

Importing necessary modules

```
In [51]: 1 import matplotlib.pyplot as plt
2 import seaborn as sns
3 import pandas as pd
4 import warnings
5 warnings.filterwarnings('ignore')
6 import statistics as st

In [86]: 1 car=pd.read_excel(r"K:\Desktop\NIIT\tables\S1_chall.xlsx")

In [87]: 1 car.dropna(0,how="all",inplace=True)
2 columns=["Displacement", "Fuel_Tank_Capacity_litre", "City_Mileage_km_litre", "Highway_Mileage_km_litre", "Minimum_Turning_Radius"]
```

Task1: To drop the rows that have missing values and analyze the spread

```
In [88]: 1 measures=car.loc[:,["Make", "Displacement", "Fuel_Tank_Capacity_litre", "City_Mileage_km_litre", "Highway_Mileage_km_litre", "Minimum_Turning_Radius"]]
2 ].groupby("Make")
3 measures.mean()
```

Out[88]:

	Displacement	Fuel_Tank_Capacity_litre	City_Mileage_km_litre	Highway_Mileage_km_litre	Minimum_Turning_Radius
Make					
Aston Martin	5038.333333	81.166667	6.700000	10.450000	11.800000
Audi	2256.354839	65.633333	12.081250	12.942857	6.338235
Bajaj	216.000000	NaN	NaN	NaN	3.500000
Bentley	5447.833333	88.333333	5.020000	7.840000	5.825000
Bmw	2707.918919	64.794118	13.686875	15.835000	7.363333
Bugatti	7993.000000	NaN	NaN	NaN	NaN
Datsun	1065.066667	32.200000	20.946667	24.000000	4.640000
Dc	2000.000000	60.000000	8.000000	10.000000	6.000000
Ferrari	4589.500000	86.750000	4.320000	6.900000	NaN
Fiat	1269.391304	45.000000	16.090909	18.409091	5.366667
Force	2447.000000	63.000000	14.000000	17.000000	5.850000
Ford	1551.325581	47.323256	10.660000	12.287500	5.313043
Honda	1444.875000	40.343750	16.805714	19.310526	5.094828
Hyundai	1350.558140	45.248000	16.679853	18.294146	5.074074
Icml	1994.000000	50.000000	8.600000	11.120000	5.600000
Isuzu	2578.800000	76.000000	9.900000	11.700000	6.200000
Jaguar	2679.545455	68.380952	8.920909	14.447778	8.946667
Jeep	2102.357143	65.678571	13.975000	8.400000	NaN
Kia	1635.380952	57.500000	NaN	NaN	5.300000
Lamborghini	5409.692308	88.750000	5.500000	6.266667	5.672222
Land Rover	2795.000000	83.600000	NaN	NaN	8.750000
Land Rover Rover	3199.703704	90.000000	9.158000	11.637500	5.780000
Lexus	3491.600000	76.777778	18.150000	NaN	5.671429
Mahindra	1719.632479	53.955752	20.003763	18.140175	5.437379
Maserati	3363.888889	75.666667	4.900000	5.966667	7.691667
Mg	1681.818182	NaN	NaN	NaN	NaN
Mini	1897.600000	45.333333	11.300000	13.800000	5.800000
Mitsubishi	2563.571429	71.142857	6.791667	10.676667	5.571429
Nissan	1507.379310	46.482759	15.324375	18.872857	5.087500
Porsche	3062.928571	74.357143	8.400000	8.071429	7.150000
Premier	1343.500000	46.000000	13.666667	17.283333	4.700000
Renault	1238.583333	41.555556	20.554286	17.690000	5.322500
Skoda	1720.581395	56.860465	13.953333	17.268529	6.672093
Suzuki	1171.731544	38.261745	21.062826	20.671818	4.885816
Suzuki R	1083.285714	32.000000	NaN	NaN	4.700000
Tata	1393.319149	42.200000	19.233542	20.502439	5.207595
Toyota	1803.292683	50.512195	14.293065	18.448750	5.150000
Volkswagen	1466.294118	51.294118	16.225000	19.229333	5.330769
Volvo	1975.555556	63.700000	12.953077	17.780000	6.861111

