

LAMPIRAN

LAMPIRAN 1. Data penyebaran covid-19 di Indonesia

Tanggal	Kasus Positif (orang)	Kasus Sembuh (orang)	Kasus Meninggal (orang)
2020-10-01	4174	3540	116
2020-10-02	4317	2853	116
2020-10-03	4007	3712	83
2020-10-04	3992	3401	96
2020-10-05	3622	4140	102
2020-10-06	4056	3844	121
2020-10-07	4538	3854	98
2020-10-08	4850	3769	108
2020-10-09	4094	3607	97
2020-10-10	4294	3814	88
2020-10-11	4497	3546	79
2020-10-12	3267	3492	91
2020-10-13	3906	4777	92
2020-10-14	4127	4555	129
2020-10-15	4411	5810	112
2020-10-16	4301	3883	79
2020-10-17	4301	4048	84
2020-10-18	4105	3732	80
2020-10-19	3373	3919	106

2020-10-20	3602	4410	117
2020-10-21	4267	3856	123
2020-10-22	4432	3497	102
2020-10-23	4369	4094	118
2020-10-24	4070	4119	128
2020-10-25	3732	4545	94
2020-10-26	3222	3908	112
2020-10-27	3520	4576	101
2020-10-28	4029	3545	100
2020-10-29	3565	3985	89
2020-10-30	2897	4517	81
2020-10-31	3143	3506	87
2020-11-01	2696	4141	74
2020-11-02	2618	3624	101
2020-11-03	2973	3931	102
2020-11-04	3356	3785	113
2020-11-05	4065	3860	89
2020-11-06	3778	3563	94
2020-11-07	4262	3712	98
2020-11-08	3880	3881	74
2020-11-09	2853	3968	75
2020-11-10	3779	3475	72

2020-11-11	3770	3241	75
2020-11-12	4173	3102	97
2020-11-13	5444	3010	104
2020-11-14	5272	3000	111
2020-11-15	4106	3897	63
2020-11-16	3535	3452	85
2020-11-17	3807	3193	97
2020-11-18	4265	3711	110
2020-11-19	4798	4265	97
2020-11-20	4792	3940	78
2020-11-21	4998	3403	96
2020-11-22	4360	4233	110
2020-11-23	4442	4198	118
2020-11-24	4192	2927	109
2020-11-25	5534	4494	114
2020-11-26	4917	3842	127
2020-11-27	5828	3807	169
2020-11-28	5418	4527	125
2020-11-29	6267	3810	169
2020-11-30	4617	4725	130
2020-12-01	5092	4361	136
2020-12-02	5533	4001	118

2020-12-03	8369	3673	156
2020-12-04	5803	3625	124
2020-12-05	6027	4271	110
2020-12-06	6089	4322	151
2020-12-07	5754	4431	127
2020-12-08	5292	4295	133
2020-12-09	6058	3948	171
2020-12-10	6033	4530	165
2020-12-11	6310	4911	175
2020-12-12	6388	4490	142
2020-12-13	6189	4460	166
2020-12-14	5489	5121	137
2020-12-15	6120	5699	155
2020-12-16	6725	5328	137
2020-12-17	7354	4995	142
2020-12-18	6689	5016	124
2020-12-19	7751	4265	145
2020-12-20	6982	5551	221
2020-12-21	6848	5073	205
2020-12-22	6347	5838	172
2020-12-23	7514	5981	151
2020-12-24	7199	5277	181
2020-12-25	7259	6324	258
2020-12-26	6740	6389	147
2020-12-27	6528	6983	243
2020-12-28	5854	6302	215
2020-12-29	7903	6805	251
2020-12-30	8002	6958	241

2020-12-31	8074	7356	194
2021-01-01	8072	6839	191
2021-01-02	7203	7582	226
2021-01-03	6877	6419	179
2021-01-04	6753	7166	177
2021-01-05	7445	6643	198
2021-01-06	8854	6767	187
2021-01-07	9321	6924	224
2021-01-08	10617	7446	233
2021-01-09	10046	6628	194
2021-01-10	9640	7513	182
2021-01-11	8692	7715	214
2021-01-12	10047	7068	302
2021-01-13	11278	7657	306
2021-01-14	11557	7741	295
2021-01-15	12818	7491	238
2021-01-16	14224	8662	283
2021-01-17	11287	9102	220
2021-01-18	9086	9475	295
2021-01-19	10365	8013	308
2021-01-20	12568	9755	267
2021-01-21	11703	9087	346
2021-01-22	13632	8357	250
2021-01-23	12191	9912	211
2021-01-24	11788	7751	171
2021-01-25	9994	10678	297
2021-01-26	13094	10868	336
2021-01-27	11948	10974	387
2021-01-28	13695	10792	476
2021-01-29	13802	10138	187

2021-01-30	14518	10242	210
2021-01-31	12001	10719	270
2021-02-01	10994	10461	279
2021-02-02	10379	12848	304
2021-02-03	11984	9135	189
2021-02-04	11434	11641	231
2021-02-05	11749	9674	201
2021-02-06	12156	12204	191
2021-02-07	10827	10806	163
2021-02-08	8242	13038	207
2021-02-09	8700	10424	213
2021-02-10	8776	9520	191
2021-02-11	8435	10145	214
2021-02-12	9869	11000	275
2021-02-13	8844	11919	280
2021-02-14	6765	9237	247
2021-02-15	6462	6792	184
2021-02-16	10029	7609	229
2021-02-17	9687	8002	192
2021-02-18	9039	10546	181
2021-02-19	10614	10783	183
2021-02-20	8054	9835	164
2021-02-21	7300	8236	173
2021-02-22	10180	9918	202

