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In [2]: # Basic Libraries
import numpy as np
import pandas as pd
import seaborn as sb
import matplotlib.pyplot as plt
# Set the default Seaborn style for graphics
sb.set()
# This is for the fonts
from matplotlib import pyplot as plt, font_manager as fm
```

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In [3]: #Importing data set
pH= pd.read_excel("D:\\SY-1sem\\SQCR\\SQCR4.xlsx")
pH
```

	SRN	Exact place	place	2011	2012	2013	2014
0	1	AMBA RIVER AT D/S OF WAKEN BRIDGENANJUS OF JS...	WAKENPHATA	7.9	7.7	7.7	7.8
1	2	BHATSAT AT D/S OF PISE DAM NEAR PISE VILLAGE (U...	PISE VILLAGE	7.7	7.9	8.2	7.9
2	3	BHATS RIVER AT D/S OF LIBERTY OIL MILLS, SATN...	d/S SHAHAPUR	8.0	7.7	7.7	7.7
3	4	BHATS RIVER AT U/S OF LIBERTY OIL MILLS, SATN...	U/S SHAHAPUR	8.0	7.7	7.6	7.8
4	5	KALU AT ATALE VILLAGE, MAHARASHTRA	ATALE VILLAGE MAHARASHTRA	7.4	7.2	7.4	7.3
5	6	KAN RIVER, NEAR SAKRI WATER WORKS, SAKRI, DHULE.	SAKRI	7.6	8.0	8.3	7.9
6	7	KUNDALIKA AT ROHA CITY, MAHARASHTRA	ROHA CITY	7.7	7.6	7.8	7.6
7	8	KUNDALIKA RIVER AT ARE KHURD (SALINE ZONE)	KHURD	7.4	7.5	7.6	7.4
8	9	KUNDALIKA RIVER NEAR SALAV BRIDGE (SALINA ZONE...	ROHA, RAIGAD	7.8	7.9	7.6	7.7
9	10	KUNDALIKA RIVER AT DHATAV AT JACKWELL (DRINKIN...	ROHA	7.9	7.7	7.7	7.6
10	11	MITHI RIVER	MITHI RIVER	7.4	7.6	7.4	7.4
11	12	MUCHKUNDI RIVER AT WAKED,RATNAGIRI, NEAR MS ...	RATNAGIRI.	7.8	7.9	8.3	7.7
12	13	PATALGANGA AT SHILPHATA, MAHARASHTRA	SHILPHATA	7.5	7.5	7.7	7.4
13	14	PATALGANGA NEAR INTAKE OF MIDC WW, MAHARASHTRA	MIDC WW MAHARASHTRA	7.5	7.3	7.5	7.5
14	15	PATALGANGA RIVER AT D/S OF KHARPADA BRIDGE, RA...	RAIGAD	6.9	6.9	7.4	7.3
15	16	PATALGANGA RIVER AT VYAL PUMP HOUSE, KHALAPUR...	KHALAPUR	7.4	7.3	7.6	7.4
16	17	PATALGANGA RIVER AT KHALAPUR PUMPING STATION, ...	KHALAPUR RAIGAD	7.4	7.5	7.6	7.3
17	18	PATALGANGA RIVER AT SAVROLI BRIDGE, KHALAPUR, ...	KHALAPUR RAIGAD	7.4	7.3	7.6	7.3
18	19	PATALGANGA RIVER AT GAGANGIRI MAHARAJ TEMPLE, ...	KHOPLI	7.5	7.7	7.8	7.4
19	20	PEHLAR DAM ON PEHLAR RIVER INLET OF WATER WORK...	VASAI	7.9	7.9	7.7	7.8
20	21	SAVITRI RIVER AT OVALE VILLAGE.	OVALE VILLAGE	7.4	7.6	7.4	7.3
