CSE523: Machine Learning

Project Report Week- 8

➢ Team name.: **Tech_mak**

➢ Name & Roll no.:

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➢ Tasks Performed in the week

- Update dataset with the new data of covid-19 cases of India
- Implement Autoregression algorithm (AR) using python library
- Implement Auto Regressive Moving Average (ARMA) algorithm using python library and plot the predicted value for the following columns
    - Daily Confirm Cases
    - Daily Deaths
- Implement Auto Regressive Integrated Moving Average (ARIMA) algorithm using python library and plot the predicted value of the following columns
    - Daily Confirm Cases
    - Daily Deaths
- Get the summary of the both algorithms Auto Regressive Moving Average (ARMA) and Auto Regressive Moving Average (ARMA)
- Get the difference between accuracy of ARIMA and ARMA for the Daily Confirm cases of the India

➢ Outcomes of the tasks performed

- Updated dataset with the latest values of Daily Cases

❖ Auto Regressive Moving Average (ARMA)

- Output Summary of the ARMA model on Daily Confirm Cases

ARMA Model Results

Dep. Variable:	y	No. Observations:	389
Model:	ARMA(5, 3)	Log Likelihood	207.160
Method:	css-mle	S.D. of innovations	0.140
Date:	Tue, 06 Apr 2021	AIC	-394.320
Time:	08:37:04	BIC	-354.684
Sample:	0	HQIC	-378.607

	coef	std err	z	P>|z|	[0.025	0.975]
const	7.1543	4.179	1.712	0.088	-1.036	15.345
ar.L1.y	0.4159	0.161	2.585	0.010	0.101	0.731
ar.L2.y	-0.2897	0.100	-2.897	0.004	-0.486	-0.094
ar.L3.y	0.7850	0.091	8.633	0.000	0.607	0.963
ar.L4.y	0.2683	0.155	1.731	0.084	-0.035	0.572
ar.L5.y	-0.1810	0.054	-3.366	0.001	-0.286	-0.076
ma.L1.y	0.4766	0.160	2.983	0.003	0.163	0.790
ma.L2.y	0.9930	0.057	17.301	0.000	0.880	1.105
ma.L3.y	0.1481	0.154	0.964	0.336	-0.153	0.449

Roots

	Real	Imaginary	Modulus	Frequency
AR.1	-0.2115	-0.9841j	1.0066	-0.2837
AR.2	-0.2115	+0.9841j	1.0066	0.2837
AR.3	1.0006	-0.0000j	1.0006	-0.0000
AR.4	-1.9256	-0.0000j	1.9256	-0.5000
AR.5	2.8302	-0.0000j	2.8302	-0.0000
MA.1	-0.1695	-1.0158j	1.0299	-0.2763
MA.2	-0.1695	+1.0158j	1.0299	0.2763
MA.3	-6.3673	-0.0000j	6.3673	-0.5000

- Output Summary of the ARMA model on Daily Deaths

ARMA Model Results

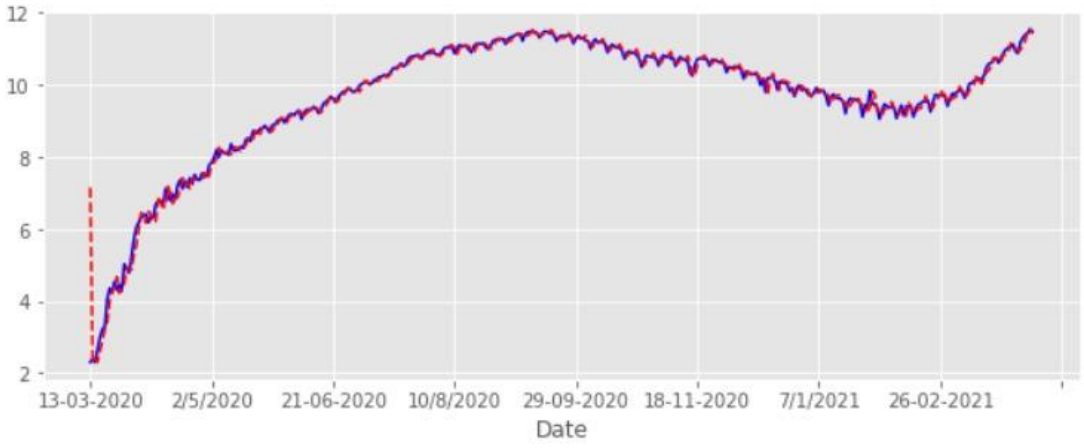
Dep. Variable:	y	No. Observations:	373
Model:	ARMA(1, 1)	Log Likelihood	69.769
Method:	css-mle	S.D. of innovations	0.199
Date:	Tue, 06 Apr 2021	AIC	-131.537
Time:	08:31:33	BIC	-115.851
Sample:	0	HQIC	-125.308

