In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
crime_data = pd.read_csv('cyber_crime.csv')
```

In [3]:

```
crime_data.head()
```

Out[3]:

	S. No	Category	State/UT	2016	2017	2018	Percentage Share of State/UT (2018)	Mid-Year Projected Population (in Lakhs) (2018)+	Rate of Total Cyber Crimes (2018)++
0	1	State	Andhra Pradesh	616	931	1207	4.4	520.3	2.3
1	2	State	Arunachal Pradesh	4	1	7	0.0	14.9	0.5
2	3	State	Assam	696	1120	2022	7.4	340.4	5.9
3	4	State	Bihar	309	433	374	1.4	1183.3	0.3
4	5	State	Chhattisgarh	90	171	139	0.5	284.7	0.5

In [4]:

```
crime_data.tail()
```

Out[4]:

	S. No	Category	State/UT	2016	2017	2018	Percentage Share of State/UT (2018)	Mid-Year Projected Population (in Lakhs) (2018)+	Rate of Total Cyber Crimes (2018)++
34	34	Union Territory	Delhi UT	98	162	189	0.7	195.6	1.0
35	35	Union Territory	Lakshadweep	0	0	4	0.0	0.7	6.0
36	36	Union Territory	Puducherry	2	5	14	0.1	14.8	0.9
37	Union Territory	Union Territory	Total UT(s)	130	203	244	0.9	236.0	1.0
38	Total (All India)	Total (All India)	Total (All India)	12317	21796	27248	100.0	13233.8	2.1

In [5]:

```
crime_data.shape
```

Out[5]:

```
(39, 9)
```

In [6]:

```
crime_data.columns
```

Out[6]:

```
Index(['S. No', 'Category', 'State/UT', '2016', '2017', '2018',
       'Percentage Share of State/UT (2018)',
       'Mid-Year Projected Population (in Lakhs) (2018)+',
       'Rate of Total Cyber Crimes (2018)++'],
      dtype='object')
```

In [7]:

```
crime_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 39 entries, 0 to 38
Data columns (total 9 columns):
 #   Column                                          Non-Null Count  Dty
pe
---  ------                                          --------------  ---
--
 0   S. No                                           39 non-null     obj
ect
 1   Category                                        39 non-null     obj
ect
 2   State/UT                                        39 non-null     obj
ect
 3   2016                                            39 non-null     int
64
 4   2017                                            39 non-null     int
64
 5   2018                                            39 non-null     int
64
 6   Percentage Share of State/UT (2018)             39 non-null     flo
at64
 7   Mid-Year Projected Population (in Lakhs) (2018)+  39 non-null     flo
at64
 8   Rate of Total Cyber Crimes (2018)++             39 non-null     flo
at64
dtypes: float64(3), int64(3), object(3)
memory usage: 2.9+ KB
```

In [8]:

```
crime_data.describe()
```

Out[8]:

	2016	2017	2018	Percentage Share of State/UT (2018)	Mid-Year Projected Population (in Lakhs) (2018)+	Rate of Total Cyber Crimes (2018)++
count	39.000000	39.000000	39.000000	39.000000	39.000000	39.000000
mean	947.461538	1676.615385	2096.000000	7.689744	1017.987179	1.689744
std	2724.974532	4832.658115	6065.161416	22.257391	2885.991893	1.811193
min	0.000000	0.000000	0.000000	0.000000	0.700000	0.000000
25%	9.500000	11.500000	24.500000	0.100000	18.300000	0.500000
50%	102.000000	176.000000	239.000000	0.900000	284.000000	1.000000
75%	439.500000	772.000000	886.500000	3.250000	663.850000	2.200000
max	12317.000000	21796.000000	27248.000000	100.000000	13233.800000	8.900000

In [9]:

```
crime_data.isnull().sum()
```

Out[9]:

```
S. No                                             0
Category                                          0
State/UT                                          0
2016                                              0
2017                                              0
2018                                              0
Percentage Share of State/UT (2018)               0
Mid-Year Projected Population (in Lakhs) (2018)+  0
Rate of Total Cyber Crimes (2018)++               0
dtype: int64
```

In [10]:

```
crime_data.nunique()
```

Out[10]:

```
S. No                                             39
Category                                           3
State/UT                                          39
2016                                              34
2017                                              35
2018                                              36
Percentage Share of State/UT (2018)               23
Mid-Year Projected Population (in Lakhs) (2018)+  38
Rate of Total Cyber Crimes (2018)++               23
dtype: int64
```

In [11]:

```
crime_data['Category'].unique()
```

Out[11]:

```
array(['State', 'Union Territory', 'Total (All India)'], dtype=object)
```

In [12]:

```
crime_data['Category'].value_counts()
```

Out[12]:

```
State                30
Union Territory       8
Total (All India)     1
Name: Category, dtype: int64
```

In [13]:

```
crime_data.corr()
```

Out[13]:

	2016	2017	2018	Percentage Share of State/UT (2018)	Mid-Year Projected Population (in Lakhs) (2018)+	Rate of Total Cyber Crimes (2018)++
2016	1.00000	0.998590	0.993830	0.993860	0.992970	0.136820
2017	0.99859	1.000000	0.998014	0.998030	0.991394	0.164416
2018	0.99383	0.998014	1.000000	0.999999	0.986735	0.200750
Percentage Share of State/UT (2018)	0.99386	0.998030	0.999999	1.000000	0.986789	0.200419
Mid-Year Projected Population (in Lakhs) (2018)+	0.99297	0.991394	0.986735	0.986789	1.000000	0.077051
Rate of Total Cyber Crimes (2018)++	0.13682	0.164416	0.200750	0.200419	0.077051	1.000000

In [14]:

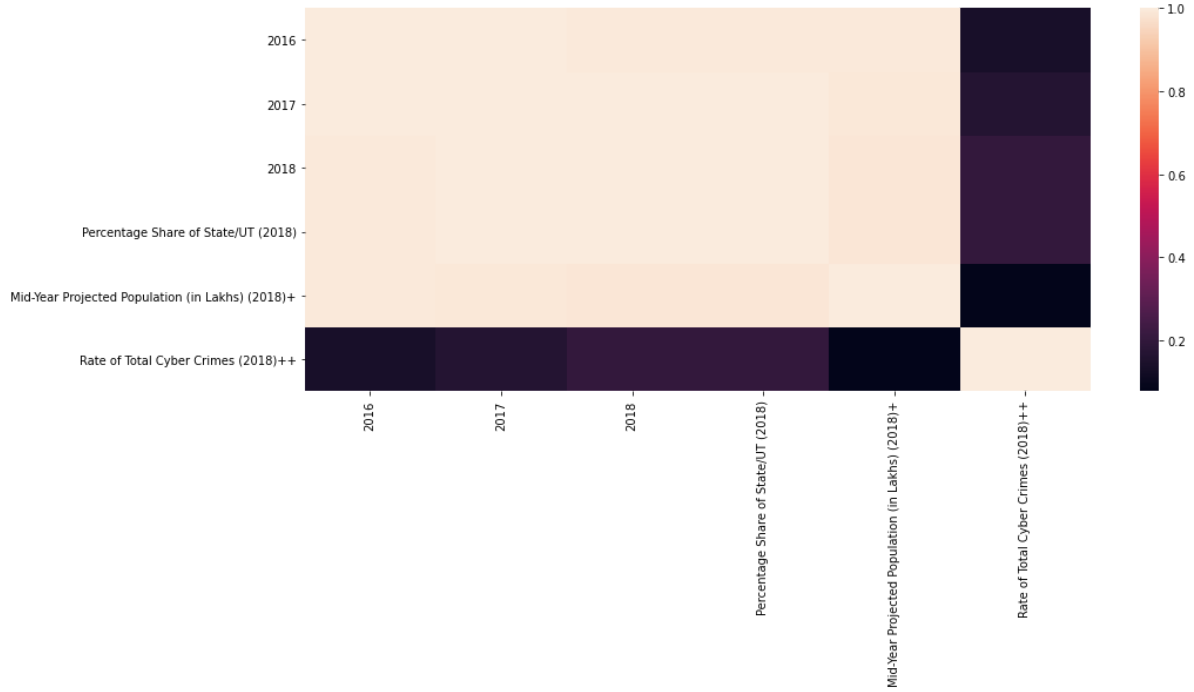
```
crime_data.corr().style.background_gradient(cmap = 'coolwarm')
```

Out[14]:

	2016	2017	2018	Percentage Share of State/UT (2018)	Mid-Year Projected Population (in Lakhs) (2018)+	Rate of Total Cyber Crimes (2018)++
2016	1.000000	0.998590	0.993830	0.993860	0.992970	0.136820
2017	0.998590	1.000000	0.998014	0.998030	0.991394	0.164416
2018	0.993830	0.998014	1.000000	0.999999	0.986735	0.200750
Percentage Share of State/UT (2018)	0.993860	0.998030	0.999999	1.000000	0.986789	0.200419
Mid-Year Projected Population (in Lakhs) (2018)+	0.992970	0.991394	0.986735	0.986789	1.000000	0.077051
Rate of Total Cyber Crimes (2018)++	0.136820	0.164416	0.200750	0.200419	0.077051	1.000000

In [15]:

```
plt.figure(figsize=(15,6))
sns.heatmap(crime_data.corr())
plt.show()
```



In [36]:

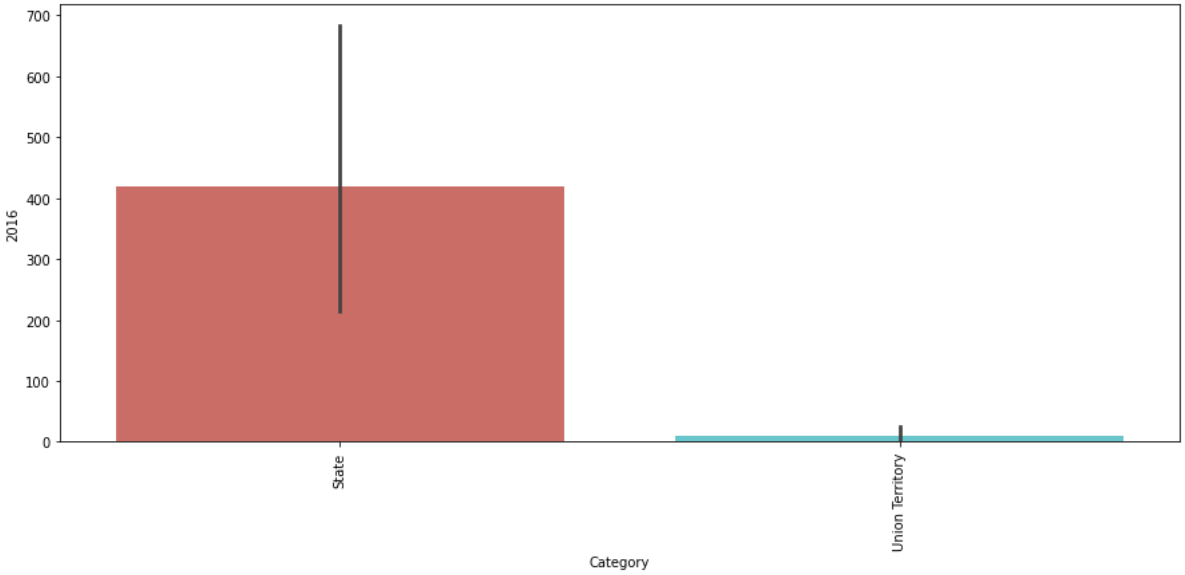
```
crime_data = crime_data.drop(labels=[29], axis=0)
```

In [38]:

```
crime_data = crime_data.drop(labels=[33, 34], axis=0)
```

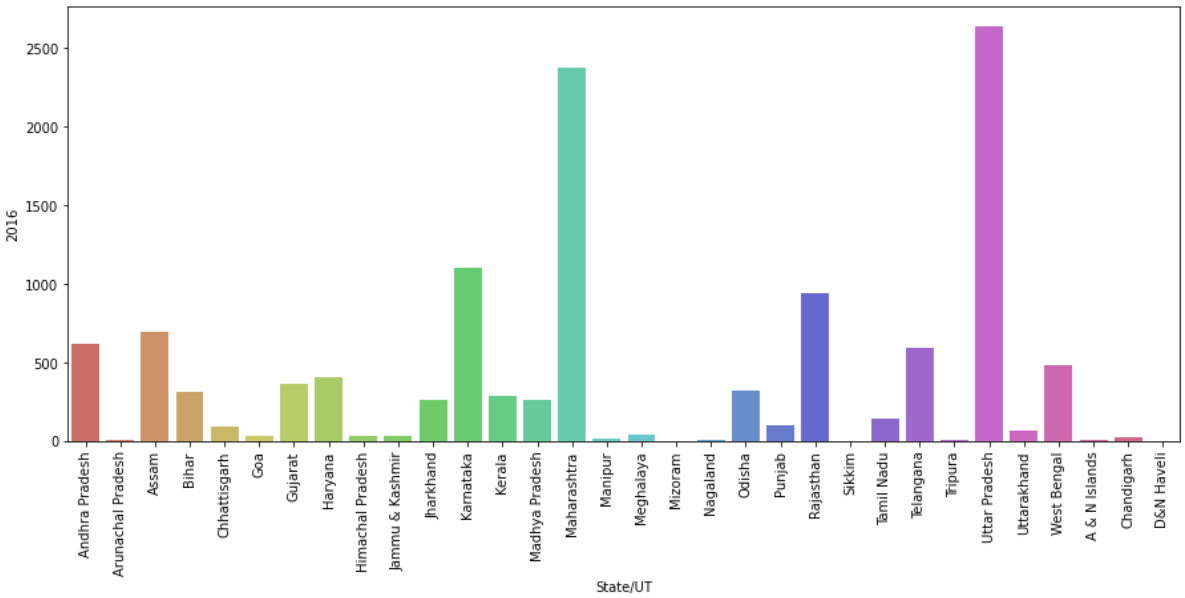
In [39]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = '2016', data = crime_data, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



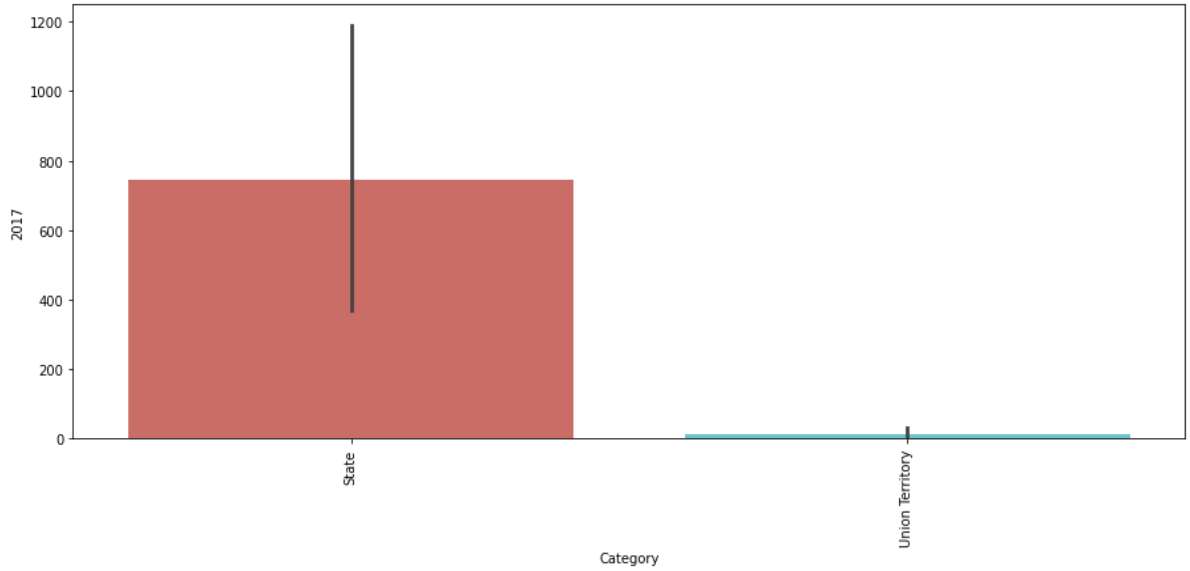
In [42]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = '2016', data = crime_data,palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



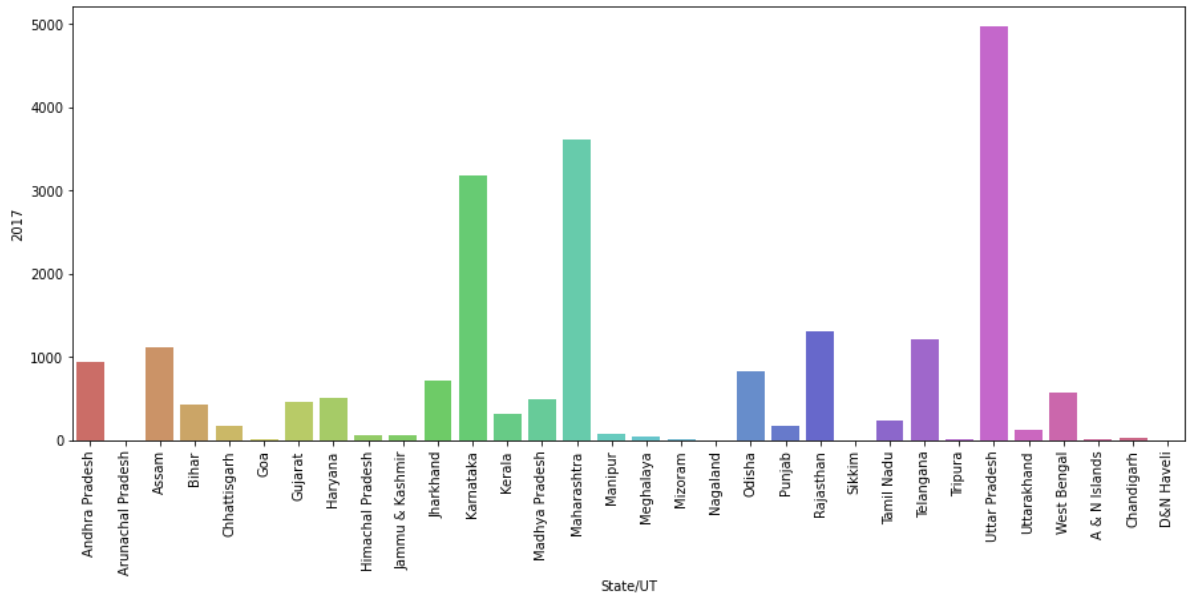
In [43]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = '2017', data = crime_data, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