2021-02-23	9775	7996	323
2021-02-24	7533	7735	240
2021-02-25	8493	8686	264
2021-02-26	8232	7261	268
2021-02-27	6208	7382	195
2021-02-28	5560	6649	185
2021-03-01	6680	9212	159
2021-03-02	5712	8948	193
2021-03-03	6808	9053	203
2021-03-04	7264	6440	176
2021-03-05	6971	6331	129
2021-03-06	5767	6823	128
2021-03-07	5826	5146	112
2021-03-08	6894	8725	281
2021-03-09	6389	7496	210
2021-03-10	5633	5556	175
2021-03-11	5144	8170	117
2021-03-12	6412	6851	180
2021-03-13	4607	6016	100
2021-03-14	4714	5647	97
2021-03-15	5589	6830	147
2021-03-16	5414	7716	180

2021-03-17	6825	9010	162
2021-03-18	6570	6285	227
2021-03-19	6279	6007	197
2021-03-20	5656	5760	108
2021-03-21	4396	6065	103
2021-03-22	5744	7177	161
2021-03-23	5297	6954	154
2021-03-24	5227	7622	118
2021-03-25	6107	4656	98
2021-03-26	4982	5679	85
2021-03-27	4461	4243	198
2021-03-28	4083	4279	85
2021-03-29	5008	5418	132
2021-03-30	4682	5877	173
2021-03-31	5937	5635	104

LAMPIRAN 2. Hasil pengujian peramalan data kasus positif bulan Oktober 2020 – Maret 2021

Tanggal	Data Aktual (orang)	Data Peramalan (orang)
2020-10-01	4174	4180
2020-10-02	4317	4328
2020-10-03	4007	4019
2020-10-04	3992	4005

2020-10-05	3622	3634
2020-10-06	4056	4069
2020-10-07	4538	4553
2020-10-08	4850	4185
2020-10-09	4094	4623
2020-10-10	4294	4102
2020-10-11	4497	4175
2020-10-12	3267	3923
2020-10-13	3906	4104
2020-10-14	4127	4504
2020-10-15	4411	4158
2020-10-16	4301	4114
2020-10-17	4301	4051
2020-10-18	4105	4174
2020-10-19	3373	3542
2020-10-20	3602	4014
2020-10-21	4267	4262
2020-10-22	4432	4223
2020-10-23	4369	4143
2020-10-24	4070	4111
2020-10-25	3732	4032
2020-10-26	3222	3307
2020-10-27	3520	3721

2020-10-28	4029	4133
2020-10-29	3565	4094
2020-10-30	2897	3720
2020-10-31	3143	3205
2020-11-01	2696	3047
2020-11-02	2618	2458
2020-11-03	2973	2818
2020-11-04	3356	3268
2020-11-05	4065	3197
2020-11-06	3778	3319
2020-11-07	4262	3517
2020-11-08	3880	3614
2020-11-09	2853	3348
2020-11-10	3779	3556
2020-11-11	3770	4160
2020-11-12	4173	4153
2020-11-13	5444	3794
2020-11-14	5272	4602
2020-11-15	4106	4505
2020-11-16	3535	3721
2020-11-17	3807	4377
2020-11-18	4265	4573
2020-11-19	4798	4755

2020-11-20	4792	4843
2020-11-21	4998	4639
2020-11-22	4360	4153
2020-11-23	4442	3654
2020-11-24	4192	4681
2020-11-25	5534	5041
2020-11-26	4917	5744
2020-11-27	5828	5487
2020-11-28	5418	5557
2020-11-29	6267	4759
2020-11-30	4617	4855
2020-12-01	5092	5203
2020-12-02	5533	6127
2020-12-03	8369	6083
2020-12-04	5803	7555
2020-12-05	6027	6663
2020-12-06	6089	6044
2020-12-07	5754	5012
2020-12-08	5292	5854
2020-12-09	6058	6560
2020-12-10	6033	7368
2020-12-11	6310	6287
2020-12-12	6388	6306

2020-12-13	6189	6113
2020-12-14	5489	5239
2020-12-15	6120	5510
2020-12-16	6725	6729
2020-12-17	7354	7587
2020-12-18	6689	7251
2020-12-19	7751	7063
2020-12-20	6982	7099
2020-12-21	6848	6083
2020-12-22	6347	6724
2020-12-23	7514	7485
2020-12-24	7199	8399
2020-12-25	7259	7561
2020-12-26	6740	7809
2020-12-27	6528	6905
2020-12-28	5854	5998
2020-12-29	7903	5922
2020-12-30	8002	7753
2020-12-31	8074	8469
2021-01-01	8072	8158
2021-01-02	7203	8333
2021-01-03	6877	7544
2021-01-04	6753	6520