In [83]:

1

measures.median()

2

Out[83]:

	Displacement	Fuel_Tank_Capacity_litre	City_Mileage_km_litre	Highway_Mileage_km_litre	Minimum_Turning_Radius
Make					
Aston Martin	5198.0	80.0	6.000	10.450	11.800
Audi	1984.0	64.0	12.000	12.600	5.900
Bajaj	216.0	NaN	NaN	NaN	3.500
Bentley	5974.0	90.0	5.300	8.600	5.900
Bmw	2979.0	67.0	14.255	16.460	6.100
Bugatti	7993.0	NaN	NaN	NaN	NaN
Datsun	1198.0	35.0	20.600	24.000	4.600
Dc	2000.0	60.0	8.000	10.000	6.000
Ferrari	3902.0	88.5	3.200	5.500	NaN
Fiat	1248.0	45.0	17.000	19.500	5.400
Force	2596.0	63.0	14.000	17.000	5.650
Ford	1498.0	42.0	9.300	12.620	5.300
Honda	1498.0	40.0	16.200	16.400	5.300
Hyundai	1197.0	45.0	16.380	18.500	5.200
Icml	1994.0	50.0	8.600	11.120	5.600
Isuzu	2499.0	76.0	7.300	10.300	6.200
Jaguar	1999.0	66.0	7.810	13.120	11.200
Jeep	1956.0	60.0	12.800	8.400	NaN
Kia	1493.0	60.0	NaN	NaN	5.300
Lamborghini	5204.0	90.0	5.600	5.000	5.600
Land Rover	2993.0	85.0	NaN	NaN	8.750
Land Rover Rover	2993.0	85.0	8.100	11.550	5.650
Lexus	3456.0	82.0	18.000	NaN	5.700
Mahindra	1497.0	60.0	16.000	17.210	5.400
Maserati	2987.0	75.0	5.200	6.200	5.975
Mg	1500.0	NaN	NaN	NaN	NaN
Mini	1998.0	44.0	11.300	13.800	5.800
Mitsubishi	2477.0	70.0	6.500	10.500	5.600
Nissan	1461.0	50.0	17.100	19.500	5.200
Porsche	2995.0	75.0	7.900	7.800	5.500
Premier	1368.5	46.0	12.500	16.000	4.700
Renault	1461.0	50.0	21.040	19.600	5.200
Skoda	1798.0	55.0	14.500	16.000	5.300
Suzuki	1197.0	37.0	21.400	22.000	4.800
Suzuki R	998.0	32.0	NaN	NaN	4.700
Tata	1199.0	44.0	19.200	23.000	5.100
Toyota	1496.0	45.0	13.600	17.935	5.100
Volkswagen	1498.0	45.0	15.300	20.000	5.400
Volvo	1969.0	67.0	13.200	18.000	5.700

In [84]:

1measures.std()

Out[84]:

	Displacement	Fuel_Tank_Capacity_litre	City_Mileage_km_litre	Highway_Mileage_km_litre	Minimum_Turning_Radius
Make					
Aston Martin	986.241519	8.808140	2.137756	3.464823	NaN
Audi	836.304352	10.463346	3.692554	3.947513	1.440435
Bajaj	0.000000	NaN	NaN	NaN	0.000000
Bentley	1164.710164	2.581989	3.189357	3.888830	0.150000
Bmw	924.567237	12.904731	3.944366	4.452292	2.235227
Bugatti	0.000000	NaN	NaN	NaN	NaN
Datsun	179.470836	3.549648	0.411096	0.000000	0.050709
Dc	NaN	NaN	NaN	NaN	NaN
Ferrari	1125.891647	5.922114	1.533623	1.917029	NaN
Fiat	65.088568	0.000000	3.695803	2.482521	0.141421
Force	230.829807	0.000000	0.000000	0.000000	0.309839
Ford	635.526618	10.599547	3.643213	0.935641	0.378159
Honda	192.049803	5.685456	5.063418	4.098359	0.295238
Hyundai	271.290864	7.375478	2.792663	3.130469	0.215604
Icml	0.000000	0.000000	0.000000	0.000000	0.000000
Isuzu	455.346242	0.000000	3.560197	1.917029	0.000000
Jaguar	1171.060030	9.265399	4.651910	3.902098	2.949777
Jeep	991.904872	12.488672	2.350000	NaN	NaN
Kia	327.485950	4.472136	NaN	NaN	0.000000
Lamborghini	703.121064	4.330127	1.900239	2.193931	0.216667
Land Rover	419.529896	7.411702	NaN	NaN	3.046778
Land Rover Rover	1183.611092	14.935760	4.174235	2.103696	0.290689
Lexus	990.103047	14.307147	0.443471	NaN	0.179947
Mahindra	534.771085	12.959683	19.338427	4.087911	0.262223
Maserati	752.408872	6.041523	0.501996	0.480278	2.779823
Mg	252.262490	NaN	NaN	NaN	NaN
Mini	211.661785	1.581139	1.414214	NaN	0.000000
Mitsubishi	284.005785	8.315218	0.714435	0.432743	0.125357
Nissan	454.160247	6.946842	3.724214	2.569765	0.260564
Porsche	733.485616	13.709105	1.647220	1.172908	3.300000
Premier	161.722911	0.000000	3.141125	3.143512	0.000000
Renault	269.404568	10.199284	5.134327	2.865000	0.171276
Skoda	207.255333	6.300345	2.611082	2.881993	2.539528
Suzuki	188.540147	5.651352	4.823524	3.330682	0.303452
Suzuki R	102.196966	0.000000	NaN	NaN	0.000000
Tata	401.589509	9.132127	4.686563	3.405913	0.990988
Toyota	641.799947	12.489249	3.995656	4.489500	0.336742
Volkswagen	310.309282	7.952623	2.248703	2.288850	0.333430
Volvo	138.270078	6.005355	2.957159	1.414920	2.245381

In [85]:

1measures.var()

Out[85]:

	Displacement	Fuel_Tank_Capacity_litre	City_Mileage_km_litre	Highway_Mileage_km_litre	Minimum_Turning_Radius
Make					
Aston Martin	9.726723e+05	77.583333	4.570000	12.005000	NaN
Audi	6.994050e+05	109.481609	13.634958	15.582857	2.074853
Bajaj	0.000000e+00	NaN	NaN	NaN	0.000000
Bentley	1.356550e+06	6.666667	10.172000	15.123000	0.022500
Bmw	8.548246e+05	166.532086	15.558023	19.822904	4.996238
Bugatti	0.000000e+00	NaN	NaN	NaN	NaN
Datsun	3.220978e+04	12.600000	0.169000	0.000000	0.002571
Dc	NaN	NaN	NaN	NaN	NaN
Ferrari	1.267632e+06	35.071429	2.352000	3.675000	NaN
Fiat	4.236522e+03	0.000000	13.658961	6.162909	0.020000
Force	5.328240e+04	0.000000	0.000000	0.000000	0.096000
Ford	4.038941e+05	112.350399	13.273000	0.875425	0.143004
Honda	3.688313e+04	32.324405	25.638202	16.796550	0.087166
Hyundai	7.359873e+04	54.397677	7.798966	9.799835	0.046485
Icml	0.000000e+00	0.000000	0.000000	0.000000	0.000000
Isuzu	2.073402e+05	0.000000	12.675000	3.675000	0.000000
Jaguar	1.371382e+06	85.847619	21.640269	15.226369	8.701183
Jeep	9.838753e+05	155.966931	5.522500	NaN	NaN
Kia	1.072470e+05	20.000000	NaN	NaN	0.000000
Lamborghini	4.943792e+05	18.750000	3.610909	4.813333	0.046944
Land Rover	1.760053e+05	54.933333	NaN	NaN	9.282857
Land Rover Rover	1.400935e+06	223.076923	17.424240	4.425536	0.084500
Lexus	9.803040e+05	204.694444	0.196667	NaN	0.032381
Mahindra	2.859801e+05	167.953382	373.974752	16.711016	0.068761
Maserati	5.661191e+05	36.500000	0.252000	0.230667	7.727417
Mg	6.363636e+04	NaN	NaN	NaN	NaN
Mini	4.480071e+04	2.500000	2.000000	NaN	0.000000
Mitsubishi	8.065929e+04	69.142857	0.510417	0.187267	0.015714
Nissan	2.062615e+05	48.258621	13.869773	6.603690	0.067894
Porsche	5.380011e+05	187.939560	2.713333	1.375714	10.890000
Premier	2.615430e+04	0.000000	9.866667	9.881667	0.000000
Renault	7.257882e+04	104.025397	26.361314	8.208225	0.029336
Skoda	4.295477e+04	39.694352	6.817747	8.305886	6.449203
Suzuki	3.554739e+04	31.937783	23.266385	11.093443	0.092083
Suzuki R	1.044422e+04	0.000000	NaN	NaN	0.000000
Tata	1.612741e+05	83.395745	21.963874	11.600244	0.982057
Toyota	4.119072e+05	155.981331	15.965271	20.155606	0.113395
Volkswagen	9.629185e+04	63.244207	5.056667	5.238835	0.111175
Volvo	1.911861e+04	36.064286	8.744790	2.002000	5.041736

