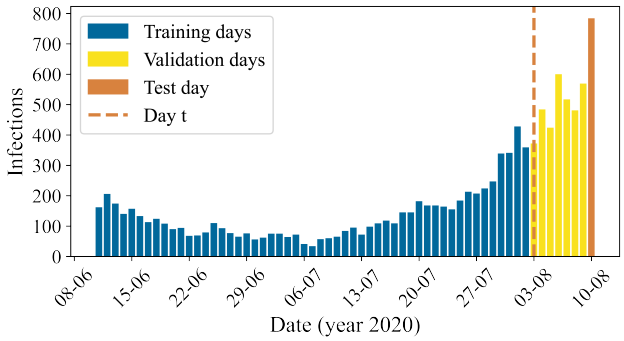
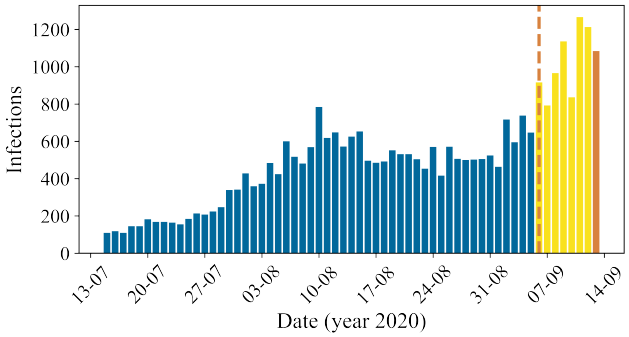
APPENDIX

A DATASETS

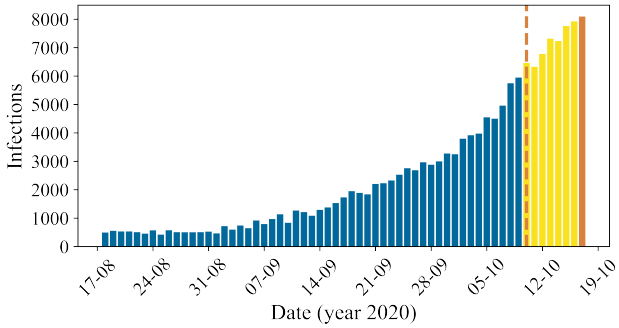
In Figure 8 and Figure 9, we visualize the aggregated number of infections in the Netherlands over time for the 14 time periods we evaluated. As explained in Section VI, we note that there are significant differences between the chosen time periods in the order of magnitude of the infection rates and in the shape of the infection curve.



