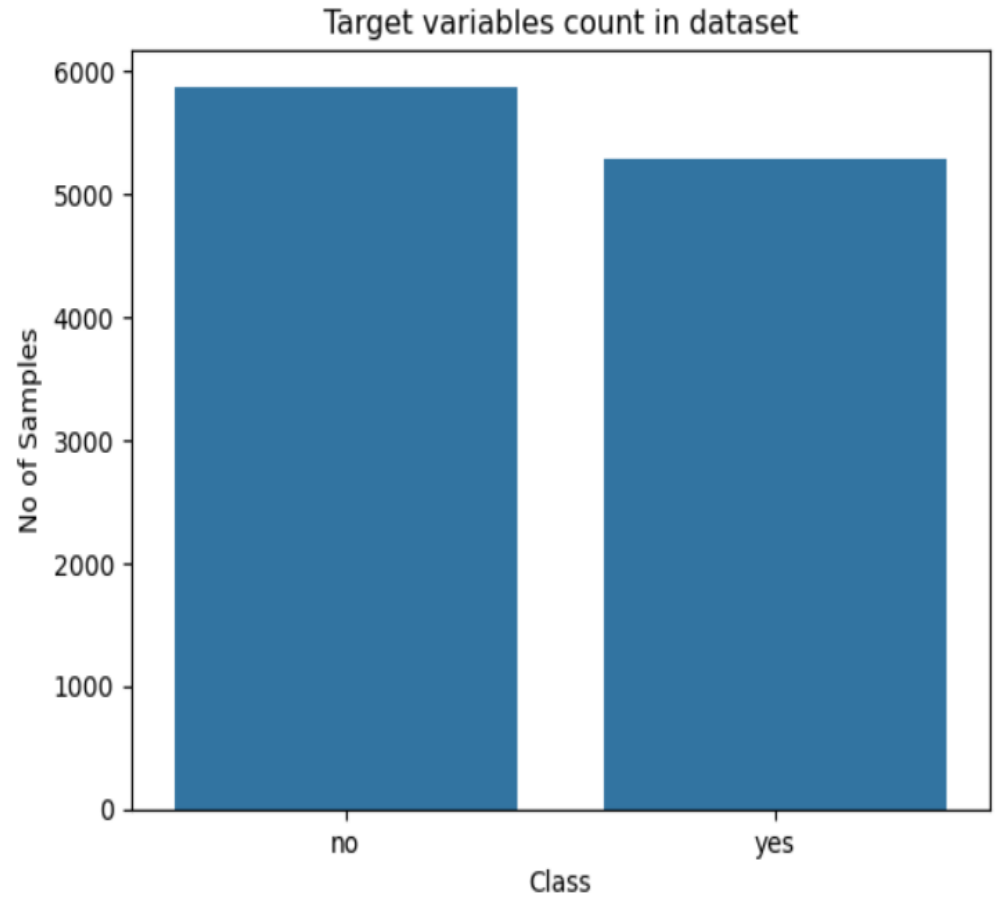
```
df.head()
```

	age	job	marital	education	default	balance	housing	loan	contact	day	month	duration	campaign	pdays	previous	poutcome	deposit
0	59	admin.	married	secondary	no	2343	yes	no	unknown	5	may	1042	1	-1	0	unknown	yes
1	56	admin.	married	secondary	no	45	no	no	unknown	5	may	1467	1	-1	0	unknown	yes
2	41	technician	married	secondary	no	1270	yes	no	unknown	5	may	1389	1	-1	0	unknown	yes
3	55	services	married	secondary	no	2476	yes	no	unknown	5	may	579	1	-1	0	unknown	yes
4	54	admin.	married	tertiary	no	184	no	no	unknown	5	may	673	2	-1	0	unknown	yes