2021-01-05	7445	7205
2021-01-06	8854	7814
2021-01-07	9321	8689
2021-01-08	10617	8864
2021-01-09	10046	9551
2021-01-10	9640	9529
2021-01-11	8692	8944
2021-01-12	10047	9720
2021-01-13	11278	10906
2021-01-14	11557	11587
2021-01-15	12818	11897
2021-01-16	14224	11864
2021-01-17	11287	12475
2021-01-18	9086	11148
2021-01-19	10365	11537
2021-01-20	12568	12237
2021-01-21	11703	12826
2021-01-22	13632	12933
2021-01-23	12191	13110
2021-01-24	11788	11436
2021-01-25	9994	10439
2021-01-26	13094	11673
2021-01-27	11948	13990

2021-01-28	13695	13233
2021-01-29	13802	14523
2021-01-30	14518	13659
2021-01-31	12001	12892
2021-02-01	10994	11078
2021-02-02	10379	13072
2021-02-03	11984	12721
2021-02-04	11434	12992
2021-02-05	11749	12990
2021-02-06	12156	12208
2021-02-07	10827	10735
2021-02-08	8242	9575
2021-02-09	8700	10046
2021-02-10	8776	10363
2021-02-11	8435	9884
2021-02-12	9869	9703
2021-02-13	8844	9662
2021-02-14	6765	8145
2021-02-15	6462	6396
2021-02-16	10029	7051
2021-02-17	9687	8920
2021-02-18	9039	9416
2021-02-19	10614	10121

2021-02-20	8054	10000
2021-02-21	7300	7897
2021-02-22	10180	6788
2021-02-23	9775	10008
2021-02-24	7533	9974
2021-02-25	8493	8892
2021-02-26	8232	9745
2021-02-27	6208	8286
2021-02-28	5560	6544
2021-03-01	6680	6204
2021-03-02	5712	6835
2021-03-03	6808	5953
2021-03-04	7264	6481
2021-03-05	6971	7315
2021-03-06	5767	6310
2021-03-07	5826	5480
2021-03-08	6894	6014
2021-03-09	6389	6425
2021-03-10	5633	6499
2021-03-11	5144	6307
2021-03-12	6412	6003
2021-03-13	4607	5354
2021-03-14	4714	4702

2021-03-15	5589	5116
2021-03-16	5414	5127
2021-03-17	6825	5120
2021-03-18	6570	5895
2021-03-19	6279	6826
2021-03-20	5656	5485
2021-03-21	4396	5415
2021-03-22	5744	5605
2021-03-23	5297	5453
2021-03-24	5227	5648
2021-03-25	6107	5265
2021-03-26	4982	5891
2021-03-27	4461	4697
2021-03-28	4083	4217
2021-03-29	5008	4905
2021-03-30	4682	4687
2021-03-31	5937	4839

LAMPIRAN 3. Hasil pengujian peramalan data kasus sembuh bulan Oktober 2020 – Maret 2021

Tanggal	Data Aktual (orang)	Data Peramalan (orang)
2020-10-01	3540	3582
2020-10-02	2853	2907

2020-10-03	3712	3798
2020-10-04	3401	3487
2020-10-05	4140	4250
2020-10-06	3844	3947
2020-10-07	3854	3957
2020-10-08	3769	3629
2020-10-09	3607	2999
2020-10-10	3814	4272
2020-10-11	3546	3789
2020-10-12	3492	4543
2020-10-13	4777	3859
2020-10-14	4555	4284
2020-10-15	5810	4103
2020-10-16	3883	3983
2020-10-17	4048	5055
2020-10-18	3732	4340
2020-10-19	3919	4964
2020-10-20	4410	4467
2020-10-21	3856	4422
2020-10-22	3497	4042
2020-10-23	4094	3017
2020-10-24	4119	4318
2020-10-25	4545	3963

2020-10-26	3908	5045
2020-10-27	4576	4599
2020-10-28	3545	4512
2020-10-29	3985	3966
2020-10-30	4517	3292
2020-10-31	3506	4554
2020-11-01	4141	3934
2020-11-02	3624	4639
2020-11-03	3931	4324
2020-11-04	3785	3995
2020-11-05	3860	3836
2020-11-06	3563	3296
2020-11-07	3712	3839
2020-11-08	3881	3697
2020-11-09	3968	4224
2020-11-10	3475	4260
2020-11-11	3241	3789
2020-11-12	3102	3510
2020-11-13	3010	2876
2020-11-14	3000	3250
2020-11-15	3897	3082
2020-11-16	3452	3763
2020-11-17	3193	3701

2020-11-18	3711	3362
2020-11-19	4265	3453
2020-11-20	3940	3314
2020-11-21	3403	3929
2020-11-22	4233	3783
2020-11-23	4198	4243
2020-11-24	2927	4292
2020-11-25	4494	3697
2020-11-26	3842	4026
2020-11-27	3807	3452
2020-11-28	4527	3833
2020-11-29	3810	4301
2020-11-30	4725	4339
2020-12-01	4361	4430
2020-12-02	4001	4607
2020-12-03	3673	4267
2020-12-04	3625	3570
2020-12-05	4271	3855
2020-12-06	4322	4077
2020-12-07	4431	4503
2020-12-08	4295	4359
2020-12-09	3948	4476
2020-12-10	4530	4161