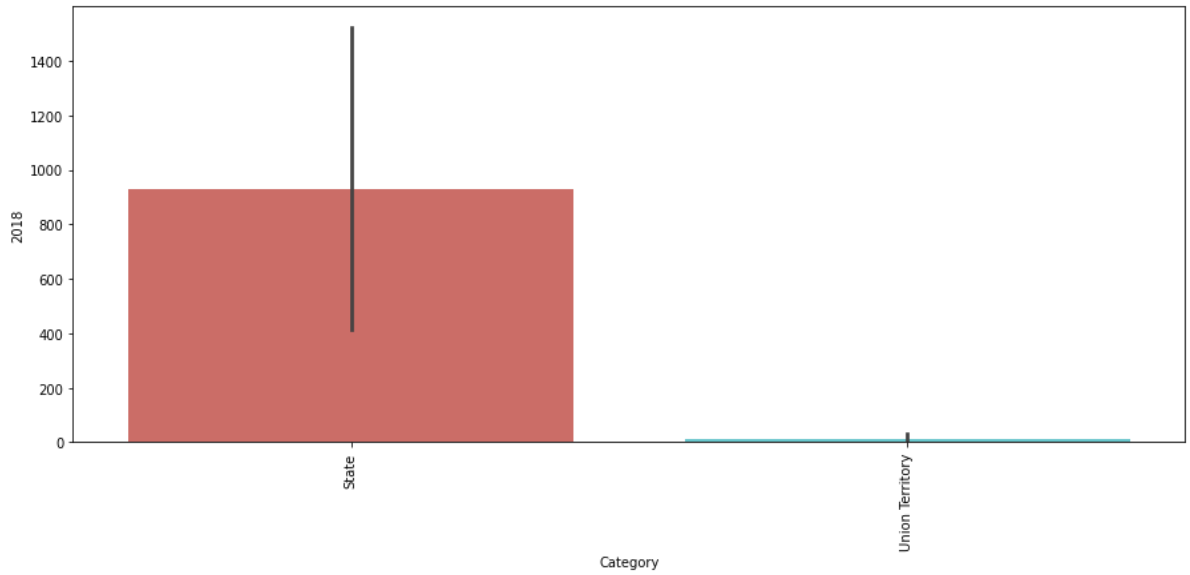
In [44]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = '2017', data = crime_data,palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



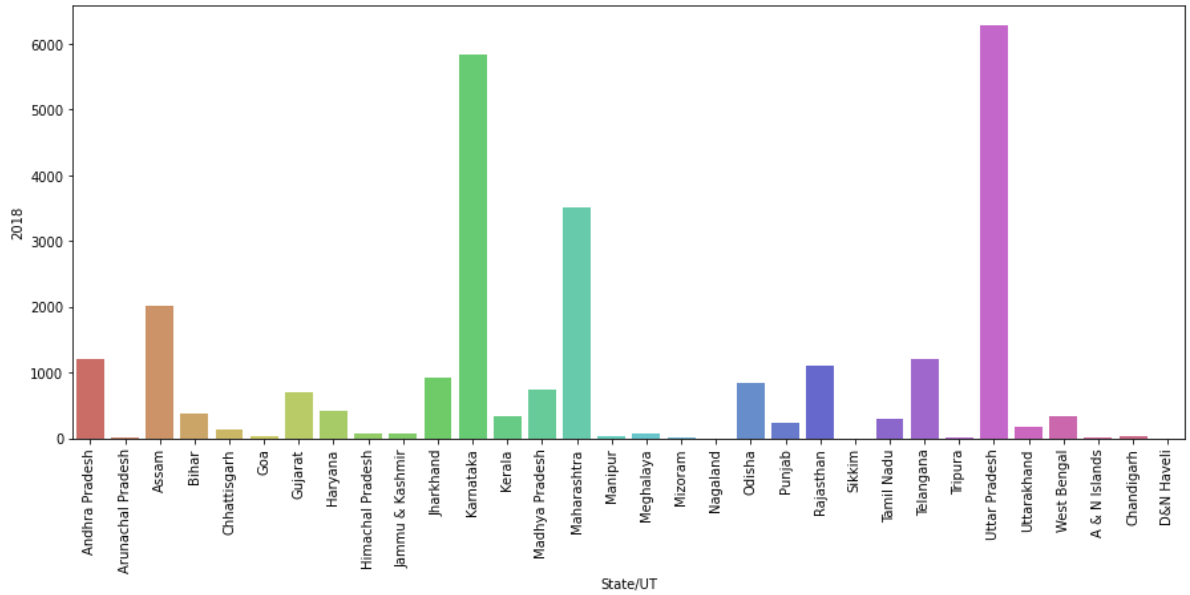
In [45]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = '2018', data = crime_data, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [46]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = '2018', data = crime_data,palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [47]:

```
olumns = {'Percentage Share of State/UT (2018)':'Percentage_share',
          'Mid-Year Projected Population (in Lakhs) (2018)+':'Projected_population',
         'Rate of Total Cyber Crimes (2018)++': 'Rate_cyber_crime_2018'}, inplace = True)
```

In [48]:

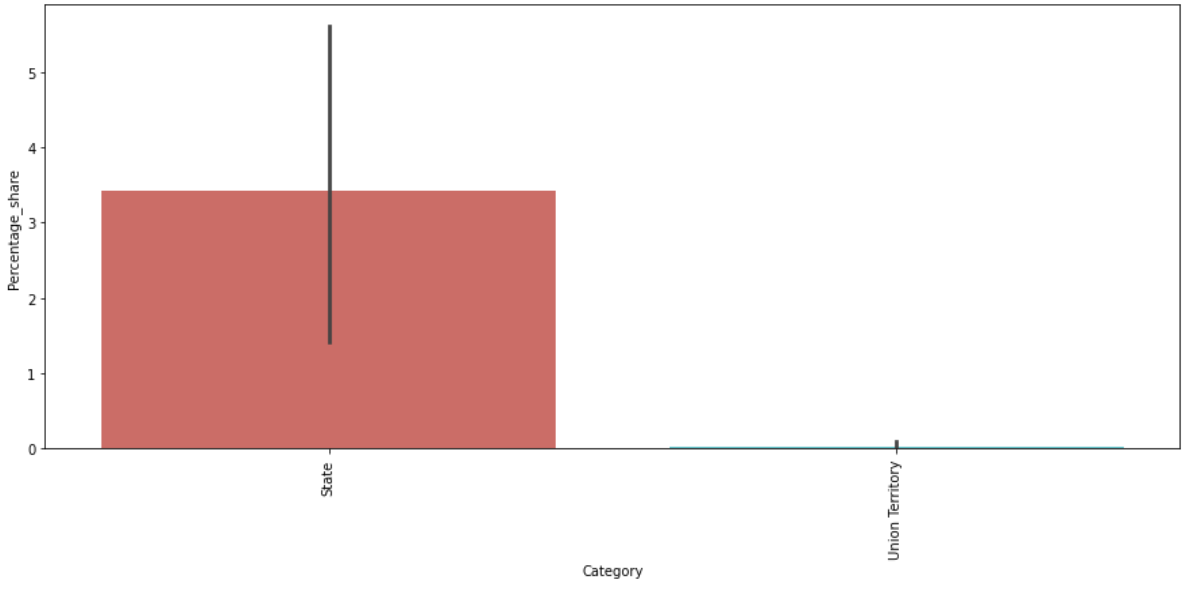
```
crime_data.head()
```

Out[48]:

State/UT	2016	2017	2018	Percentage_share	Projected_population	Rate_cyber_crime_2018
Andhra Pradesh	616	931	1207	4.4	520.3	2.3
Arunachal Pradesh	4	1	7	0.0	14.9	0.5
Assam	696	1120	2022	7.4	340.4	5.9
Bihar	309	433	374	1.4	1183.3	0.3
Chhattisgarh	90	171	139	0.5	284.7	0.5

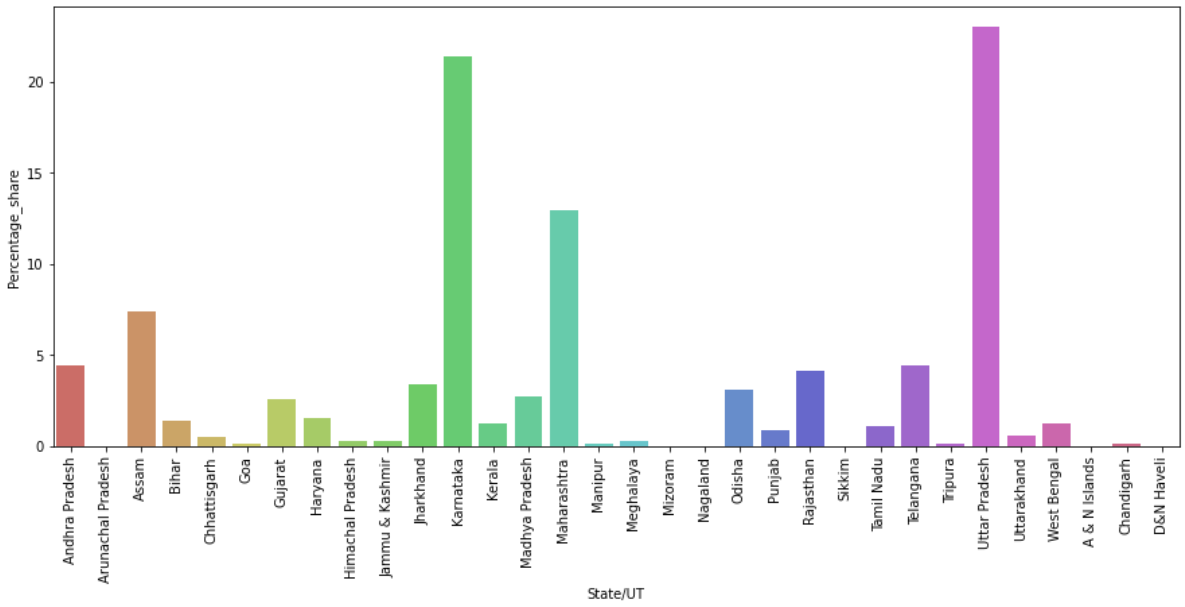
In [49]:

```
#percentage share for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = 'Percentage_share', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



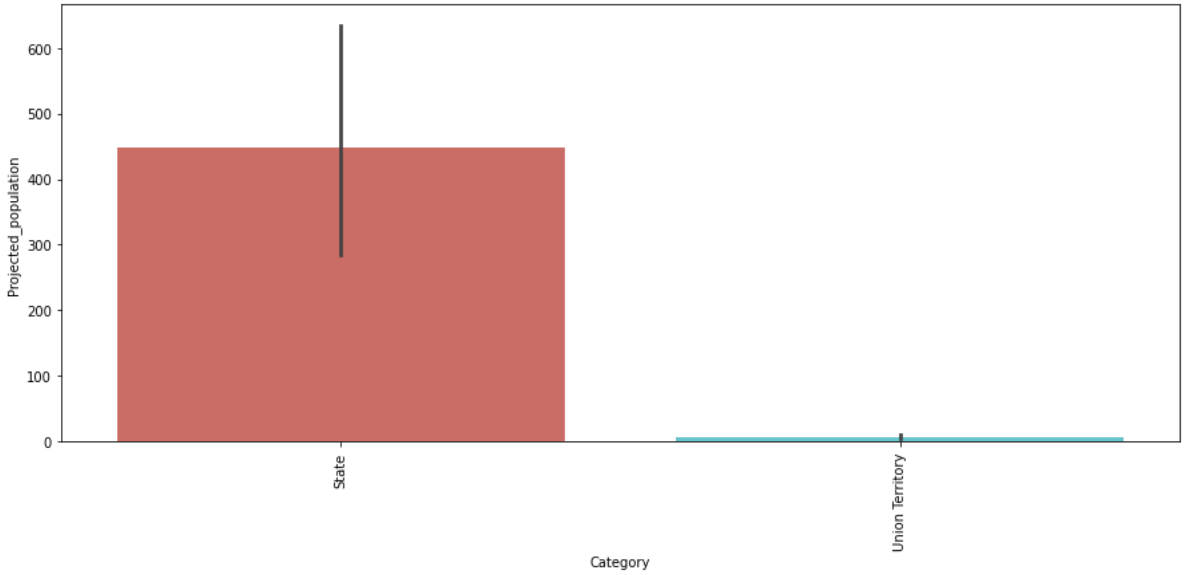
In [50]:

```
# percentage share for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = 'Percentage_share', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



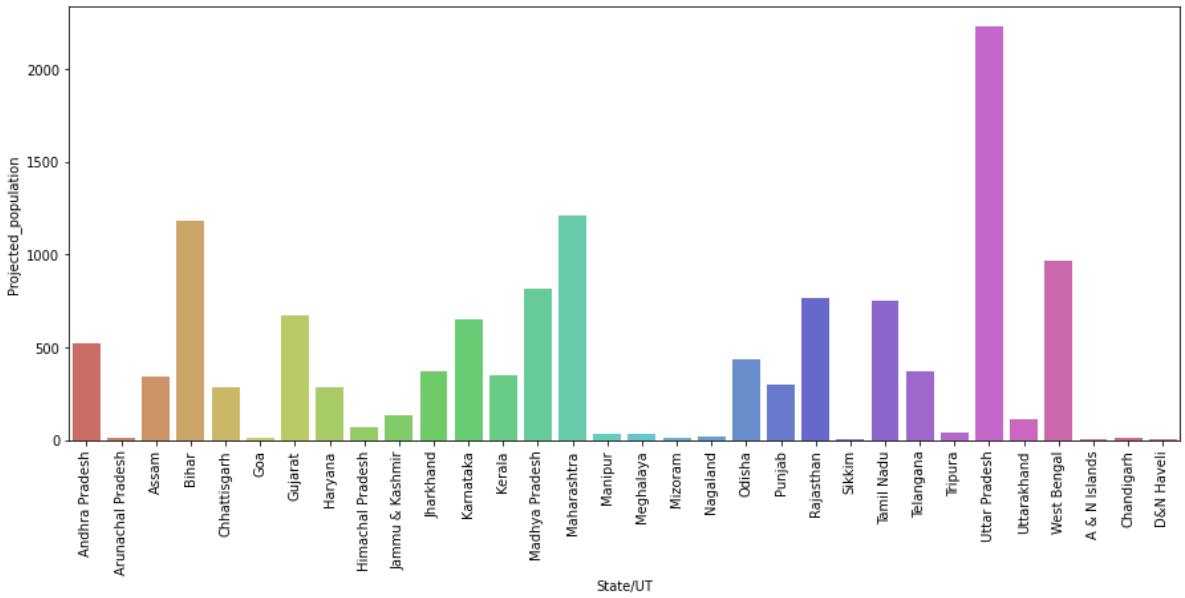
In [51]:

```
#projected population for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = 'Projected_population', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