Task2: To visually represent Suzuki Toyota and Mahindra make's displacement

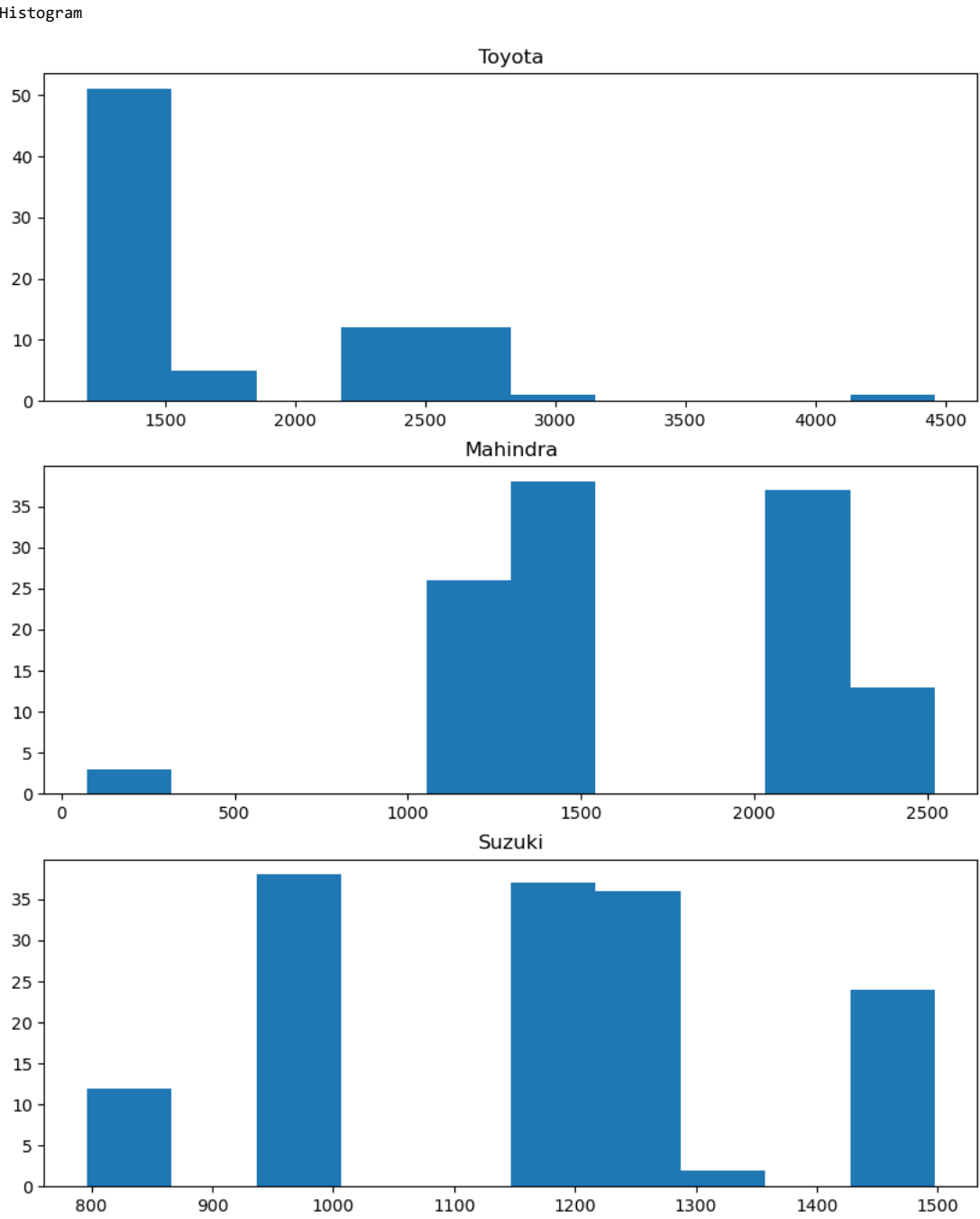
In [102]:

1spread=car[(car.Make=="Suzuki")|(car.Make=="Mahindra")|(car.Make=="Toyota")].loc[:,["Make", "Displacement"]]

In [ ]:

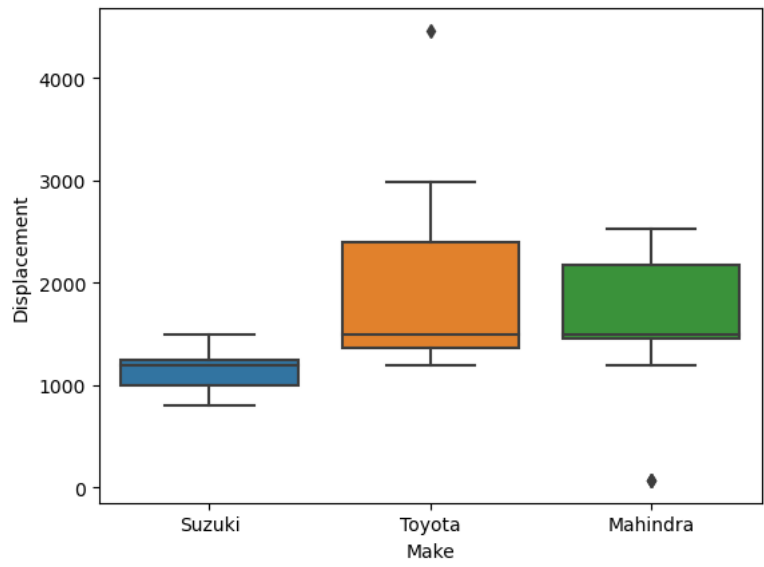
1

```
In [139]: 1 print("Histogram")
2 fig,ax=plt.subplots(3,1,figsize=(10,12))
3 ax[0].hist(spread[spread.Make=="Toyota"].Displacement)
4 ax[0].set_title("Toyota")
5 ax[1].hist(spread[spread.Make=="Mahindra"].Displacement)
6 ax[1].set_title("Mahindra")
7 ax[2].hist(spread[spread.Make=="Suzuki"].Displacement)
8 ax[2].set_title("Suzuki")
9 plt.show()
```



```
In [156]: 1 sns.boxplot(x="Make",y="Displacement",data=spread)
```

Out[156]: <AxesSubplot: xlabel='Make', ylabel='Displacement'>



**Task2 subtask: To group by make and calculate correlation coeff for all possible columns and index for city mileage and to interpret output**

