Univariate Time Series Models for Monthly $PM_{2.5}$

Model Name	Stat.	Train	Validation	Test	Parameters	MAPE Train + Test
Naive Model Last observed value	NS	2014-2019	-	2020-2021	-	0.165
Seasonal Naive Model Last year's values	NS	2014-2019	-	2020-2021	-	0.170
Simple Average Model Mean of train set	NS	2014-2019	-	2020-2021	-	0.289
Simple Exponential Smooting model	NS	2014-2019	-	2020-2021	-	0.173
Holt Winter's Exponential Smoothing	NS	2014-2019	-	2020-2021	-	0.110
ARMA Loop for p & q	S	2014-2018	2019-2020	2021	(p,q) = (0,2)	1.405
ARIMA Loop for p, d, q	NS	2014-2018	2019-2020	2021	(p,d,q) = (4,2,5) Mape = 0.18	0.113
ARIMA TimeSeriesSplit Forecast one month 24 splits	NS	Begins with 2014-2018 Increase one month	1 month begins from 2019 Jan.	2021	(p,d,q) = (3,2,2) Mape = 0.10	0.173
ARIMA TimeSeriesSplit Forecast 6 months 4 splits	NS	Begins with 2014-2018 Increase 6 months	6 months begins from 2019 Jan-2019 Jun	2021	(p,d,q) = (0,2,5) Mape = 0.15	0.156
ARIMA auto_ARIMA	NS	2014-2020	-	2021	(p,d,q) = (3,2,0)	0.139
SARIMA Loop for p, d, q and ps, ds, qs	NS	2014-2018	2019-2020	2021	(p,d,q) = (1,2,2) (ps,ds,qs,s) = (1,1,0,12)	.098

SARIMA TimeSeriesSplit Forecast one month 24 splits	NS	Begins with 2014-2018 Increase one month	1 month begins from 2019 Jan.	2021	(p,d,q) = (5,2,1) (ps,ds,qs,s) = (0,1,1,12)	.118
SARIMA TimeSeriesSplit Forecast 6 months 4 splits	NS	Begins with 2014-2018 Increase 6 months	6 months begins from 2019 Jan-2019 Jun	2021	(p,d,q) = (0,2,1) (ps,ds,qs,s) = (1,1,1,12)	.113
SARIMA auto_ARIMA	NS	2014-2020	-	2021	(p,d,q) = (1, 0,0) (ps,ds,qs,s) = (1,0,0,12)	0.154
FbProphet Default Setting	NS	2014-2020	-	2021	-	0.162
FbProphet HP Tuning just one validation set	NS	2014-2018	2019-2020	2021	changepoint_prior_scale': 0.5, 'n_changepoints': 200, 'seasonality_mode': 'additive	0.144
FbProphet HP Tuning TimeSeriesSplit Forecast one month	NS	Begins with 2014-2018 Increase one month	1 month begins from 2019 Jan.	2021	Changepoint_prior_scale: 0.5 n_changepoints:50 seasonality_mode:multip	0.148
FbProphet HP Tuning TimeSeriesSplit Forecast 6 months	NS	Begins with 2014-2018 Increase 6 months	6 month begins from 2019 Jan.	2021	changepoint_prior_scale = 0.1, n_changepoints = 50, seasonality_mode = 'additive'	0.108
PyCaret	NS	2014-2019	-	2020-2021	-	0.173
LSTM	NS	2014-2019	-	2020-2021	-	0.27