2020-12-11	4911	3883
2020-12-12	4490	4672
2020-12-13	4460	4653
2020-12-14	5121	4905
2020-12-15	5699	4875
2020-12-16	5328	5343
2020-12-17	4995	5347
2020-12-18	5016	4793
2020-12-19	4265	5161
2020-12-20	5551	4856
2020-12-21	5073	5562
2020-12-22	5838	5308
2020-12-23	5981	5568
2020-12-24	5277	5710
2020-12-25	6324	5157
2020-12-26	6389	5829
2020-12-27	6983	6354
2020-12-28	6302	7029
2020-12-29	6805	6825
2020-12-30	6958	6885
2020-12-31	7356	6804
2021-01-01	6839	6774
2021-01-02	7582	6975

2021-01-03	6419	7595
2021-01-04	7166	7423
2021-01-05	6643	7489
2021-01-06	6767	7222
2021-01-07	6924	6961
2021-01-08	7446	6629
2021-01-09	6628	7176
2021-01-10	7513	7117
2021-01-11	7715	7662
2021-01-12	7068	7792
2021-01-13	7657	7611
2021-01-14	7741	7589
2021-01-15	7491	7398
2021-01-16	8662	7513
2021-01-17	9102	8281
2021-01-18	9475	9045
2021-01-19	8013	9282
2021-01-20	9755	9011
2021-01-21	9087	9303
2021-01-22	8357	8932
2021-01-23	9912	8933
2021-01-24	7751	9647
2021-01-25	10678	9270

2021-01-26	10868	9712
2021-01-27	10974	1070
2021-01-28	10792	1070
2021-01-29	10138	1038
2021-01-30	10242	1077
2021-01-31	10719	1059
2021-02-01	10461	1153
2021-02-02	12848	1093
2021-02-03	9135	1220
2021-02-04	11641	1082
2021-02-05	9674	1072
2021-02-06	12204	1073
2021-02-07	10806	1142
2021-02-08	13038	1196
2021-02-09	10424	1254
2021-02-10	9520	1164
2021-02-11	10145	1097
2021-02-12	11000	1002
2021-02-13	11919	1108
2021-02-14	9237	1127
2021-02-15	6792	1131
2021-02-16	7609	9277
2021-02-17	8002	8477

2021-02-18	10546	8443
2021-02-19	10783	8851
2021-02-20	9835	1018
2021-02-21	8236	9623
2021-02-22	9918	9548
2021-02-23	7996	9692
2021-02-24	7735	8997
2021-02-25	8686	8919
2021-02-26	7261	8362
2021-02-27	7382	8116
2021-02-28	6649	7352
2021-03-01	9212	7527
2021-03-02	8948	7981
2021-03-03	9053	8368
2021-03-04	6440	9190
2021-03-05	6331	7566
2021-03-06	6823	7257
2021-03-07	5146	6638
2021-03-08	8725	6613
2021-03-09	7496	7165
2021-03-10	5556	7243
2021-03-11	8170	6671
2021-03-12	6851	6888

2021-03-13	6016	7132
2021-03-14	5647	6159
2021-03-15	6830	6890
2021-03-16	7716	6405
2021-03-17	9010	6682
2021-03-18	6285	8146
2021-03-19	6007	6860
2021-03-20	5760	6658
2021-03-21	6065	5844
2021-03-22	7177	6924
2021-03-23	6954	6705
2021-03-24	7622	6651
2021-03-25	4656	7092
2021-03-26	5679	5707
2021-03-27	4243	5795
2021-03-28	4279	4864
2021-03-29	5418	5369
2021-03-30	5877	5110
2021-03-31	5635	5324

LAMPIRAN 4. Hasil pengujian peramalan data kasus meninggal bulan Oktober 2020 – Maret 2021

Tanggal	Data Aktual (orang)	Data Peramalan (orang)
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2020-10-01	116	114
2020-10-02	116	114
2020-10-03	83	814
2020-10-04	96	940
2020-10-05	102	997
2020-10-06	121	118
2020-10-07	98	958
2020-10-08	108	113
2020-10-09	97	110
2020-10-10	88	744
2020-10-11	79	915
2020-10-12	91	910
2020-10-13	92	106
2020-10-14	129	809
2020-10-15	112	116
2020-10-16	79	113
2020-10-17	84	727
2020-10-18	80	858
2020-10-19	106	891
2020-10-20	117	111
2020-10-21	123	980
2020-10-22	102	118
2020-10-23	118	107

2020-10-24	128	856
2020-10-25	94	111
2020-10-26	112	115
2020-10-27	101	130
2020-10-28	100	104
2020-10-29	89	108
2020-10-30	81	990
2020-10-31	87	731
2020-11-01	74	802
2020-11-02	101	863
2020-11-03	102	103
2020-11-04	113	923
2020-11-05	89	104
2020-11-06	94	969
2020-11-07	98	792
2020-11-08	74	862
2020-11-09	75	927
2020-11-10	72	944
2020-11-11	75	784
2020-11-12	97	771
2020-11-13	104	846
2020-11-14	111	785
2020-11-15	63	877

2020-11-16	85	883
2020-11-17	97	955
2020-11-18	110	902
2020-11-19	97	101
2020-11-20	78	991
2020-11-21	96	785
2020-11-22	110	764
2020-11-23	118	104
2020-11-24	109	121
2020-11-25	114	112
2020-11-26	127	113
2020-11-27	169	116
2020-11-28	125	125
2020-11-29	169	114
2020-11-30	130	154
2020-12-01	136	157
2020-12-02	118	145
2020-12-03	156	137
2020-12-04	124	146
2020-12-05	110	119
2020-12-06	151	111
2020-12-07	127	135
2020-12-08	133	143