	coef	std err	z	P>|z|	[0.025	0.975]
const	4.7747	1.401	3.409	0.001	2.030	7.520
ar.L1.y	0.9981	0.002	450.072	0.000	0.994	1.002
ma.L1.y	-0.5140	0.044	-11.779	0.000	-0.600	-0.428

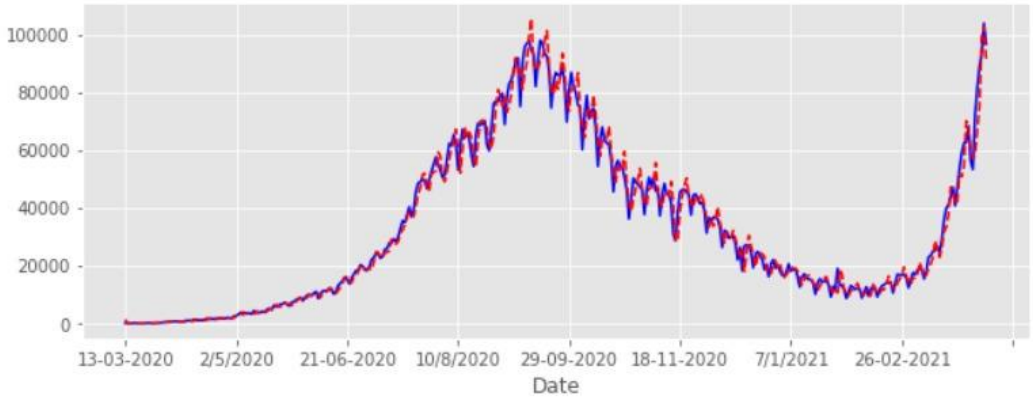
Roots

	Real	Imaginary	Modulus	Frequency
AR.1	1.0019	+0.0000j	1.0019	0.0000
MA.1	1.9454	+0.0000j	1.9454	0.0000

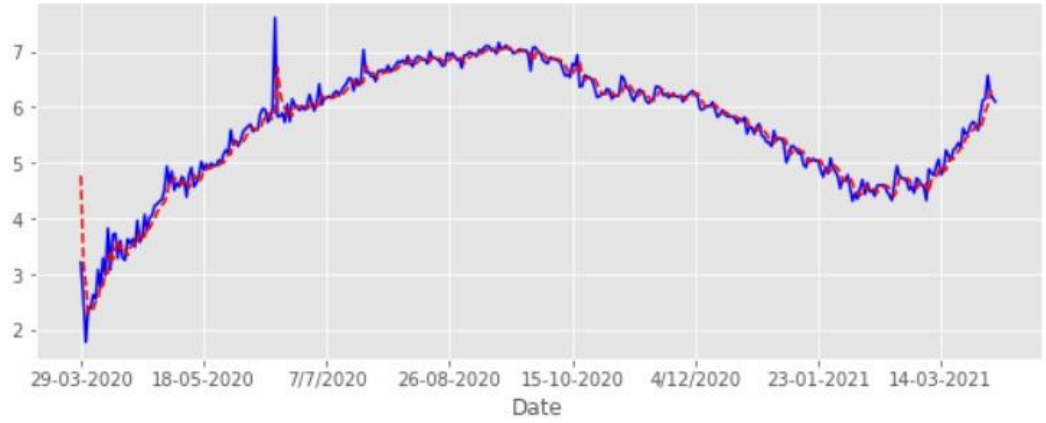
- Implement ARMA on log value Daily confirm cases