[6]:

	age	job	marital	education	default	balance	housing	loan	contact	day	month	duration	campaign	pdays	previous	poutcome	deposit
0	59	admin.	married	secondary	no	2343	yes	no	unknown	5	may	1042	1	-1	0	unknown	yes
1	56	admin.	married	secondary	no	45	no	no	unknown	5	may	1467	1	-1	0	unknown	yes
2	41	technician	married	secondary	no	1270	yes	no	unknown	5	may	1389	1	-1	0	unknown	yes
3	55	services	married	secondary	no	2476	yes	no	unknown	5	may	579	1	-1	0	unknown	yes
4	54	admin.	married	tertiary	no	184	no	no	unknown	5	may	673	2	-1	0	unknown	yes



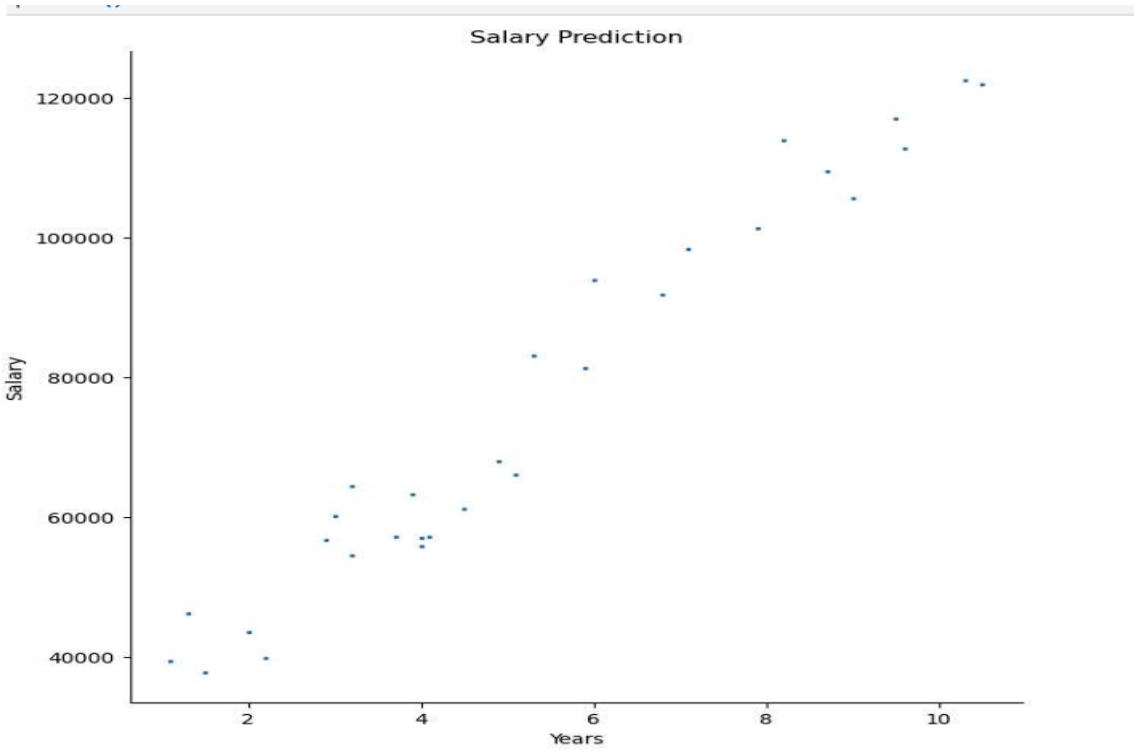
7 output

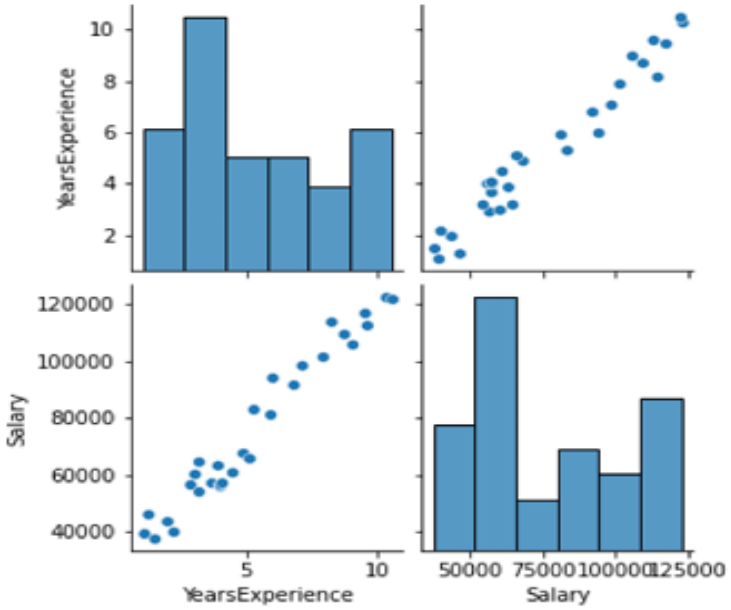
```
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)  \
0                5.1               3.5                1.4               0.2
1                4.9               3.0                1.4               0.2
2                4.7               3.2                1.3               0.2
3                4.6               3.1                1.5               0.2
4                5.0               3.6                1.4               0.2

   target
0       0
1       0
2       0
3       0
4       0
Confusion Matrix:
[[10  0  0]
 [ 0  9  0]
 [ 0  0 11]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30

Predicted class for the new data: ['setosa']
```

