CRIME RATE ANALYSIS IN INDIA BY LOCATION (2011-2016)

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1. INTRODUCTION

1.1 Problem description and discussion of background

India is a diverse and rapidly growing nation. Crime in India is very common and happens in many ways. Along with violent crimes (like homicide, robbery and assault), and property crime (like burglary, theft and motor vehicle theft), there are major problems with organized crime, the illegal drug trade, arms trafficking, corruption and many other forms of crime.

Location has a significant impact on crime in India. Different places in India have different amount and type of crime. So, crime rate analysis is of great importance. In general, the uses of existing crime data include operational and resource allocation decisions by law enforcement, local and state government agencies, and businesses and other groups. Crime data are also a critical source of information for program and policy evaluations by researchers in government, academia, and the public and private sectors. They are also used by advocates of particular issues and by the public, and are often seen as measures of accountability. For some of these purposes, existing crime data appear to be adequate, though users often noted many ways that the available data could be improved.

We tried to analyze the crime rate in India over the last seven years. We analyzed this rate by location i.e. states in India.

1.2 Description of data

We have used web scrapping to collect data from different web pages for analyzing crime rate by location. The data used is described below.

a. Table of crime rate in year 2011 and 2012 is available in [1].

State/UT	2011	2012
India		2.8
Bihar	3.3	3.2
Arunachal Pradesh	4.7	5.8
Assam	4.2	4.4
Andhra Pradesh	3.1	3.6
Chhattisgarh	4.3	4.0
Goa	3.3	2.5
Gujarat	1.9	1.9
Haryana	4.2	3.8
Himachal Pradesh	1.9	1.6
Jammu & Kashmir	1.3	1.0
Jharkhand	5.3	5.3
Karnataka	3.0	3.1
Kerala	1.1	1.1
Madhya Pradesh	3.5	3.2
Maharashtra	2.5	2.4
Manipur	2.9	3.3
Meghalaya	2.9	5.1
Mizoram	2.4	2.9
Nagaland	2.3	3.3
Odisha	3.5	3.8
Punjab	3.0	3.0
Rajasthan	2.1	2.1
Sikkim	2.3	1.1
Tamil Nadu	2.6	2.9
Tripura	4.4	3.4
Uttar Pradesh	7.5	7.4
Uttarakhand	1.8	2.1
West Bengal	2.3	2.5
Delhi	10	5

b. Table of crime rate in year 2013 is available in [3].

TABLE-1.6
Incidence & Rate of Total Cognizable Crimes (IPC) In States, UTs & Cities During 2013

Sl. No.	State/UT	Incidence of Total Cognizable Crimes	Percentage Contribution to All-India Total	Mid-Year Projected Population (In Lakh)**	Rate of Total Cognizable Crimes
(1)	(2)	(3)	(4)	(5)	(6)
STATES:					
1	ANDHRA PRADESH	218015	8.2	864.76	252.1
2	ARUNACHAL PRADESH	2776	0.1	12.74	217.9
3	ASSAM	87186	3.3	314.45	277.3
4	BIHAR	167455	6.3	1007.15	166.3
5	CHHATTISGARH	56870	2.1	250.18	227.3
6	GOA	4312	0.2	18.85	228.8
7	GUJARAT	157435	5.9	608.28	258.8
8	HARYANA	72098	2.7	264.05	273.0
9	HIMACHAL PRADESH	13750	0.5	69.39	198.2
10	JAMMU & KASHMIR	25390	1.0	120.59	210.5
11	JHARKHAND	48208	1.8	324.79	148.4
12	KARNATAKA	136689	5.2	608.24	224.7
13	KERALA	176334	6.7	351.11	502.2
14	MADHYA PRADESH	227453	8.6	748.65	303.8
15	MAHARASHTRA	234385	8.9	1162.06	201.7
16	MANIPUR	3178	0.1	25.16	126.3
17	MEGHALAYA	3259	0.1	26.92	121.1
18	MIZORAM	1709	0.1	10.32	165.6
19	NAGALAND	1216	0.0	23.10	52.6
20	ODISHA	71718	2.7	415.69	172.5
21	PUNJAB	36667	1.4	283.79	129.2
22	RAJASTHAN	196224	7.4	702.93	279.2
23	SIKKIM	851	0.0	6.29	135.3
24	TAMIL NADU	203579	7.7	683.99	297.6
25	TRIPURA	6210	0.2	37.14	167.2
26	UTTAR PRADESH	226445	8.6	2089.15	108.4
27	UTTARAKHAND	9546	0.4	102.71	92.9
28	WEST BENGAL	169535	6.4	913.92	185.5
	TOTAL (STATES)	**2558493**	**96.6**	**12046.40**	**212.4**
UNION TERRITORIES					
29	A & N ISLANDS	612	0.0	5.25	116.6
30	CHANDIGARH	4077	0.2	16.05	254.0
31	D & N HAVELI	314	0.0	3.92	80.1
32	DAMAN & DIU	246	0.0	2.97	82.8
33	DELHI	80184	3.0	197.14	406.7
34	LAKSHADWEEP	40	0.0	0.78	51.3
35	PUDUCHERRY	3756	0.1	15.34	244.9
	TOTAL (UTs)	**89229**	**3.4**	**241.45**	**369.6**

