

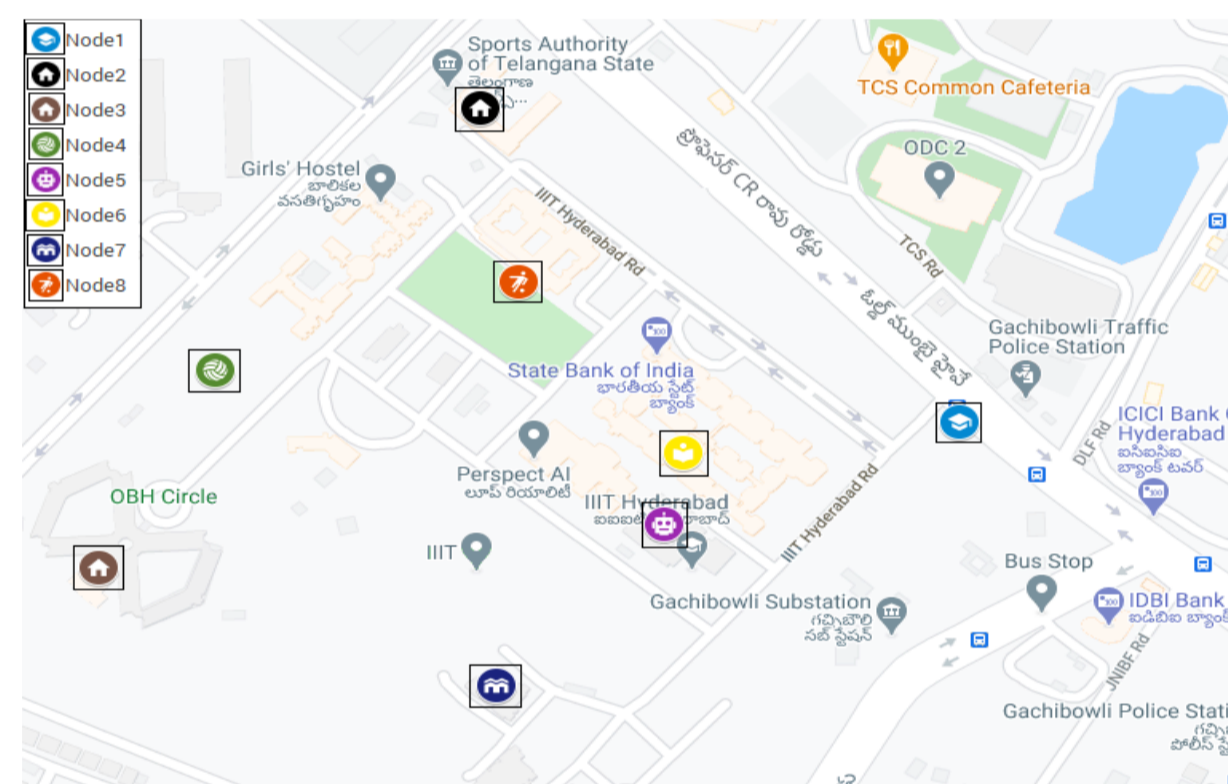
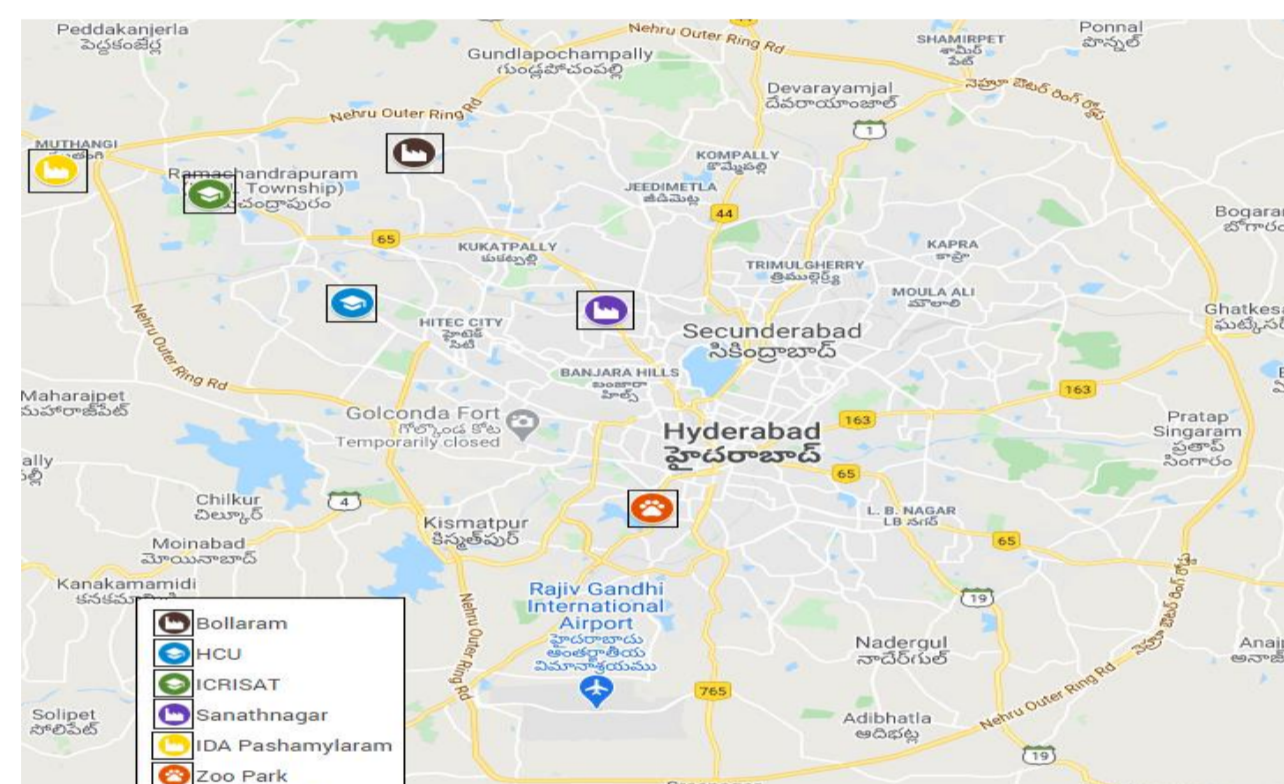