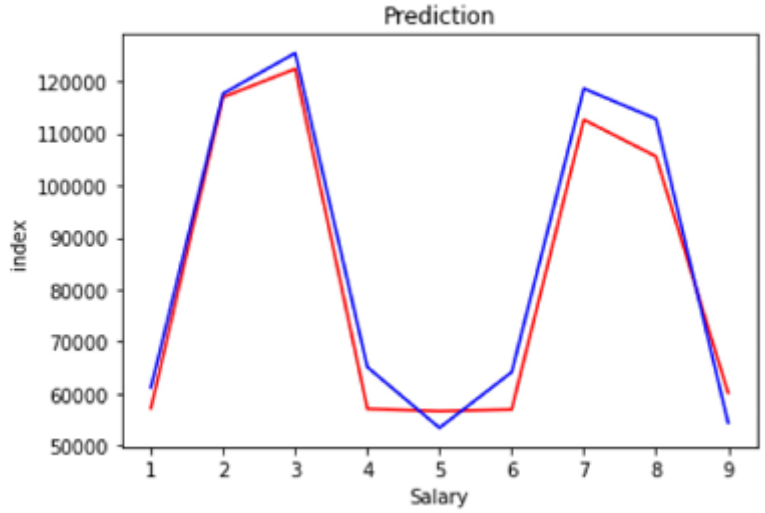
8 output

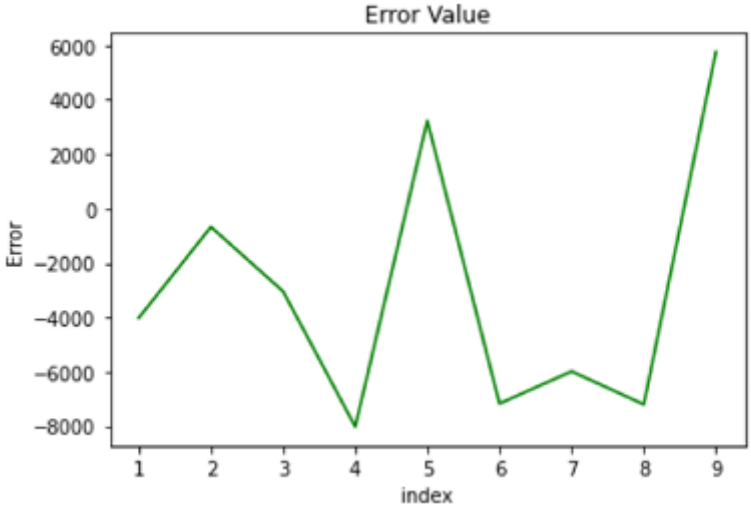
```
array([['Sunny', 'Hot', 'High', 'Weak', 'No'],
       ['Sunny', 'Hot', 'High', 'Strong', 'No'],
       ['Overcast', 'Hot', 'High', 'Weak', 'Yes'],
       ['Rain', 'Mild', 'High', 'Weak', 'Yes'],
       ['Rain', 'Cool', 'Normal', 'Weak', 'Yes'],
       ['Rain', 'Cool', 'Normal', 'Strong', 'No'],
       ['Overcast', 'Cool', 'Normal', 'Strong', 'Yes'],
       ['Sunny', 'Mild', 'High', 'Weak', 'No'],
       ['Sunny', 'Cool', 'Normal', 'Weak', 'Yes'],
       ['Rain', 'Mild', 'Normal', 'Weak', 'Yes'],
       ['Sunny', 'Mild', 'Normal', 'Strong', 'Yes'],