2020-12-09	171	135
2020-12-10	165	158
2020-12-11	175	158
2020-12-12	142	145
2020-12-13	166	144
2020-12-14	137	156
2020-12-15	155	162
2020-12-16	137	159
2020-12-17	142	155
2020-12-18	124	149
2020-12-19	145	120
2020-12-20	221	132
2020-12-21	205	167
2020-12-22	172	200
2020-12-23	151	188
2020-12-24	181	180
2020-12-25	258	178
2020-12-26	147	189
2020-12-27	243	184
2020-12-28	215	199
2020-12-29	251	218
2020-12-30	241	229
2020-12-31	194	249

2021-01-01	191	234
2021-01-02	226	183
2021-01-03	179	226
2021-01-04	177	194
2021-01-05	198	200
2021-01-06	187	195
2021-01-07	224	199
2021-01-08	233	216
2021-01-09	194	196
2021-01-10	182	211
2021-01-11	214	189
2021-01-12	302	214
2021-01-13	306	244
2021-01-14	295	284
2021-01-15	238	298
2021-01-16	283	239
2021-01-17	220	275
2021-01-18	295	247
2021-01-19	308	295
2021-01-20	267	290
2021-01-21	346	290
2021-01-22	250	315
2021-01-23	211	263

2021-01-24	171	249
2021-01-25	297	221
2021-01-26	336	274
2021-01-27	387	285
2021-01-28	476	347
2021-01-29	187	387
2021-01-30	210	280
2021-01-31	270	256
2021-02-01	279	284
2021-02-02	304	304
2021-02-03	189	294
2021-02-04	231	268
2021-02-05	201	224
2021-02-06	191	200
2021-02-07	163	206
2021-02-08	207	202
2021-02-09	213	220
2021-02-10	191	202
2021-02-11	214	214
2021-02-12	275	189
2021-02-13	280	210
2021-02-14	247	245
2021-02-15	184	271

2021-02-16	229	253
2021-02-17	192	226
2021-02-18	181	232
2021-02-19	182	196
2021-02-20	164	176
2021-02-21	173	171
2021-02-22	202	182
2021-02-23	323	208
2021-02-24	240	235
2021-02-25	264	257
2021-02-26	268	245
2021-02-27	195	236
2021-02-28	185	221
2021-03-01	159	222
2021-03-02	193	225
2021-03-03	203	185
2021-03-04	176	208
2021-03-05	129	185
2021-03-06	128	146
2021-03-07	112	139
2021-03-08	281	135
2021-03-09	210	225
2021-03-10	175	196

2021-03-11	117	198
2021-03-12	180	154
2021-03-13	100	151
2021-03-14	97	130
2021-03-15	147	139
2021-03-16	180	148
2021-03-17	162	143
2021-03-18	227	154
2021-03-19	197	181
2021-03-20	108	163
2021-03-21	103	142
2021-03-22	161	156
2021-03-23	154	167
2021-03-24	118	143
2021-03-25	98	140
2021-03-26	85	117
2021-03-27	198	868
2021-03-28	85	133
2021-03-29	132	144
2021-03-30	173	146
2021-03-31	104	137

LAMPIRAN 5. Tabel hasil peramalan ke depan data kasus positif, sembuh dan meninggal bulan April 2021 – Mei 2021

Tanggal	Kasus Positif (orang)	Kasus Sembuh (orang)	Kasus Meninggal (orang)
2021-04-01	5571	5192	129
2021-04-02	5459	5002	123
2021-04-03	4761	4946	119
2021-04-04	4320	4725	103
2021-04-05	5312	5566	135
2021-04-06	5022	5366	145
2021-04-07	5253	5200	124
2021-04-08	5488	4956	130
2021-04-09	5377	4775	124
2021-04-10	4679	4721	120
2021-04-11	4238	4510	103
2021-04-12	5229	5313	135
2021-04-13	4939	5122	145
2021-04-14	5171	4964	125
2021-04-15	5406	4730	130
2021-04-16	5294	4558	124
2021-04-17	4597	4506	120
2021-04-18	4156	4305	104
2021-04-19	5147	5071	136
2021-04-20	4857	4889	146

2021-04-21	5089	4738	126
2021-04-22	5324	4515	131
2021-04-23	5212	4350	125
2021-04-24	4515	4301	121
2021-04-25	4074	4109	105
2021-04-26	5065	4841	137
2021-04-27	4775	4666	147
2021-04-28	5006	4522	126
2021-04-29	5241	4310	132
2021-04-30	5130	4152	126
2021-05-01	4432	4105	122
2021-05-02	3991	3922	105
2021-05-03	4983	4620	138
2021-05-04	4692	4454	148
2021-05-05	4924	4317	127
2021-05-06	5159	4114	132
2021-05-07	5048	3963	126
2021-05-08	4350	3919	122
2021-05-09	3909	3744	106
2021-05-10	4900	4410	138
2021-05-11	4610	4252	149
2021-05-12	4842	4120	128
2021-05-13	5077	3926	133