c. Table of crime rate in year 2014, 2015 and 2016 is available in [2].

| S.No	State/UT	2014	2015	2016	Percentage Share of State/UT (2016)[3]	Rank Based on Incidence / % share (2016)	Rate of Cognizable Crimes (2016)	Rank Based on Crime Rate (2016)
1	Andhra Pradesh	114604	110893	106774	3.6	13	206.4	15
2	Arunachal Pradesh	2843	2968	2534	0.1	29	192.3	17
3	Assam	94337	103616	102250	3.4	14	313.9	5
4	Bihar	177595	176973	164183	5.5	9	157.4	22
5	Chhattisgarh	58200	56692	55029	1.8	17	211.7	14
6	Goa	4466	3074	2692	0.1	28	135.6	25
7	Gujarat	131385	126935	147122	4.9	11	233.2	11
8	Haryana	79947	84466	88527	3.0	15	320.6	4
9	Himachal Pradesh	14160	14007	13386	0.4	21	188.1	20
10	Jammu and Kashmir	23848	23583	24501	0.8	20	196.6	16
11	Jharkhand	45335	45050	40710	1.4	18	120.4	30
12	Karnataka	137338	138847	148402	5.0	10	237.2	10
13	Kerala	206789	257074	260097	8.7	4	727.6	2
14	Madhya Pradesh	272423	268814	264418	8.9	2	337.9	3
15	Maharashtra	249834	275414	261714	8.8	3	217.1	13
16	Manipur	3641	3847	3170	0.1	26	121.9	28
17	Meghalaya	3679	4079	3366	0.1	25	120.9	29
18	Mizoram	2140	2228	2425	0.1	30	227.3	12
19	Nagaland	1157	1302	1376	0.0	31	57.6	34
20	Odisha	74569	83360	81460	2.7	16	191.3	18
21	Punjab	37162	37983	40007	1.3	19	137.0	24
22	Rajasthan	210418	198080	180398	6.1	6	246.2	8
23	Sikkim	1065	766	809	0.0	32	124.47	27
24	Tamil Nadu	193200	187558	179896	6.0	7	258.8	7
25	Telangana	106830	106282	108991	3.7	12	295.7	6
26	Tripura	5499	4692	3933	0.1	24	102.4	31
27	Uttar Pradesh	240475	241920	282171	9.5	1	128.7	26
28	Uttarakhand	9156	10248	10867	0.4	22	101.8	32
29	West Bengal	185672	179501	176569	5.9	8	188.2	19
30	Andaman and Nicobar Islands	746	862	802	0.0	33	144.8	23
31	Chandigarh	3221	3248	2996	0.1	27	166.4	21
32	Dadra and Nagar Haveli	277	289	244	0.0	35	57.4	35
33	Daman and Diu	233	302	271	0.0	34	81.1	33
34	Delhi	155654	191377	209519	7.0	5	974.9	1
35	Lakshwadeep	81	50	36	0.0	36	43.9	36
36	Puducherry	3584	3440	4086	0.1	23	242.8	9

d. These tables are separately available on different web pages. So, we create our own dataset by web scraping and merging these table.