       ['Overcast', 'Mild', 'High', 'Strong', 'Yes'],
       ['Overcast', 'Hot', 'Normal', 'Weak', 'Yes'],
       ['Rain', 'Mild', 'High', 'Strong', 'No']], dtype=object)
```

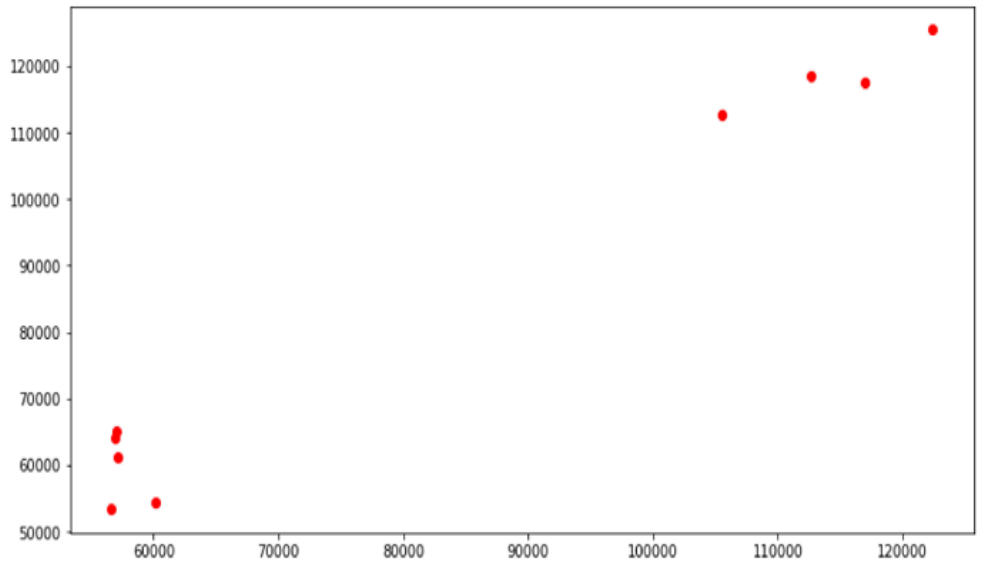
9th outputs




YearsExperience
Salary
YearsExperience
Salary


Prediction
index
Salary


Error Value
Error
index



10th outputs

Out[2]:

	SNo	X_1	X_2	y
0	0	-0.869144	0.389310	0.0
1	1	-0.993467	-0.610591	0.0
2	2	-0.834064	0.239236	0.0
3	3	-0.136471	0.632003	1.0
4	4	0.403887	0.310784	1.0
5	5	-0.569309	-0.246681	0.0
6	6	-0.109982	0.930917	1.0
7	7	0.288994	-0.532689	1.0
8	8	0.319782	0.664582	1.0
9	9	0.558686	-0.621185	1.0