2021-05-14	4965	3783	127
2021-05-15	4268	3740	123
2021-05-16	3827	3573	106
2021-05-17	4818	4209	139
2021-05-18	4528	4058	149
2021-05-19	4759	3933	128
2021-05-20	4995	3748	134
2021-05-21	4883	3611	128
2021-05-22	4185	3570	124
2021-05-23	3744	3411	107
2021-05-24	4736	4018	140
2021-05-25	4445	3873	150
2021-05-26	4677	3754	129
2021-05-27	4912	3577	135
2021-05-28	4801	3447	128
2021-05-29	4103	3408	124
2021-05-30	3662	3256	107
2021-05-31	4653	3835	140

LAMPIRAN 6. Source code pembuatan model dengan Python

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from scipy import stats
import statsmodels.api as sm
from statsmodels.tsa.stattools import adfuller
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
```

```
import statsmodels.api as sm
import statsmodels.tsa.statespace.tools as sts
import warnings
warnings.filterwarnings('ignore')
```

a. Input Data

```
uploaded = files.upload()
datacovid = pd.read_csv("data_fix.csv")
```

b. Transform to Time Series

```
length = len(data)

dateIndex = pd.date_range(data['Tanggal'][1], freq="D",
periods=length)

data.index = pd.Index(dateIndex)
```

c. Uji Stasioneritas Data

```
From statsmodels.tsa.stattools import adfuller
print ('Results of Dicky-Fuller Test Kasus Positif:')

dfctest = adfuller(datacovid['Kasus_Positif'],
autolag='AIC')

dfcoutput = pd.Series(dfctest[0:4], index = ['Test
Statistic', 'P=value', '#Lags Used', 'Number pf
Observations Use'])

for key,value in dfctest[4].items():

    dfcoutput['Critical value (%s)'%key] = value

print(dfcoutput)
```

d. Uji ACF dan PACF

```
From statsmodels.graphics.tsaplots import plot_acf,
plot_pacf

acf_plot = plot_acf(datacovid['Kasus_Positif'], lags=21)
```

```
pacf_plot = plot_acf(datacovid['Kasus_Positif'], lags=21)
```

e. Performa Algoritm *Holt Winters* pada Kasus Positif

```
Hwes = HWES (datacovid['Kasus_Positif'], trend = "mul",  
seasonal = "mul", seasonal_periods=7)  
  
Fitted = hwes.fit(optimized = False, smoothing_level = 0.4,  
smoothing_slope = 0.05, smoothing_seasonal = 0.25)  
  
Print(fitted.summary())  
  
Predict = fittec.predict(start = 0, end = 181)  
  
Print(predict)  
  
MAPE = np.mean(np.abs((datacovid['Kasus_Positif'] -  
predict) / datacovid['Kasus_Positif']))*100  
  
Print (MAPE, '%')
```

f. Performa Algoritm *Holt Winters* pada Kasus Sembuh

```
Hwes = HWES (datacovid['Kasus_Sembuh'], trend = "mul",  
seasonal = "mul", seasonal_periods=7)  
  
Fitted = hwes.fit(optimized = False, smoothing_level = 0.4,  
smoothing_slope = 0.03, smoothing_seasonal = 0.1)  
  
Print(fitted.summary())  
  
Predict = fittec.predict(start = 0, end = 181)  
  
Print(predict)  
  
MAPE = np.mean(np.abs((datacovid['Kasus_Sembuh'] - predict) /  
datacovid['Kasus_Sembuh']))*100  
  
Print (MAPE, '%')
```

g. Performa Algoritm *Holt Winters* pada Kasus Meninggal

```
Hwes = HWES (datacovid['Kasus_Meninggal'], trend = "mul",  
seasonal = "mul", seasonal_periods=7)  
  
Fitted = hwes.fit(optimized = False, smoothing_level = 0.4,  
smoothing_slope = 0.01, smoothing_seasonal = 0.1)  
  
Print(fitted.summary())  
  
Predict = fittec.predict(start = 0, end = 181)  
  
Print(predict)
```

```

MAPE = np.mean(np.abs((datacovid['Kasus_Meninggal'] -
predict)/ datacovid['Kasus_Meninggal']))*100

Print (MAPE, '%')

```

h. Peramalan Periode Kedepan

```

prediksi = fitted.predict(len(datacovid['Kasus_Positif'])-
180, len(datacovid['Kasus_Positif'])+60)

prediksi = fitted.predict(len(datacovid['Kasus_Sembuh'])-
180, len(datacovid['Kasus_Sembuh'])+60)

prediksi = fitted.predict(len(datacovid['Kasus_Meninggal'])-
180, len(datacovid['Kasus_Meninggal'])+60)

```

LAMPIRAN 7. Pembuatan *Prototype*

a. Template index.html

```

<div class="row" onload="myfunction()">

    <!-- MAIN VIEW -->

    <div class="col-md-3"></div>
    <div class="col-md-6">
        <div class="white-box">
            <div class="row">
                <h3 class="box-title m-b-
0">GUI Holt Winters</h3>
                <p class="text-muted m-b-30 font-
13"> Peramalan Kasus Covid-19 menggunakan Metode <i>Holt
Winters</i> </p>
                <form id="formUpload" class="form-
horizontal" action="." method="POST" enctype="multipart/form-
data">