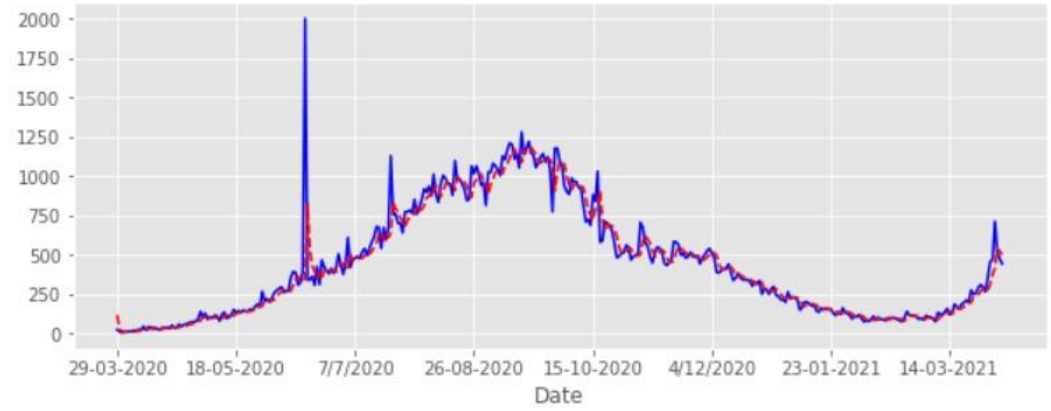
- Output of ARMA algorithm on Daily confirm cases (After converting from the log values)



- Implement ARMA on log value Daily deaths



- Output of ARMA algorithm on Daily confirm cases (After converting form the log values)



❖ Auto Regressive Integrated Moving Average (ARIMA)

- Output Summary of the ARMA model on Daily Confirm Cases

ARIMA Model Results

Dep. Variable:	D.y	No. Observations:	388
Model:	ARIMA(5, 1, 3)	Log Likelihood	223.967
Method:	css-mle	S.D. of innovations	0.134
Date:	Tue, 06 Apr 2021	AIC	-427.934
Time:	08:40:11	BIC	-388.324
Sample:	1	HQIC	-412.229

	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0574	0.045	1.283	0.200	-0.030	0.145
ar.L1.D.y	0.4266	0.054	7.961	0.000	0.322	0.532
ar.L2.D.y	-0.4926	0.055	-8.939	0.000	-0.601	-0.385
ar.L3.D.y	0.8817	0.040	21.989	0.000	0.803	0.960
ar.L4.D.y	0.1644	0.056	2.961	0.003	0.056	0.273
ar.L5.D.y	0.0058	0.053	0.109	0.914	-0.098	0.110
ma.L1.D.y	-0.6334	0.017	-37.852	0.000	-0.666	-0.601
ma.L2.D.y	0.6990	nan	nan	nan	nan	nan
ma.L3.D.y	-0.9502	0.005	-198.950	0.000	-0.960	-0.941

Roots

	Real	Imaginary	Modulus	Frequency
AR.1	1.0051	-0.0000j	1.0051	-0.0000
AR.2	-0.2016	-0.9876j	1.0080	-0.2821
AR.3	-0.2016	+0.9876j	1.0080	0.2821
AR.4	-8.0694	-0.0000j	8.0694	-0.5000
AR.5	-21.0537	-0.0000j	21.0537	-0.5000
MA.1	-0.1584	-0.9874j	1.0000	-0.2753
MA.2	-0.1584	+0.9874j	1.0000	0.2753
MA.3	1.0524	-0.0000j	1.0524	-0.0000