Out[5]:

	SNo	X_1	X_2	y
0	0	-0.869144	0.389310	0.0
1	1	-0.993467	-0.610591	0.0
2	2	-0.834064	0.239236	0.0
3	3	-0.136471	0.632003	1.0
4	4	0.403887	0.310784	1.0
5	5	-0.569309	-0.246681	0.0
6	6	-0.109982	0.930917	1.0
7	7	0.288994	-0.532689	1.0
8	8	0.319782	0.664582	1.0
9	9	0.558686	-0.621185	1.0

11th outputs

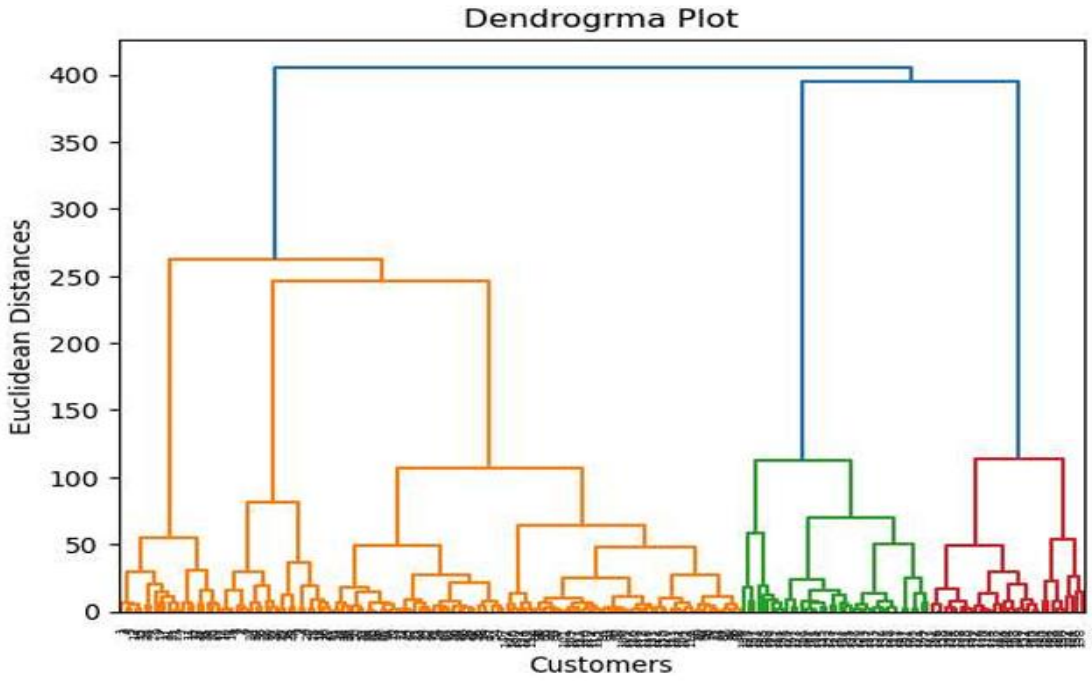
```
   sepal-length  sepal-width  petal-length  petal-width
0           5.1          3.5           1.4          0.2
1           4.9          3.0           1.4          0.2
2           4.7          3.2           1.3          0.2
3           4.6          3.1           1.5          0.2
4           5.0          3.6           1.4          0.2
```