                    {% csrf_token %}

                    <!-- INPUT DATASET -->
                    <div class="form-group col-sm-12">
                        <label class="col-sm-
12">Upload File Dataset <sub>.csv</sub></label>
                        <div class="col-sm-12">

```

```

        <div class="fileinput fileinput-
new input-group" data-provides="fileinput">
            <div class="form-
control" data-
trigger="fileinput"> <i class="glyphicon glyphicon-
file fileinput-exists"></i> <span class="fileinput-
filename"></span></div> <span class="input-group-
addon btn btn-default btn-file"> <span class="fileinput-
new">Select file</span> <span class="fileinput-
exists">Change</span>
                <input id="inputDataset" type=
"file" name="inputDataset" accept=".csv"> </span> <a href="#"
class="input-group-addon btn btn-default fileinput-
exists" data-dismiss="fileinput">Remove</a> </div>
            </div>
        </div>
        <!-- PARAMETER TREND SEASON -->
        <div class="col-sm-12">
            <!-- INPUT PARAMETER TREND -->
            <div class="col-sm-5">
                <div class="form-group">
                    <label class="control-
label">Trend</label>
                    <select class="form-
control" name="trend" id="trend">
                        <option value="add" selected>P
ilih Parameter</option>
                        <option value="add">Additive</
option>
                        <option value="mul">Multiplica
tive</option>
                    </select>
                </div>
            </div>
            <div class="col-sm-1"></div>
            <!-- INPUT PARAMETER SEASON -->
            <div class="col-sm-5">
                <div class="form-group">
                    <label class="control-
label">Season</label>
                    <select class="form-
control" name="season" id="season">

```



```

                                <option value="add" selected>P
ilih Parameter</option>                                <option value="add">Additive</
option>                                                <option value="mul">Multiplica
tive</option>
                                </select>
                                </div>
                                </div>
                                </div>
                                </div>
                                <!-- SMOOTHING -->
                                <div class="col-sm-12">
                                <!-- INPUT PARAMETER SMOOTHING ALPHA -
->
                                <div class="col-sm-3">
                                <div class="form-group">
                                <label class="control-
label">Smoothing Alpha</label>
                                <input value="0" type="number" na
me="alpha" id="alpha" class="form-
control" min="0" max="1" step="0.01" placeholder="0">
                                </div>
                                </div>
                                <div class="col-sm-1"></div>
                                <!-- INPUT PARAMETER SMOOTHING BETA --
>
                                <div class="col-sm-3">
                                <div class="form-group">
                                <label class="control-
label">Smoothing Beta</label>
                                <input value="0" type="number" na
me="beta" id="beta" class="form-
control" min="0" max="1" step="0.01" placeholder="0">
                                </div>
                                </div>
                                <div class="col-sm-1"></div>
                                <!-- INPUT PARAMETER SMOOTHING GAMMA -
->
                                <div class="col-sm-3">
                                <div class="form-group">

```



```

                <label class="control-
label">Smoothing Gamma</label>
                <input value="0" type="number" na
me="gamma" id="gamma" class="form-
control" min="0" max="1" step="0.01" placeholder="0">
            </div>
        </div>
        <div class="col-sm-1"></div>
    </div>

    <!-- INPUT PARAMETER N PERAMALAN -->
    <div class="col-sm-12">
        <div class="form-group col-sm-12">
            <label class="control-
label">Target Peramalan</label>
            <input value=0 type="number" name
="peramalan" id="peramalan" class="form-
control" min="0" step="1" placeholder="0 Hari ke depan">
            </div>
        </div>

        <!-- BUTTON SUBMIT -->
        <div class="col-sm-12">
            <div class="col-sm-5">

                <a id="tampilkan" onclick="tampilk
anData()" value="tampilkan" class="btn btn-block btn-info btn-
rounded disabled">Tampilkan Data</a>
            </div>

            <div class="col-sm-2"></div>
            <div class="col-sm-5">
                <button id="ramalan" value="ramalan" cla
ss="btn btn-block btn-info btn-
rounded disabled">Prediksi Ramalan</button>
            </div>

        </div>

    </form>
</div>

```

```

        </div>
    </div>
    <div class="col-md-3"></div>

</div>

<!-- DATASET VIEW -->
    <div id="dataview" style="display:none" class="panel p
anel-info block4">
        <div class="panel-heading"> Dataset
            <div class="pull-right"><a href="#" data-
perform="panel-collapse"><i class="ti-minus"></i></a></div>
        </div>
        <div class="panel-wrapper collapse in" aria-
expanded="true">
            <div class="panel-body">
                <div class="row">
                    <div class="col-md-12">
                        <div class="table-
responsive border tableFixHead" id="tampilkanGrafik"></div>
                    </div>
                </div>
            </div>
        </div>
    </div>
</div>

<!-- FORECAST VIEW -->
    <div id="forecast" style="display:none" class="panel p
anel-info block4">
        <div class="panel-heading"> Hasil Prediksi Ramalan
            <div class="pull-right"><a href="#" data-
perform="panel-collapse"><i class="ti-minus"></i></a></div>
        </div>
        <div class="panel-wrapper collapse in" aria-
expanded="true">
            <div class="panel-body">
                <div class="row">
                    <div class="col-md-12">
                        <div class="table-
responsive border tableFixHead" id="hasilGrafik"></div>
                    </div>
                    <div class="col-md-4">
                        <div class="form-group">
                            <div class="row">

```