|	State	2011	2012	2013	2014	2015	2016	mean	lat	lng
0	Andhra Pradesh	3.1	3.6	8.2	1.15	1.11	1.07	3.04	15.924091	80.186381
1	Arunachal Pradesh	4.7	5.8	0.1	0.03	0.03	0.03	1.78	28.364199	94.758627
2	Assam	4.2	4.4	3.3	0.94	1.04	1.02	2.48	26.407384	93.255130
3	Bihar	3.3	3.2	6.3	1.78	1.77	1.64	3.00	25.644085	85.906508
4	Chhattisgarh	4.3	4.0	2.1	0.58	0.57	0.55	2.02	21.663736	81.840635
5	Delhi	10.0	5.0	13.0	1.56	1.91	2.10	5.59	28.651718	77.221939
6	Goa	3.3	2.5	0.2	0.04	0.03	0.03	1.02	15.300454	74.085513
7	Gujarat	1.9	1.9	5.9	1.31	1.27	1.47	2.29	22.413424	71.498674
8	Haryana	4.2	3.8	2.7	0.80	0.84	0.89	2.20	29.000000	76.000000
9	Himachal Pradesh	1.9	1.6	0.5	0.14	0.14	0.13	0.74	31.929235	77.182846
10	Jammu & Kashmir	1.3	1.0	1.0	0.24	0.24	0.25	0.67	34.047656	76.797289
11	Jharkhand	5.3	5.3	1.8	0.45	0.45	0.41	2.29	23.455981	85.255730
12	Karnataka	3.0	3.1	5.2	1.37	1.39	1.48	2.59	14.520390	75.722352
13	Kerala	1.1	1.1	6.7	2.07	2.57	2.60	2.69	10.352959	76.511975
14	Madhya Pradesh	3.5	3.2	8.6	2.72	2.69	2.64	3.89	23.814342	77.534072
15	Maharashtra	2.5	2.4	8.9	2.50	2.75	2.62	3.61	19.531932	76.055457
16	Manipur	2.9	3.3	0.1	0.04	0.04	0.03	1.07	24.720882	93.922939
17	Meghalaya	2.9	5.1	0.1	0.04	0.04	0.03	1.37	25.537943	91.299910
18	Mizoram	2.4	2.9	0.1	0.02	0.02	0.02	0.91	23.214617	92.868761
19	Nagaland	2.3	3.3	0.0	0.01	0.01	0.01	0.94	26.163056	94.588491
20	Odisha	3.5	3.8	2.7	0.75	0.83	0.81	2.07	20.543124	84.689732
21	Punjab	3.0	3.0	1.4	0.37	0.38	0.40	1.43	30.929321	75.500484
22	Rajasthan	2.1	2.1	7.4	2.10	1.98	1.80	2.91	26.810578	73.768455
23	Sikkim	2.3	1.1	0.0	0.01	0.01	0.01	0.57	27.601029	88.454136
24	Tamil Nadu	2.6	2.9	7.7	1.93	1.88	1.80	3.13	10.909433	78.366535
25	Tripura	4.4	3.4	0.2	0.05	0.05	0.04	1.36	23.775082	91.702509
26	Uttar Pradesh	7.5	7.4	8.6	2.40	2.42	2.82	5.19	27.130334	80.859666
27	Uttarakhand	1.8	2.1	0.4	0.09	0.10	0.11	0.77	30.041738	79.089691
28	West Bengal	2.3	2.5	6.4	1.86	1.80	1.77	2.77	22.996495	87.685588

e. Column with mean attribute is the average crime rate for different states in these years.
f. Column with lat and lng attributes are the latitude and longitude value for different states. We calculated these calling foursquare agent.

2. METHODOLOGY

The dataset we have created provides the crime rate from 2011 to 2016 in different states. So, we have plotted bar graph for this dataset.