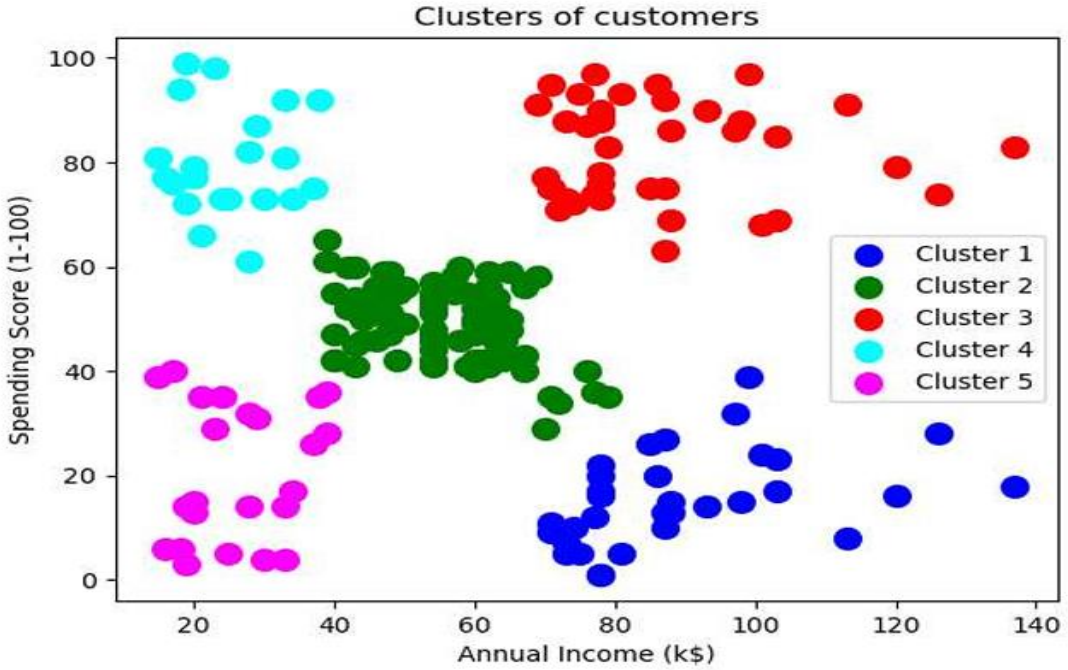
```
------------------------------------------------------------------------
Original Label            Predicted Label           Correct/Wrong
------------------------------------------------------------------------
Iris-virginica            Iris-virginica            Correct
Iris-versicolor           Iris-virginica            Wrong
Iris-virginica            Iris-virginica            Correct
Iris-setosa               Iris-setosa               Correct
Iris-virginica            Iris-virginica            Correct
Iris-versicolor           Iris-versicolor           Correct
Iris-setosa               Iris-setosa               Correct
Iris-versicolor           Iris-versicolor           Correct
Iris-versicolor           Iris-versicolor           Correct
Iris-versicolor           Iris-versicolor           Correct
Iris-setosa               Iris-setosa               Correct
Iris-virginica            Iris-virginica            Correct
Iris-setosa               Iris-setosa               Correct
Iris-virginica            Iris-virginica            Correct
Iris-setosa               Iris-setosa               Correct
------------------------------------------------------------------------

Confusion Matrix:
 [[5 0 0]
 [0 4 1]
 [0 0 5]]
------------------------------------------------------------------------

Classification Report:
                  precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00         5
Iris-versicolor       1.00      0.80      0.89         5
 Iris-virginica       0.83      1.00      0.91         5

       accuracy                           0.93        15
      macro avg       0.94      0.93      0.93        15
   weighted avg       0.94      0.93      0.93        15

------------------------------------------------------------------------
Accuracy of the classifer is 0.93
------------------------------------------------------------------------
```

12th outputs

Out[2]:

	CustomerID	Genre	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40
5	6	Female	22	17	76
6	7	Female	35	18	6
7	8	Female	23	18	94
8	9	Male	64	19	3
9	10	Female	30	19	72