```

        <label class="col-md-
4" for="mape"><h2>Nilai MAPE</h2></label>
        <div class="col-md-8">
            <input id="mape" value="0"
type="number" class="form-
control" placeholder="Nilai MAPE" readonly>
        </div>
    </div>
</div>
</div>
</div>
</div>

```

b. Views.py

```

import os
import glob
from django.http import JsonResponse
from django.views.decorators.csrf import csrf_exempt
from django.core.files.storage import FileSystemStorage
from .scripts import holt_winters as hw
import warnings

warnings.filterwarnings('ignore')

filedir = "cache/temp.csv"

@csrf_exempt
def upload(request):
    if request.method == 'POST':
        #####
        # 1. Saving File CSV to Cache
        #####

```

```

files = glob.glob('cache/*')
for f in files:
    try:
        print(f)
        os.remove(f)

    except:
        print("0 Deleted Cache")

data = request.FILES['inputDataset']

fs = FileSystemStorage()

fs.save('temp.csv', data)

return JsonResponse({
    'status': 'success'
})

return JsonResponse({
    'status': 'failed'
})

```

```
@csrf_exempt
```

```
def holtWinters(request):
```

```
    if request.method == 'POST':
```

```
        # Variable saving
```

```
        trend, season = request.POST['trend'],
request.POST['season']
```

```

    alpha, beta, gamma = float(request.POST['alpha']),
float(request.POST['beta']), float(request.POST['gamma'])

    peramalan = int(request.POST['peramalan'])

# Loading File CSV
data = hw.load_file()

# Getting Length of data
length = len(data)

# Object to DateTime Index
data = hw.convert_datetime(data)

# First column
target_data = data.iloc[:, 0]

# Holt Winters Model
fitted = hw.holtwinters(target_data, trend, season,
alpha, beta, gamma)

# Fitted Data
fitted_data = hw.forecast(fitted, length - 1, 0)

# Calculate MAPE
mape = hw.calculate_mape(target_data, fitted_data)

    aktual = packPayload(target_data.to_list(),
target_data.index.to_list())

# Forecasting
if peramalan != 0:

```

```

        result = hw.forecast(fitted, length - 1,
peramalan)

        prediksi = packPayload(result.to_list(),
result.index.to_list())

    else:

        prediksi = aktual

payload = {

    'title': data.columns.values[0].replace('_', ' '),

    'mape': mape,

    'aktual': aktual,

    'prediksi': prediksi

}

return JsonResponse(payload)

@csrf_exempt
def viewOnly(request):

    if request.method == 'POST':

        # Loading File CSV
        data = hw.load_file()

        # Object to DateTime Index
        data = hw.convert_datetime(data)

        target_data = data.iloc[:, 0]

        content = packPayload(target_data.to_list(),
target_data.index.to_list())

        payload = {

```

```

        'title': data.columns.values[0].replace('_', ' '),
        'data': content
    }

    return JsonResponse(payload)

def packPayload(value, date):
    temp = []

    for i in range(len(value)):
        temp.append({
            'x': int(date[i].to_pydatetime().timestamp() *
1000),
            'y': value[i]
        })
    return temp

```

c. Urls.py

```

from django.urls import path
from .views import *

```

```

urlpatterns = [
    path('upload/', upload),
    path('hw/', holtWinters),
    path('view/', viewOnly)
]

```

d. Model holt_winters.py

```

from statsmodels.tsa.holtwinters import ExponentialSmoothing
as HWES

```

```

import pandas as pd
import numpy as np

filedir = 'cache/temp.csv'

def load_file():
    return pd.read_csv(filedir)

def convert_datetime(data):
    length = len(data)
    dateIndex = pd.date_range(data['Tanggal'][1], freq="D",
periods=length)
    data.index = pd.Index(dateIndex)

    return data.drop(['Tanggal'], axis=1)

def holtwinters(data, trend_params, seasonal_params, alpha,
beta, gamma):
    """
    :param trend_params: parameter trend, mul atau add
    :param seasonal_params: parameter seasonal, mul atau add
    :param data: dataframe covid
    :param case: kasus yang dipilih misal Kasus_Positif
    :return: model holt winters
    """
    hwes = HWES(data,
                 trend=trend_params,
                 seasonal=seasonal_params,
                 seasonal_periods=7)

    return hwes.fit(optimized=False,
                   smoothing_level=alpha,

```



```
        smoothing_trend=beta,  
        smoothing_seasonal=gamma)  
def calculate_mape(data, predict):  
    return np.mean(np.abs((data - predict) / data)) * 100  
  
def forecast(fitted_hw, length, day):  
    return fitted_hw.predict(start=0, end=length+day)
```



BIODATA PENULIS

I. Data Diri

- Foto

:



- Nama : Adhitama Ihza Pangestu
- Tempat, Tanggal Lahir : Semarang, 18 Agustus 1999
- Agama : Islam
- Alamat : Jalan Lamongan Tengah no. 1 Semarang
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II. Jenjang Pendidikan

- 2005 – 2011 : SD IT AITI PERAWANG
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- 2014 – 2017 : SMAN 12 SEMARANG

Demikian biodata ini saya buat dengan benar dan dapat dipertanggungjawabkan

Gresik, 7 September 2021



Adhitama Ihza Pangestu