Percentage of crime rate in India
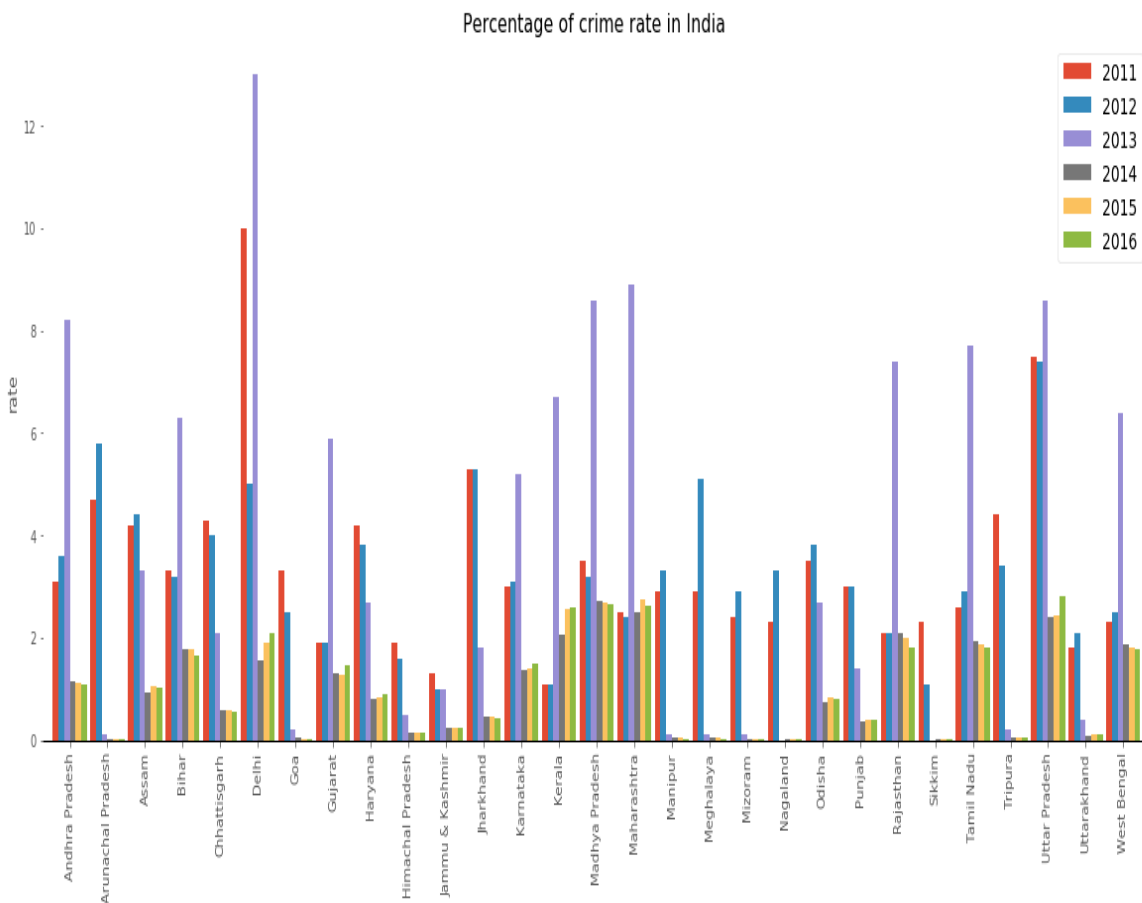
As average crime rate gives us the overall crime rate for these six years. We also plotted bar graph for average crime rate in different states of India.