13th outputs

Out[17]:

	status_id	status_type	status_published	num_reactions	num_comments	num_shares	num_likes	num_loves	num_wows	num_hahas	num_sads	num_angrys	Column1	Column2	Column3	Column4
0	1	video	4/22/2018 6:00	529	512	262	432	92	3	1	1	0	NaN	NaN	NaN	NaN
1	2	photo	4/21/2018 22:45	150	0	0	150	0	0	0	0	0	NaN	NaN	NaN	NaN
2	3	video	4/21/2018 6:17	227	236	57	204	21	1	1	0	0	NaN	NaN	NaN	NaN
3	4	photo	4/21/2018 2:29	111	0	0	111	0	0	0	0	0	NaN	NaN	NaN	NaN
4	5	photo	4/18/2018 3:22	213	0	0	204	9	0	0	0	0	NaN	NaN	NaN	NaN

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7050 entries, 0 to 7049
Data columns (total 16 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   status_id         7050 non-null   int64  
 1   status_type       7050 non-null   object 
 2   status_published  7050 non-null   object 
 3   num_reactions     7050 non-null   int64  
 4   num_comments      7050 non-null   int64  
 5   num_shares        7050 non-null   int64  
 6   num_likes         7050 non-null   int64  
 7   num_loves         7050 non-null   int64  
 8   num_wows          7050 non-null   int64  
 9   num_hahas         7050 non-null   int64  
 10  num_sads          7050 non-null   int64  
 11  num_angrys        7050 non-null   int64  
 12  Column1           0 non-null      float64
 13  Column2           0 non-null      float64
 14  Column3           0 non-null      float64
 15  Column4           0 non-null      float64
dtypes: float64(4), int64(10), object(2)
memory usage: 881.4+ KB
```

```
status_id              0
status_type            0
status_published       0
num_reactions          0
num_comments           0
num_shares             0
num_likes              0
num_loves              0
num_wows               0
num_hahas              0
num_sads               0
num_angrys             0
Column1             7050
Column2             7050
Column3             7050
Column4             7050
dtype: int64
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7050 entries, 0 to 7049
Data columns (total 12 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   status_id         7050 non-null   int64 
 1   status_type       7050 non-null   object
 2   status_published  7050 non-null   object
 3   num_reactions     7050 non-null   int64 
 4   num_comments      7050 non-null   int64 
 5   num_shares        7050 non-null   int64 
 6   num_likes         7050 non-null   int64 
 7   num_loves         7050 non-null   int64 
 8   num_wows          7050 non-null   int64 
 9   num_hahas         7050 non-null   int64 
 10  num_sads          7050 non-null   int64 
 11  num_angrys        7050 non-null   int64 
dtypes: int64(10), object(2)
memory usage: 661.1+ KB
```

[34]:

	status_id	num_reactions	num_comments	num_shares	num_likes	num_loves	num_wows	num_hahas	num_sads	num_angrys
count	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000	7050.000000
mean	3525.500000	230.117163	224.356028	40.022553	215.043121	12.728652	1.289362	0.696454	0.243688	0.113191
std	2035.304031	462.625309	889.636820	131.599965	449.472357	39.972930	8.719650	3.957183	1.597156	0.726812
min	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	1763.250000	17.000000	0.000000	0.000000	17.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50%	3525.500000	59.500000	4.000000	0.000000	58.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75%	5287.750000	219.000000	23.000000	4.000000	184.750000	3.000000	0.000000	0.000000	0.000000	0.000000
max	7050.000000	4710.000000	20990.000000	3424.000000	4710.000000	657.000000	278.000000	157.000000	51.000000	31.000000

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7050 entries, 0 to 7049
Data columns (total 10 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   status_type    7050 non-null   int32
 1   num_reactions  7050 non-null   int64
 2   num_comments   7050 non-null   int64
 3   num_shares     7050 non-null   int64
 4   num_likes      7050 non-null   int64
 5   num_loves      7050 non-null   int64
 6   num_wows       7050 non-null   int64
 7   num_hahas      7050 non-null   int64
 8   num_sads       7050 non-null   int64
 9   num_angrys     7050 non-null   int64
dtypes: int32(1), int64(9)
memory usage: 523.4 KB
```