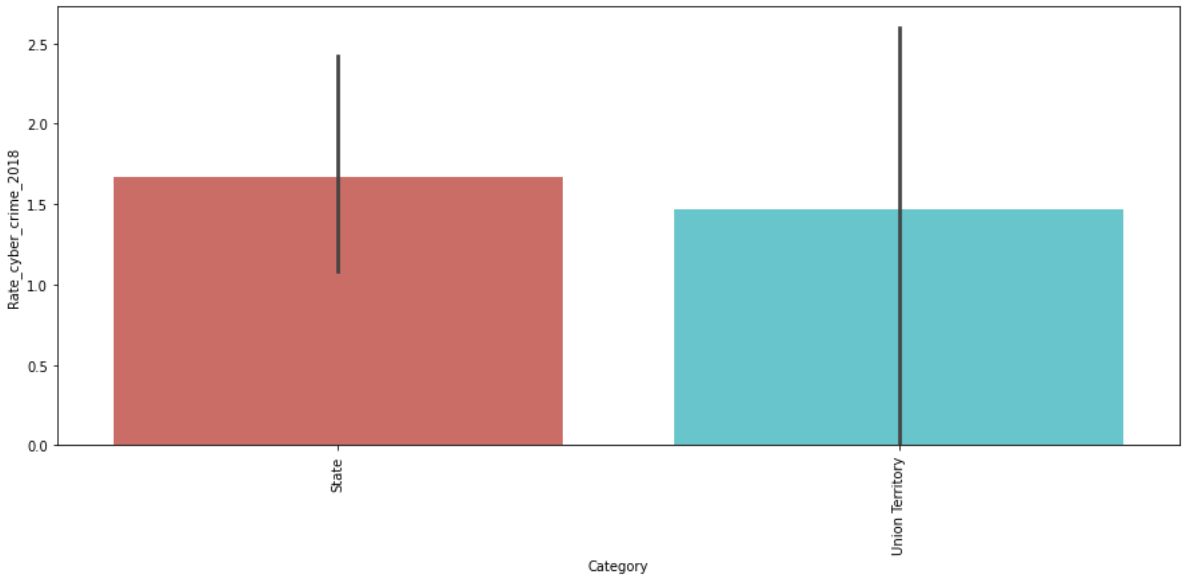
In [52]:

```
#projected population for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = 'Projected_population', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



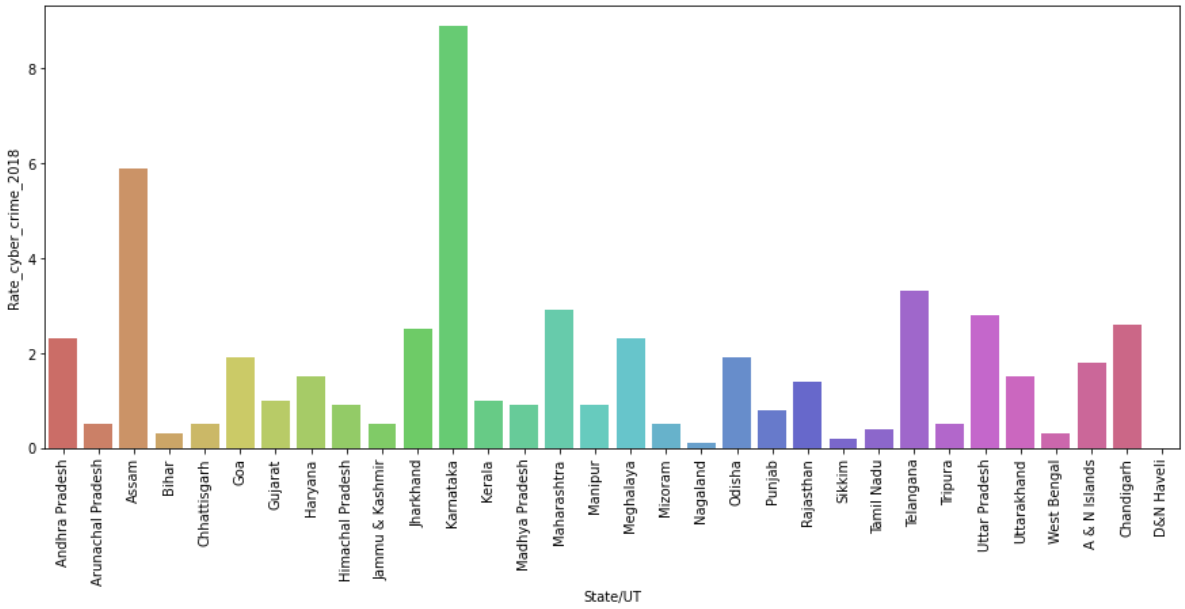
In [53]:

```
#rate cyber crime for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'Category', y = 'Rate_cyber_crime_2018', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [54]:

```
#rate cyber crime for 2018
plt.figure(figsize=(15,6))
sns.barplot(x = 'State/UT', y = 'Rate_cyber_crime_2018', data = crime_data,
            palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [55]:

```
crime_data['Total'] = crime_data['2016'] + crime_data['2017'] + crime_data['2018']
```

In [110]:

```
crime_data_new = crime_data[['2016', '2017', '2018']]
```

In [111]:

```
crime_data_new.head()
```

Out[111]:

	2016	2017	2018
0	616	931	1207
1	4	1	7
2	696	1120	2022
3	309	433	374
4	90	171	139

In [112]:

```
crime_data_new = crime_data_new.transpose()
```

In [113]:

```
crime_data_new.head()
```

Out[113]:

	0	1	2	3	4	5	6	7	8	9	...	22	23	24	25	26	27	28
2016	616	4	696	309	90	31	362	401	31	28	...	1	144	593	8	2639	62	478
2017	931	1	1120	433	171	13	458	504	56	63	...	1	228	1209	7	4971	124	568
2018	1207	7	2022	374	139	29	702	418	69	73	...	1	295	1205	20	6280	171	335

3 rows × 32 columns

In [114]:

```
crime_data_new = crime_data_new.reset_index()
```

In [115]:

```
crime_data_new = crime_data_new.rename(columns = {'index':'year'})
```

In [117]:

```
crime_data_new.columns
```

Out[117]:

```
Index(['year',      0,      1,      2,      3,      4,      5,      6,
7,
            8,      9,     10,     11,     12,     13,     14,     15,
16,
           17,     18,     19,     20,     21,     22,     23,     24,
25,
           26,     27,     28,     30,     31,     32],
      dtype='object')
```

In [118]:

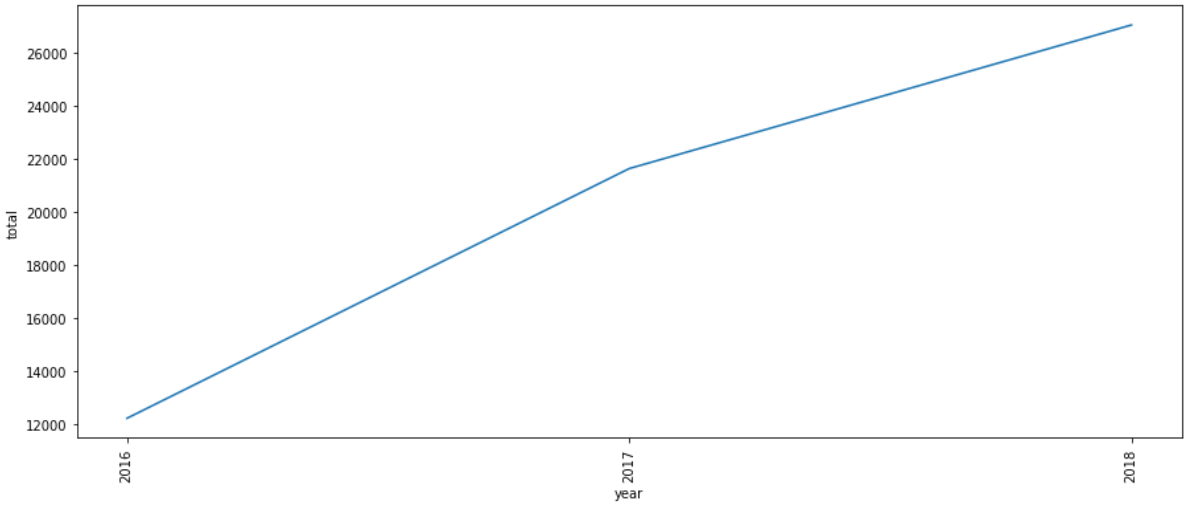
```
cols = [0,  1,      2,      3,      4,      5,      6,     7,  8,   9,
        10,     11,     12,     13,     14,     15,     16,  17,     18,
        19,     20,     21,     22,     23,     24,     25,
           26,     27,     28,     30,     31,     32]
```

In [119]:

```
crime_data_new['total'] = crime_data_new[cols].sum(axis=1)
```

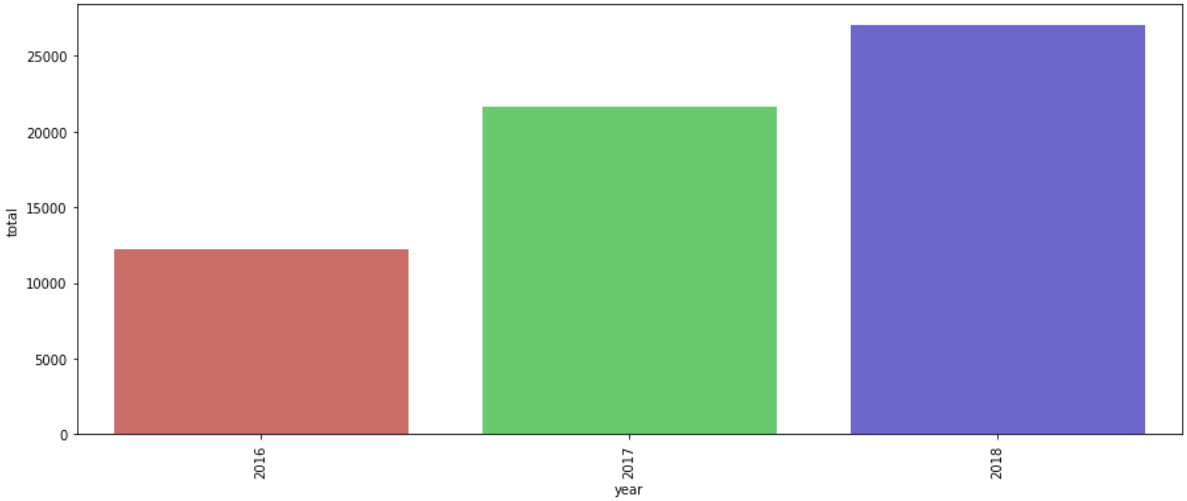
In [123]:

```
plt.figure(figsize=(15,6))
sns.lineplot(x = 'year', y = 'total', data = crime_data_new,
             palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [124]:

```
plt.figure(figsize=(15,6))
sns.barplot(x = 'year', y = 'total', data = crime_data_new,
             palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [125]:

```
crime_data.columns
```

Out[125]:

```
Index(['S. No', 'Category', 'State/UT', '2016', '2017', '2018',
       'Percentage_share', 'Projected_population', 'Rate_cyber_crime_201
8',
       'Total'],
      dtype='object')
```

In [126]:

```
x = crime_data.drop(['S. No', 'Category', 'State/UT','Percentage_share',
                     'Projected_population', 'Rate_cyber_crime_2018',
                     'Total'], axis = 1)
y = crime_data['Total']
```

In [127]:

```
x.shape
```

Out[127]:

```
(32, 3)
```

In [128]:

```
y.shape
```

Out[128]:

```
(32,)
```

In [148]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size = 0.2)
```

In [145]:

```
from sklearn.tree import DecisionTreeRegressor
```

In [149]:

```
regressor = DecisionTreeRegressor(max_depth=6)
regressor.fit(X_train, y_train)
```

Out[149]:

```
DecisionTreeRegressor(max_depth=6)
```

In [150]:

```
print("Training Accuracy :", regressor.score(X_train, y_train))
print("Testing Accuracy :", regressor.score(X_test, y_test))
```

```
Training Accuracy : 0.9999918891849268
Testing Accuracy : 0.9392823987099106
```

In [151]:

```
from sklearn.ensemble import RandomForestRegressor
```

In [152]:

```
rf_regressor = RandomForestRegressor(n_estimators = 100, random_state = 0)
rf_regressor.fit(X_train, y_train)
```

Out[152]:

```
RandomForestRegressor(random_state=0)
```

In [153]:

```
print("Training Accuracy :", rf_regressor.score(X_train, y_train))
print("Testing Accuracy :", rf_regressor.score(X_test, y_test))
```

```
Training Accuracy : 0.9816148535801777
Testing Accuracy : 0.8879297307015475
```