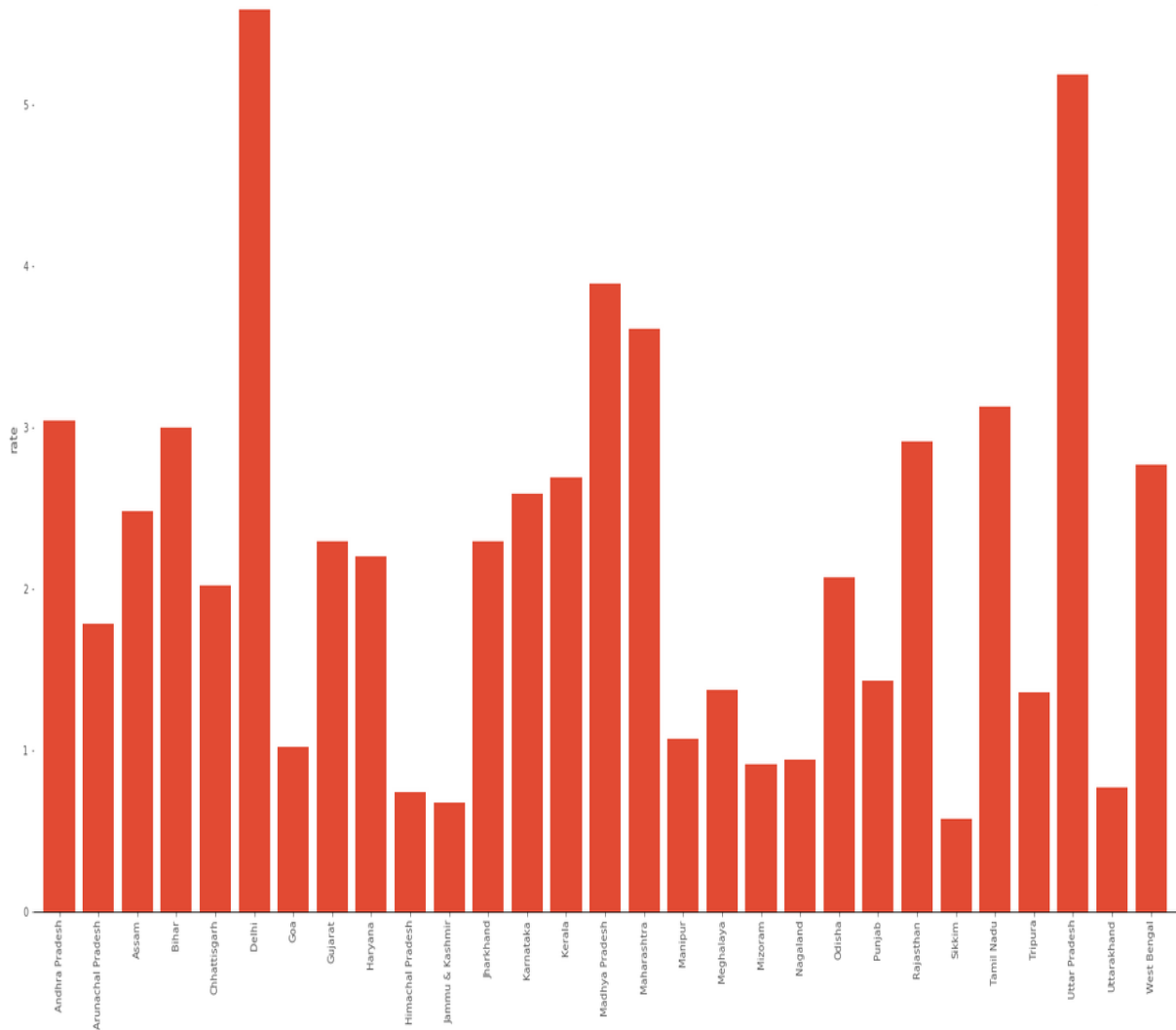
Now, we have used K-means clustering to cluster the states in three categories i.e. state of maximum crime rate, state of average crime rate and state of minimum crime rate.
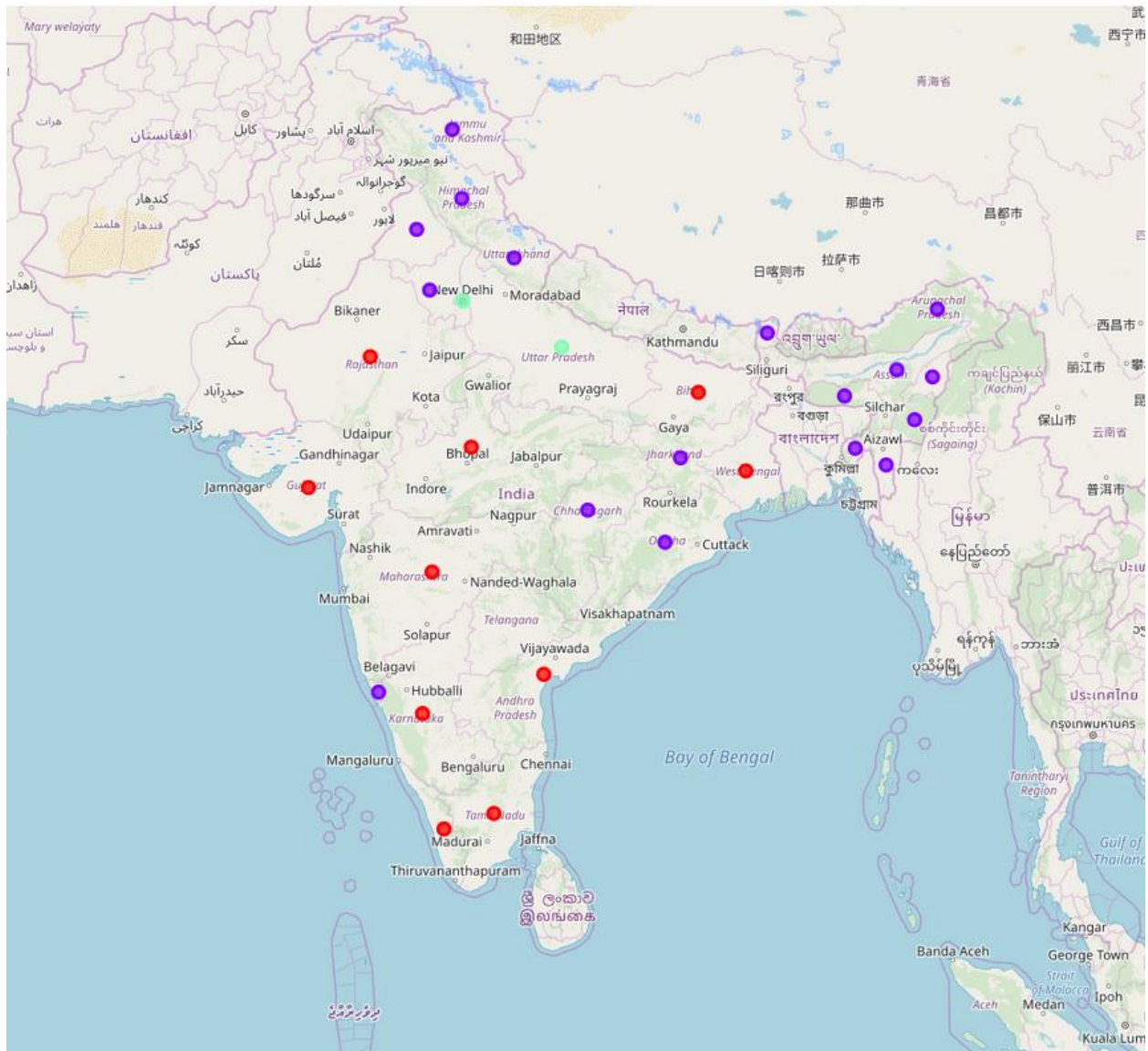