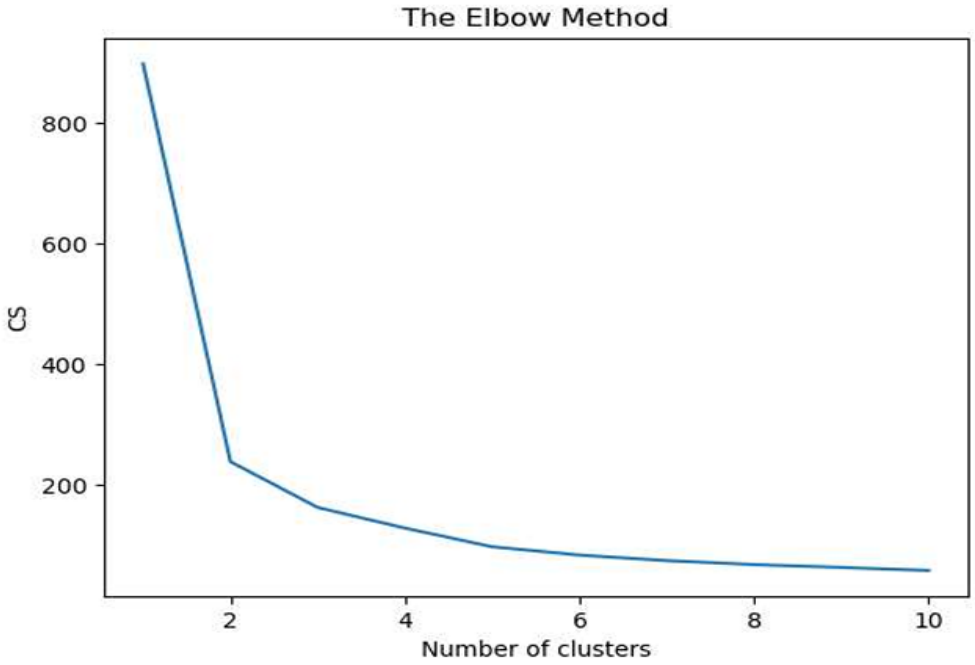
75]:

	status_type	num_reactions	num_comments	num_shares	num_likes	num_loves	num_wows	num_hahas	num_sads	num_angrys
0	3	529	512	262	432	92	3	1	1	0
1	1	150	0	0	150	0	0	0	0	0
2	3	227	236	57	204	21	1	1	0	0
3	1	111	0	0	111	0	0	0	0	0
4	1	213	0	0	204	9	0	0	0	0

84]:

	status_type	num_reactions	num_comments	num_shares	num_likes	num_loves	num_wows	num_hahas	num_sads	num_angrys
0	1.000000	0.112314	0.024393	0.076519	0.091720	0.140030	0.010791	0.006369	0.019608	0.0
1	0.333333	0.031847	0.000000	0.000000	0.031847	0.000000	0.000000	0.000000	0.000000	0.0
2	1.000000	0.048195	0.011243	0.016647	0.043312	0.031963	0.003597	0.006369	0.000000	0.0
3	0.333333	0.023567	0.000000	0.000000	0.023567	0.000000	0.000000	0.000000	0.000000	0.0
4	0.333333	0.045223	0.000000	0.000000	0.043312	0.013699	0.000000	0.000000	0.000000	0.0

```
array([[9.54921576e-01, 6.46330441e-02, 2.67028654e-02, 2.93171709e-02,
        5.71231462e-02, 4.71007076e-02, 8.18581889e-03, 9.65207685e-03,
        8.04219428e-03, 7.19501847e-03],
       [3.28506857e-01, 3.90710874e-02, 7.54854864e-04, 7.53667113e-04,
        3.85438884e-02, 2.17448568e-03, 2.43721364e-03, 1.20039760e-03,
        2.75348016e-03, 1.45313276e-03]])
```


The Elbow Method
800
600
400
200
CS
2
4
6
8
10
Number of clusters