21	22	SAVITRI RIVER JACKWELL AT UPSA KENDRE, NANGALW...	MAHAD	7.7	7.7	7.6	7.2
22	23	SAVITRI RIVER AT SHEDAV DOH, MAHAD,RAIGAD	MAHAD RAIGAD	7.9	7.7	7.8	7.3
23	24	SAVITRI RIVER AT DADLI BRIDGE, DADLI, MAHAD, R...	DADLI RAIGAD	7.9	7.5	7.7	7.3
24	25	SAVITRI RIVER AT MUTHAVALI VILLAGE, MAHAD, RAI...	MUTHAVALI VILLAGE RAIGHAD	7.7	7.4	8.1	7.3
25	26	SURYA RIVER, U/S OF SURYA DAM, DHAMMI, VIKRAMG...	VIKRAMGAD	8.3	8.1	8.0	7.9
26	27	SURYA RIVER AT MIDC PUMPING STATION, GARVASHET...	PALGHAR	8.3	8.0	8.0	8.1
27	28	SURYA RIVER AT INTAKE OF VASAINANVIRAR WIS SCH...	MASVAN	8.3	8.0	7.9	8.0
28	29	TANSA RIVER NEAR ROAD BRIDGE, VILLAGE DAKEWALI...	WADA	8.2	7.8	7.6	7.8
29	30	ULHAS AT U/S OF NRC BUND AT MOHANE, MAHARASHTRA	MOHANE	7.8	7.6	7.5	7.7
30	31	ULHAS AT U/S OF BADLAPUR, MAHARASHTRA	BADLAPUR	7.8	7.7	7.7	7.6
31	32	ULHAS RIVER ATJAMBHUL WATER WORKS.	JAMBHUL	7.8	7.6	7.5	7.6
32	33	VAITARNA RIVER NEAR ROAD BRIDGE, GANDHARE VILL...	WADA THANE	8.2	7.8	7.7	7.7
33	34	VASHISTI RIVER AT U/S OF THREE M PAPER MILLS N...	KHERDI	7.8	7.7	7.7	7.4
34	35	VASHISHTI RIVER AT D/S OF THREE M PAPER MILLS ...	RATNAGARI	7.8	7.6	7.5	7.4
35	36	VASHISHTI RIVER AT U/S OF POPHALI NEAR KONPHAN...	CHIPLUN	7.7	7.5	7.7	7.2

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In [4]: pH.nunique()

Out[4]: SRN      36
        Exact place  36
        place      36
        2011      10
        2012      11
        2013      10
        2014      10
        dtype: int64

In [5]: pH.columns

Out[5]: Index(['SRN', 'Exact place ', 'place', 2011, 2012, 2013, 2014], dtype='object')
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In [6]: # Drop column 'Sr. No.'
pH=pH.drop(['SRN'],axis=1)
# Round the values in the '2011' column to one decimal place
pH[2011] = pH[2011].round(1)
pH
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	Exact place	place	2011	2012	2013	2014
0	AMBA RIVER AT D/S OF WAKEN BRIDGENANJUS OF JS ...	WAKENPHATA	7.9	7.7	7.7	7.8
1	BHATSAT AT D/S OF PISE DAM NEAR PISE VILLAGE (U...	PISE VILLAGE	7.7	7.9	8.2	7.9
2	BHATS RIVER AT D/S OF LIBERTY OIL MILLS, SATN...	d/S SHAHAPUR	8.0	7.7	7.7	7.7