A choropleth map of states is plotted based upon the state of maximum crime rate and result is compared with the above map. We will show the comparison in result section.
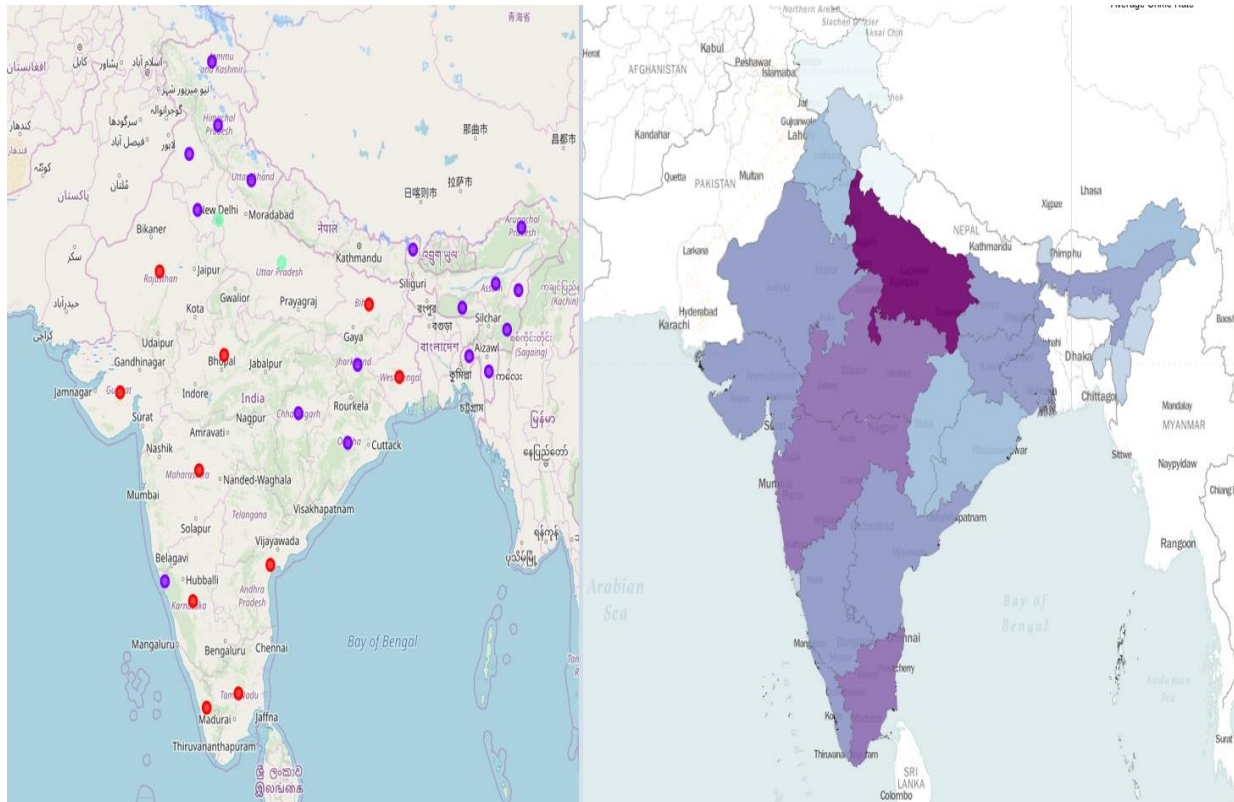
3. RESULT