- Output Summary of the ARIMA model on Daily Deaths

ARIMA Model Results

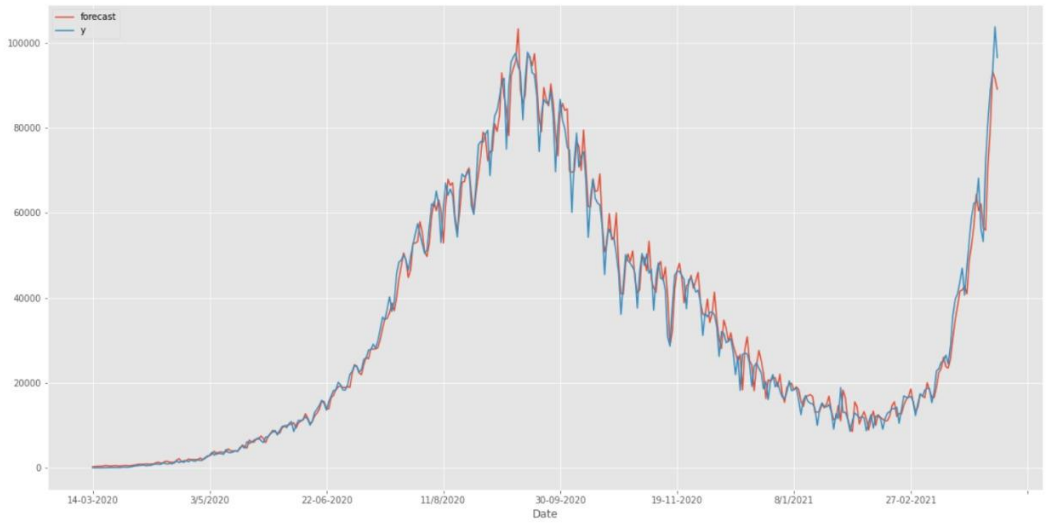
Dep. Variable:	D.y	No. Observations:	372
Model:	ARIMA(1, 1, 1)	Log Likelihood	-2294.436
Method:	css-mle	S.D. of innovations	115.348
Date:	Tue, 06 Apr 2021	AIC	4596.872
Time:	09:14:15	BIC	4612.547
Sample:	1	HQIC	4603.097

	coef	std err	z	P>|z|	[0.025	0.975]
const	1.2334	1.693	0.729	0.467	-2.085	4.551
ar.L1.D.y	0.0379	0.065	0.580	0.562	-0.090	0.166
ma.L1.D.y	-0.7296	0.039	-18.771	0.000	-0.806	-0.653

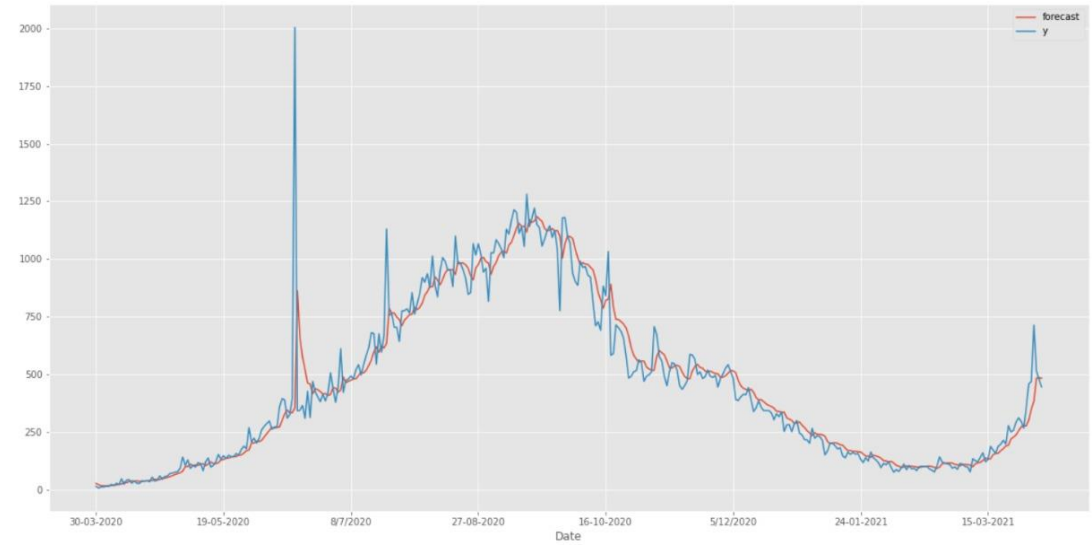
Roots

	Real	Imaginary	Modulus	Frequency
AR.1	26.3863	+0.0000j	26.3863	0.0000
MA.1	1.3705	+0.0000j	1.3705	0.0000

- Output of ARIMA algorithm on Daily confirm cases



- Output of ARIMA algorithm on Daily confirm cases



➢ Tasks to be performed in the upcoming week

- Prepare Final report
- Commit codes and output on Git-hub repository
- Prepare End-semester Presentation