3	BHATS RIVER AT U/S OF LIBERTY OIL MILLS, SATN...	U/S SHAHAPUR	8.0	7.7	7.6	7.8
4	KALU AT ATALE VILLAGE, MAHARASHTRA	ATALE VILLAGE MAHARASHTRA	7.4	7.2	7.4	7.3
5	KAN RIVER, NEAR SAKRI WATER WORKS, SAKRI, DHULE.	SAKRI	7.6	8.0	8.3	7.9
6	KUNDALIKA AT ROHA CITY, MAHARASHTRA	ROHA CITY	7.7	7.6	7.8	7.6
7	KUNDALIKA RIVER AT ARE KHURD (SALINE ZONE)	KHURD	7.4	7.5	7.6	7.4
8	KUNDALIKA RIVER NEAR SALAV BRIDGE (SALINA ZONE...	ROHA, RAIGAD	7.8	7.9	7.6	7.7
9	KUNDALIKA RIVER AT DHATAV AT JACKWELL (DRINKIN...	ROHA	7.9	7.7	7.7	7.6
10	MITHI RIVER	MITHI RIVER	7.4	7.6	7.4	7.4
11	MUCHKUNDI RIVER AT WAKED,RATNAGIRI, NEAR MS ...	RATNAGIRI.	7.8	7.9	8.3	7.7
12	PATALGANGA AT SHILPHATA, MAHARASHTRA	SHILIPHATA	7.5	7.5	7.7	7.4
13	PATALGANGA NEAR INTAKE OF MIDC WW, MAHARASHTRA	MIDC WW MAHARASHTRA	7.5	7.3	7.5	7.5
14	PATALGANGA RIVER AT D/S OF KHARPADA BRIDGE, RA...	RAIGAD	6.9	6.9	7.4	7.3
15	PATALGANGA RIVER AT VYAL PUMP HOUSE, KHALAPUR...	KHALAPUR	7.4	7.3	7.6	7.4
16	PATALGANGA RIVER AT KHALAPUR PUMPING STATION, ...	KHALAPUR RAIGAD	7.4	7.5	7.6	7.3
17	PATALGANGA RIVER AT SAVROLI BRIDGE, KHALAPUR, ...	KHALAPUR RAIGAD	7.4	7.3	7.6	7.3
18	PATALGANGA RIVER AT GAGANGIRI MAHARAJ TEMPLE, ...	KHOPLI	7.5	7.7	7.8	7.4
19	PEHLAR DAM ON PEHLAR RIVER INLET OF WATER WORK...	VASAI	7.9	7.9	7.7	7.8
20	SAVITRI RIVER AT OVALE VILLAGE.	OVALE VILLAGE	7.4	7.6	7.4	7.3
21	SAVITRI RIVER JACKWELL AT UPSA KENDRE, NANGALW...	MAHAD	7.7	7.7	7.6	7.2
22	SAVITRI RIVER AT SHEDAV DOH, MAHAD,RAIGAD	MAHAD RAIGAD	7.9	7.7	7.8	7.3
23	SAVITRI RIVER AT DADLI BRIDGE, DADLI, MAHAD, R...	DADLI RAIGAD	7.9	7.5	7.7	7.3
24	SAVITRI RIVER AT MUTHAVALI VILLAGE, MAHAD, RAI...	MUTHAVALI VILLAGE RAIGHAD	7.7	7.4	8.1	7.3
25	SURYA RIVER, U/S OF SURYA DAM, DHAMMI, VIKRAMG...	VIKRAMGAD	8.3	8.1	8.0	7.9
26	SURYA RIVER AT MIDC PUMPING STATION, GARVASHET...	PALGHAR	8.3	8.0	8.0	8.1
27	SURYA RIVER AT INTAKE OF VASAINANVIRAR WIS SCH...	MASVAN	8.3	8.0	7.9	8.0
28	TANSA RIVER NEAR ROAD BRIDGE, VILLAGE DAKEWALI...	WADA	8.2	7.8	7.6	7.8
29	ULHAS AT U/S OF NRC BUND AT MOHANE, MAHARASHTRA	MOHANE	7.8	7.6	7.5	7.7
30	ULHAS AT U/S OF BADLAPUR, MAHARASHTRA	BADLAPUR	7.8	7.7	7.7	7.6
31	ULHAS RIVER ATJAMBHUL WATER WORKS.	JAMBHUL	7.8	7.6	7.5	7.6