The states are clustered into three categories. The categories are given below:

1. Cluster 0: It is in red color and clusters show states with minimum crime rate.
2. Cluster 1: It is in purple color and clusters show states with average crime rate.
3. Cluster 2: It is in green color and clusters show states with maximum crime rate.

In the choropleth map the Darkest region have the maximum crime rate. And the lightest region have minimum crime rate.

4. DISCUSSION

From analyzing the data, we can conclude that Delhi and Uttar Pradesh have the maximum crime rate in these last 6 years. States like Chhattisgarh, Goa, Orrisa have the average crime rate and Madhya Pradesh Kerala Karnataka and Tamil Nadu have low crime rate.

5. CONCLUSION

With the above analysis we can conclude the followings:

a. **Maximum crime rate region:** Delhi, Uttar Pradesh.
b. **Average crime rate region:** Arunachal Pradesh, Assam, Chhattisgarh, Goa, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Manipur, Meghalaya, Mizoram, Nagaland, Orrisa, Punjab, Sikkim, Tripura, Uttarakhand.
c. **Minimum crime rate region:** Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, West Bengal.

6. REFERENCES

1. https://en.wikipedia.org/wiki/Crime_in_India
2. https://en.wikipedia.org/wiki/List_of_states_and_union_territories_of_India_by_crime_rate
3. NCRB-2013_1556903701051.pdf