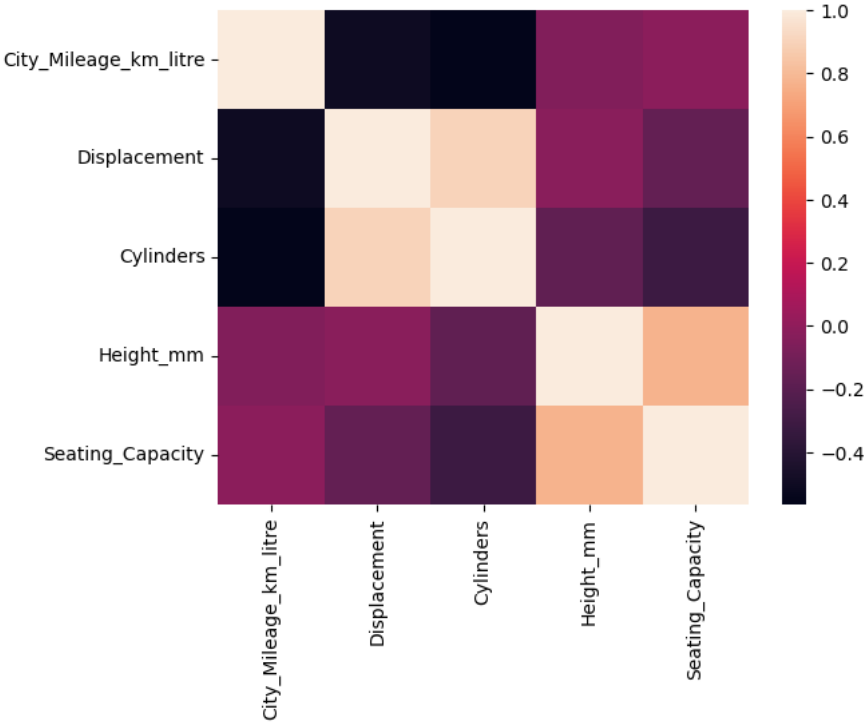
```
In [164]: 1 bymake=pd.DataFrame(car.groupby("Make").corr().iloc[:,9])
          2 bymake
```

Out[164]:

City_Mileage_km_litre		
Make		
Aston Martin	Sl. No.	0.284747
	Displacement	0.909719
	Cylinders	0.688686
	Valves_Per_Cylinder	NaN
	Fuel_Tank_Capacity_litre	0.985148
...	...	...
Volvo	Seating_Capacity	0.185428
	Boot_Space_litre	-0.506211
	Minimum_Turning_Radius	0.633933
	Number_of_Airbags	0.184882
	USB_Ports	NaN

624 rows × 1 columns

```
In [154]: 1 sns.heatmap(car.loc[:,["City_Mileage_km_litre","Displacement","Cylinders","Height_mm","Seating_Capacity"]].corr());
```



```
In [162]: 1 car.loc[:,["City_Mileage_km_litre","Displacement","Cylinders","Height_mm","Seating_Capacity"]].corr()
```

Out[162]:

	City_Mileage_km_litre	Displacement	Cylinders	Height_mm	Seating_Capacity
City_Mileage_km_litre	1.000000	-0.509127	-0.564450	-0.052415	-0.017684
Displacement	-0.509127	1.000000	0.898620	-0.023656	-0.162146
Cylinders	-0.564450	0.898620	1.000000	-0.179106	-0.318495
Height_mm	-0.052415	-0.023656	-0.179106	1.000000	0.769479
Seating_Capacity	-0.017684	-0.162146	-0.318495	0.769479	1.000000

```
In [163]: 1 """From above heatmap and correalation coefficient its observable that number of cylinders have the highest correlation with
          2 mileage and followed by displacement"""
```

Out[163]: 'From above heatmap and correalation coefficient its observable that number of cylinders have the highest correlation with\nmileage and followed by displacement'