IoT Network Based Analysis of Variations in Particulate Matter due to COVID-19 Lockdown

PROBLEM STATEMENT

Was there any significant impact in the ambient Particulate Matter (PM) levels of Hyderabad due to the implementation of the nationwide lockdown from 24th March to 3rd May 2020?

TEST AREAS



Yearly variation PM2.5
(2020 w.r.t. 2019)

Stations	Change (Feb) (µgm-3)	Relative Change (Feb) (%)	Change (Apr) (µgm-3)	Relative Change (Apr) (%)
Bollaram	-3.263	-7.07	-12.371	-30.83
HCU	-2.347	-6.26	-8.168	-26.14
ICRISAT	2.042	5.11	-5.168	-15.33
Sanathnagar	0.099	0.20	-9.972	-22.86
IDA	1.584	3.53	-2.626	-7.58

Seasonal variation PM2.5
(Apr w.r.t. Feb)

Stations	Change (2019) (µgm-3)	Relative Change (2019) (%)	Change (2020) (µgm-3)	Relative Change (2020) (%)
Bollaram	-6.028	-13.06	-15.137	-35.29
HCU	-6.247	-16.66	-12.068	-34.34
ICRISAT	-6.248	-15.64	-13.459	-32.05
Sanathnagar	-5.570	-11.32	-15.641	-31.73
IDA	-10.123	-22.61	-14.334	-30.92