32	VAITARNA RIVER NEAR ROAD BRIDGE, GANDHARE VILL...	WADA THANE	8.2	7.8	7.7	7.7
33	VASHISTI RIVER AT U/S OF THREE M PAPER MILLS N...	KHERDI	7.8	7.7	7.7	7.4
34	VASHISHTI RIVER AT D/S OF THREE M PAPER MILLS ...	RATNAGARI	7.8	7.6	7.5	7.4
35	VASHISHTI RIVER AT U/S OF POPHALI NEAR KONPHAN...	CHIPLUN	7.7	7.5	7.7	7.2

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In [7]: # Calculate the mean for each row across columns and create a 'X-bar' column
pH['X-bar'] = pH[[2011, 2012, 2013, 2014]].mean(axis=1)

# Calculate the range for each row across columns and create a 'R' column
pH['R'] = pH[[2011, 2012, 2013, 2014]].max(axis=1) - pH[[2011, 2012, 2013, 2014]].min(axis=1)

#Calculate the sd for each row across columns and create a 'S' column
pH['S'] = pH[[2011, 2012, 2013, 2014]].std(axis=1)
pH
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	Exact place	place	2011	2012	2013	2014	X-bar	R	S
0	AMBA RIVER AT D/S OF WAKEN BRIDGENANJUS OF JS ...	WAKENPHATA	7.9	7.7	7.7	7.8	7.775	0.2	0.095743
1	BHATSAT AT D/S OF PISE DAM NEAR PISE VILLAGE (U...	PISE VILLAGE	7.7	7.9	8.2	7.9	7.925	0.5	0.206155
2	BHATS RIVER AT D/S OF LIBERTY OIL MILLS, SATN...	d/S SHAHAPUR	8.0	7.7	7.7	7.7	7.775	0.3	0.150100
3	BHATS RIVER AT U/S OF LIBERTY OIL MILLS, SATN...	U/S SHAHAPUR	8.0	7.7	7.6	7.8	7.775	0.4	0.170783
4	KALU AT ATALE VILLAGE, MAHARASHTRA	ATALE VILLAGE MAHARASHTRA	7.4	7.2	7.4	7.3	7.325	0.2	0.095743
5	KAN RIVER, NEAR SAKRI WATER WORKS, SAKRI, DHULE.	SAKRI	7.6	8.0	8.3	7.9	7.950	0.7	0.288675
6	KUNDALIKA AT ROHA CITY, MAHARASHTRA	ROHA CITY	7.7	7.6	7.8	7.6	7.675	0.2	0.095743
7	KUNDALIKA RIVER AT ARE KHURD (SALINE ZONE)	KHURD	7.4	7.5	7.6	7.4	7.475	0.2	0.095743
8	KUNDALIKA RIVER NEAR SALAV BRIDGE (SALINA ZONE...	ROHA, RAIGAD	7.8	7.9	7.6	7.7	7.750	0.3	0.129099
9	KUNDALIKA RIVER AT DHATAV AT JACKWELL (DRINKIN...	ROHA	7.9	7.7	7.7	7.6	7.725	0.3	0.125831
10	MITHI RIVER	MITHI RIVER	7.4	7.6	7.4	7.4	7.450	0.2	0.100000
11	MUCHKUNDI RIVER AT WAKED,RATNAGIRI, NEAR MS ...	RATNAGIRI.	7.8	7.9	8.3	7.7	7.925	0.6	0.262996
12	PATALGANGA AT SHILPHATA, MAHARASHTRA	SHILIPHATA	7.5	7.5	7.7	7.4	7.525	0.3	0.125831