Welch's t-test

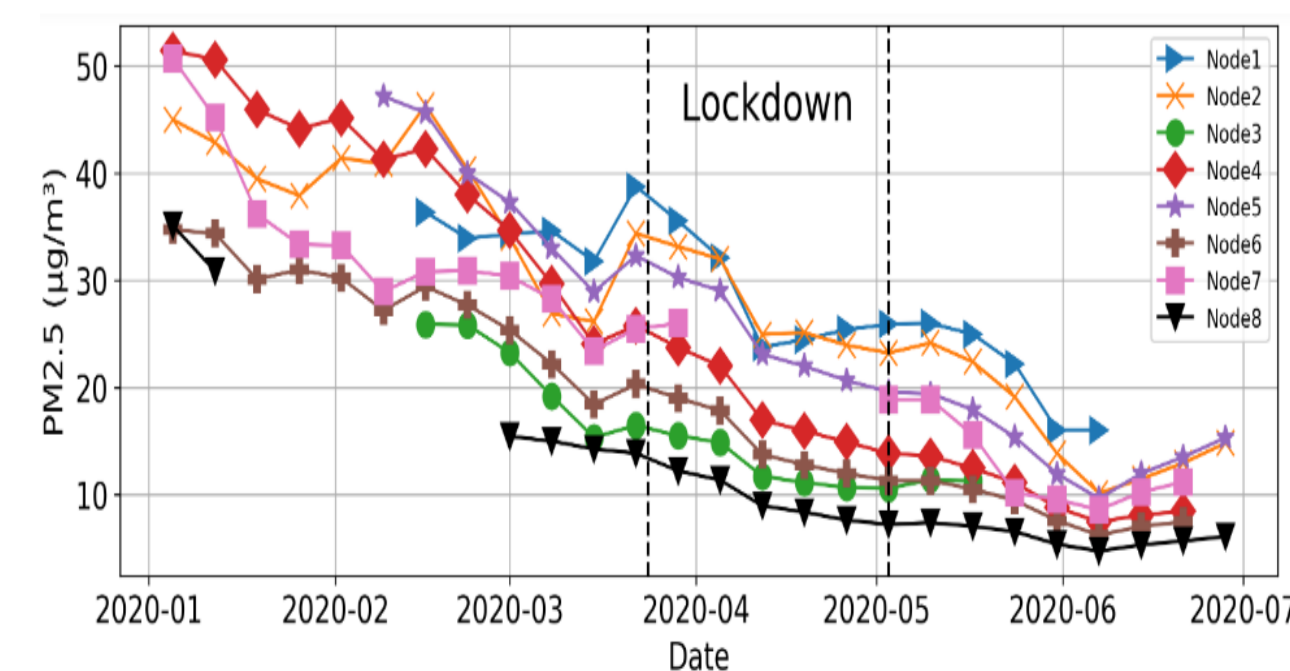
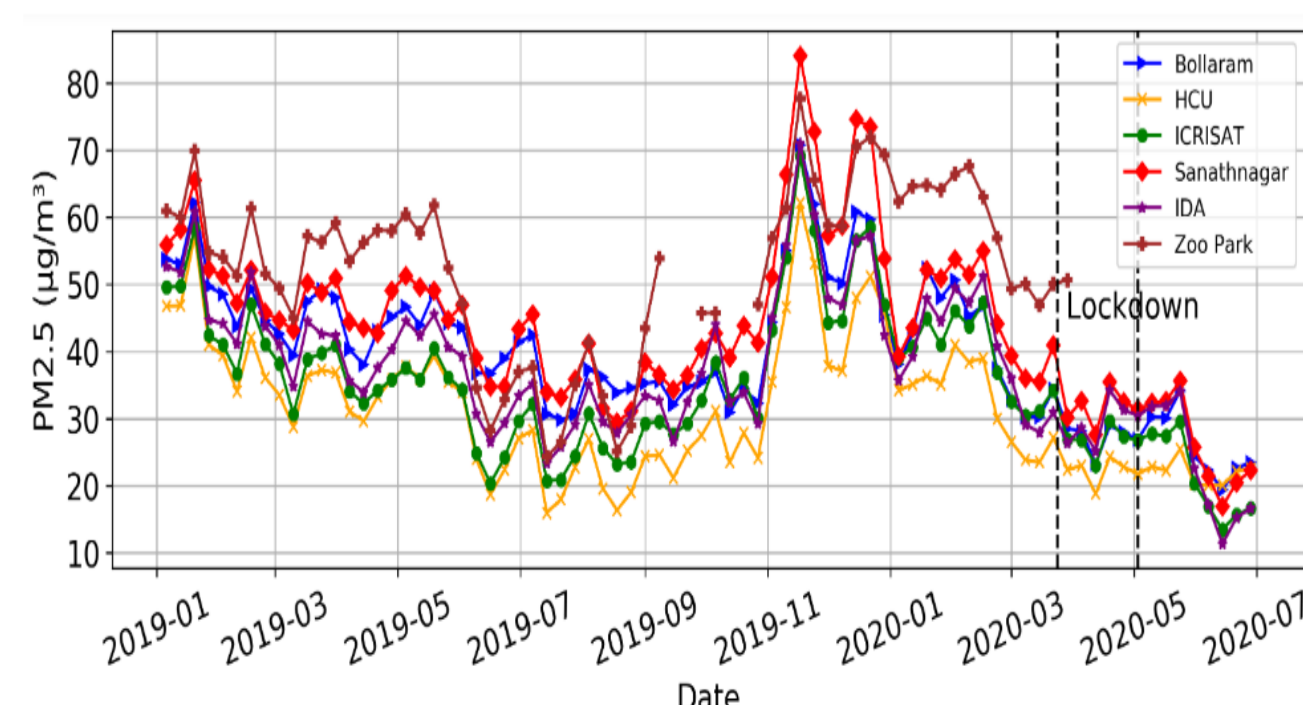
Stations	t-value (PM2.5)	p-value (PM2.5)	t-value (PM10)	p-value (PM10)
Bollaram	-8.043	2.38e-15	-9.597	5.60e-21
HCU	-3.862	0.00011	-7.331	4.88e-13
ICRISAT	-5.455	6.26e-08	-7.050	3.62e-12
Sanathnagar	-7.663	4.81e-14	-	-
IDA	-2.039	0.0417	-5.817	8.60e-09