13	PATALGANGA NEAR INTAKE OF MIDC WW, MAHARASHTRA	MIDC WW MAHARASHTRA	7.5	7.3	7.5	7.5	7.450	0.2	0.100000
14	PATALGANGA RIVER AT D/S OF KHARPADA BRIDGE, RA...	RAIGAD	6.9	6.9	7.4	7.3	7.125	0.5	0.262996
15	PATALGANGA RIVER AT VYAL PUMP HOUSE, KHALAPUR...	KHALAPUR	7.4	7.3	7.6	7.4	7.425	0.3	0.125831
16	PATALGANGA RIVER AT KHALAPUR PUMPING STATION, ...	KHALAPUR RAIGAD	7.4	7.5	7.6	7.3	7.450	0.3	0.129099
17	PATALGANGA RIVER AT SAVROLI BRIDGE, KHALAPUR, ...	KHALAPUR RAIGAD	7.4	7.3	7.6	7.3	7.400	0.3	0.141421
18	PATALGANGA RIVER AT GAGANGIRI MAHARAJ TEMPLE, ...	KHOPLI	7.5	7.7	7.8	7.4	7.600	0.4	0.182574
19	PEHLAR DAM ON PEHLAR RIVER INLET OF WATER WORK...	VASAI	7.9	7.9	7.7	7.8	7.825	0.2	0.095743
20	SAVITRI RIVER AT OVALE VILLAGE.	OVALE VILLAGE	7.4	7.6	7.4	7.3	7.425	0.3	0.125831
21	SAVITRI RIVER JACKWELL AT UPSA KENDRE, NANGALW...	MAHAD	7.7	7.7	7.6	7.2	7.550	0.5	0.238048
22	SAVITRI RIVER AT SHEDAV DOH, MAHAD,RAIGAD	MAHAD RAIGAD	7.9	7.7	7.8	7.3	7.675	0.6	0.262996
23	SAVITRI RIVER AT DADLI BRIDGE, DADLI, MAHAD, R...	DADLI RAIGAD	7.9	7.5	7.7	7.3	7.600	0.6	0.258199
24	SAVITRI RIVER AT MUTHAVALI VILLAGE, MAHAD, RAI...	MUTHAVALI VILLAGE RAIGHAD	7.7	7.4	8.1	7.3	7.625	0.8	0.359398
25	SURYA RIVER, U/S OF SURYA DAM, DHAMMI, VIKRAMG...	VIKRAMGAD	8.3	8.1	8.0	7.9	8.075	0.4	0.170783
26	SURYA RIVER AT MIDC PUMPING STATION, GARVASHET...	PALGHAR	8.3	8.0	8.0	8.1	8.100	0.3	0.141421
27	SURYA RIVER AT INTAKE OF VASAINANVIRAR WIS SCH...	MASVAN	8.3	8.0	7.9	8.0	8.050	0.4	0.173205
28	TANSA RIVER NEAR ROAD BRIDGE, VILLAGE DAKEWALI...	WADA	8.2	7.8	7.6	7.8	7.850	0.6	0.251661
29	ULHAS AT U/S OF NRC BUND AT MOHANE, MAHARASHTRA	MOHANE	7.8	7.6	7.5	7.7	7.650	0.3	0.129099
30	ULHAS AT U/S OF BADLAPUR, MAHARASHTRA	BADLAPUR	7.8	7.7	7.7	7.6	7.700	0.2	0.081650
31	ULHAS RIVER ATJAMBHUL WATER WORKS.	JAMBHUL	7.8	7.6	7.5	7.6	7.625	0.3	0.125831
32	VAITARNA RIVER NEAR ROAD BRIDGE, GANDHARE VILL...	WADA THANE	8.2	7.8	7.7	7.7	7.850	0.5	0.238048
33	VASHISTI RIVER AT U/S OF THREE M PAPER MILLS N...	KHERDI	7.8	7.7	7.7	7.4	7.650	0.4	0.173205
34	VASHISHTI RIVER AT D/S OF THREE M PAPER MILLS ...	RATNAGARI	7.8	7.6	7.5	7.4	7.575	0.4	0.170783