Pearson's r	Node1	Node2	Node3	Node4	Node5	Node6	Node7
PM2.5	-0.67	-0.58	-0.80	-0.81	-0.37	-0.85	-0.74
PM10	-0.86	-0.64	-0.87	-0.80	-0.42	-0.83	-0.74

SPECIFIC CONTRIBUTIONS OF THE STUDY

Two datasets have been used for this analysis: 1. CPCB stations (1.5 years), 2. IIITH IoT network (6 months)

Central Moving Averages (Window = 3 weeks)



Differential analyses are done on the data to understand the effect of lockdown on PM values by factoring in the yearly and seasonal variations.

CONCLUSION

1. Yearly and seasonal trend analysis and t-test (CPCB data): Consistent decrease in PM values across all nodes.
2. Similar trend observed in the IIITH PM monitors.
3. Pearson's correlation (IIITH data) : Strong negative correlation between temperature and PM, implying not all decrease in PM values can be attributed due to the lockdown.
4. Considerable variation in PM values over small area of IIITH highlights the importance of dense deployment of IoT nodes

REFERENCE

[1] S. Deb, C. Rajashekar Reddy, S. Chaudhari, K. Vemuri, K.S. Rajan, "IoT Network Based Analysis of Variations in PM due to COVID-19 Lockdown", IEEE WF-IoT 2021 (Submitted)