35	VASHISHTI RIVER AT U/S OF POPHALI NEAR KONPHAN...	CHIPLUN	7.7	7.5	7.7	7.2	7.525	0.5	0.236291

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In [8]: pH['S'] = pH['S'].round(3)
pH
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	Exact place	place	2011	2012	2013	2014	X-bar	R	S
0	AMBA RIVER AT D/S OF WAKEN BRIDGENANJUS OF JS ...	WAKENPHATA	7.9	7.7	7.7	7.8	7.775	0.2	0.096
1	BHATSAT AT D/S OF PISE DAM NEAR PISE VILLAGE (U...	PISE VILLAGE	7.7	7.9	8.2	7.9	7.925	0.5	0.206
2	BHATS RIVER AT D/S OF LIBERTY OIL MILLS, SATN...	d/S SHAHAPUR	8.0	7.7	7.7	7.7	7.775	0.3	0.150
3	BHATS RIVER AT U/S OF LIBERTY OIL MILLS, SATN...	U/S SHAHAPUR	8.0	7.7	7.6	7.8	7.775	0.4	0.171
4	KALU AT ATALE VILLAGE, MAHARASHTRA	ATALE VILLAGE MAHARASHTRA	7.4	7.2	7.4	7.3	7.325	0.2	0.096
5	KAN RIVER, NEAR SAKRI WATER WORKS, SAKRI, DHULE.	SAKRI	7.6	8.0	8.3	7.9	7.950	0.7	0.289
6	KUNDALIKA AT ROHA CITY, MAHARASHTRA	ROHA CITY	7.7	7.6	7.8	7.6	7.675	0.2	0.096
7	KUNDALIKA RIVER AT ARE KHURD (SALINE ZONE)	KHURD	7.4	7.5	7.6	7.4	7.475	0.2	0.096
8	KUNDALIKA RIVER NEAR SALAV BRIDGE (SALINA ZONE...	ROHA, RAIGAD	7.8	7.9	7.6	7.7	7.750	0.3	0.129
9	KUNDALIKA RIVER AT DHATAV AT JACKWELL (DRINKIN...	ROHA	7.9	7.7	7.7	7.6	7.725	0.3	0.126
10	MITHI RIVER	MITHI RIVER	7.4	7.6	7.4	7.4	7.450	0.2	0.100
11	MUCHKUNDI RIVER AT WAKED,RATNAGIRI, NEAR MS ...	RATNAGIRI.	7.8	7.9	8.3	7.7	7.925	0.6	0.263
12	PATALGANGA AT SHILPHATA, MAHARASHTRA	SHILIPHATA	7.5	7.5	7.7	7.4	7.525	0.3	0.126
13	PATALGANGA NEAR INTAKE OF MIDC WW, MAHARASHTRA	MIDC WW MAHARASHTRA	7.5	7.3	7.5	7.5	7.450	0.2	0.100
14	PATALGANGA RIVER AT D/S OF KHARPADA BRIDGE, RA...	RAIGAD	6.9	6.9	7.4	7.3	7.125	0.5	0.263
15	PATALGANGA RIVER AT VYAL PUMP HOUSE, KHALAPUR...	KHALAPUR	7.4	7.3	7.6	7.4	7.425	0.3	0.126
16	PATALGANGA RIVER AT KHALAPUR PUMPING STATION, ...	KHALAPUR RAIGAD	7.4	7.5	7.6	7.3	7.450	0.3	0.129
17	PATALGANGA RIVER AT SAVROLI BRIDGE, KHALAPUR, ...	KHALAPUR RAIGAD	7.4	7.3	7.6	7.3	7.400	0.3	0.141
18	PATALGANGA RIVER AT GAGANGIRI MAHARAJ TEMPLE, ...	KHOPLI	7.5	7.7	7.8	7.4	7.600	0.4	0.183
19	PEHLAR DAM ON PEHLAR RIVER INLET OF WATER WORK...	VASAI	7.9	7.9	7.7	7.8	7.825	0.2	0.09