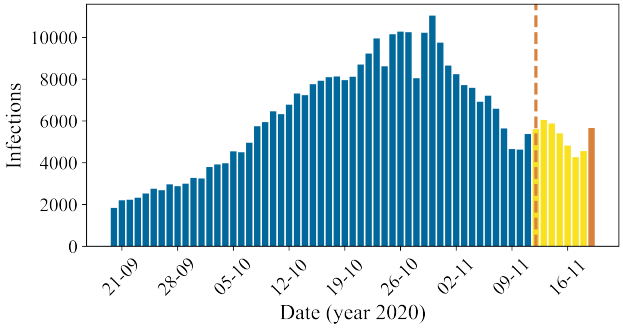
(a) Time period **W1**



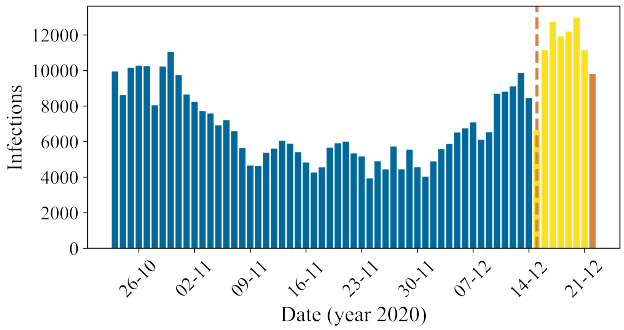
(b) Time period **W2**



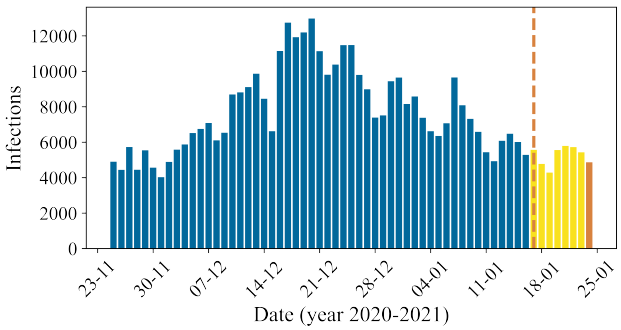
(c) Time period **W3**



(d) Time period **W4**

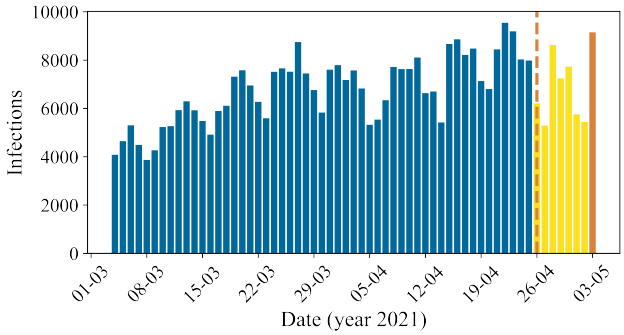


(e) Time period **W5**

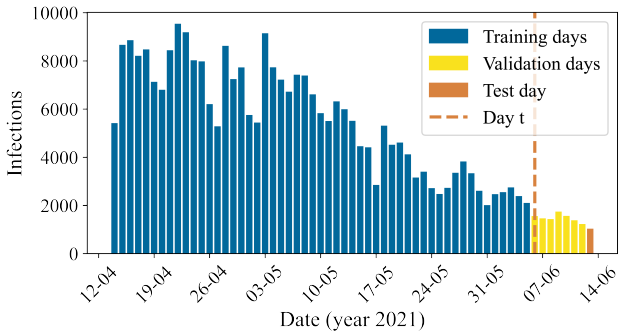


(f) Time period **W6**

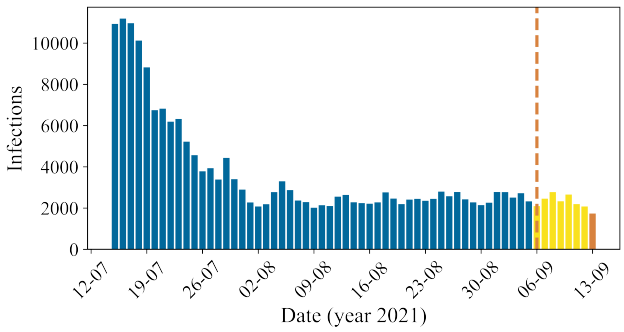
Fig. 8: The aggregated number of reported COVID-19 cases in the Netherlands over the prediction days of the wild type time periods **W1**, **W2**, **W3**, **W4**, **W5**, and **W6**. We present the training set in blue, the validation set in yellow, and the test set in orange. Once the model is trained, we use data up to and including day t (dashed orange line) to predict one week ahead t+7 for the test day.



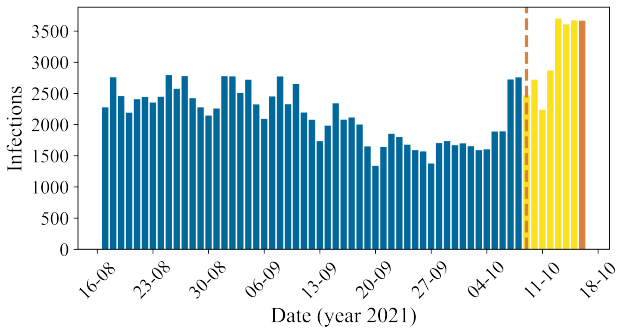
(a) Time period **A1**



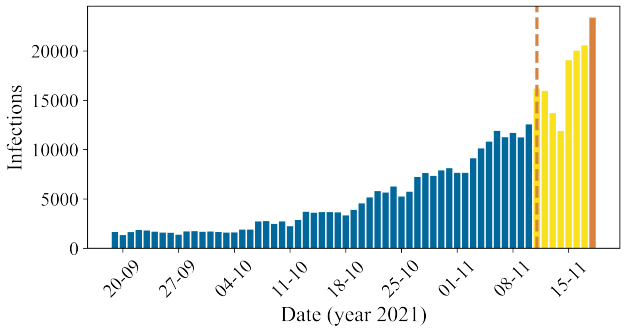
(b) Time period **A2**



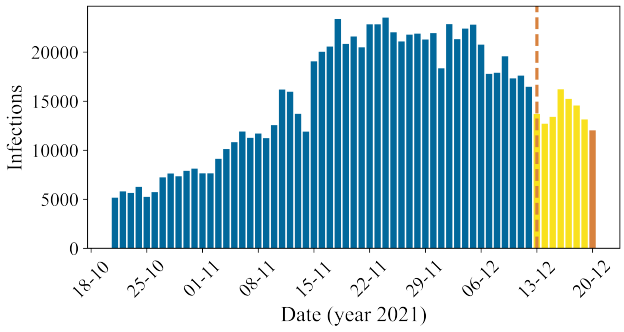
(c) Time period **D1**



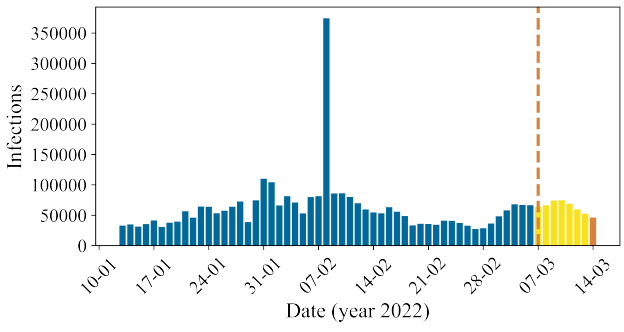
(d) Time period **D2**



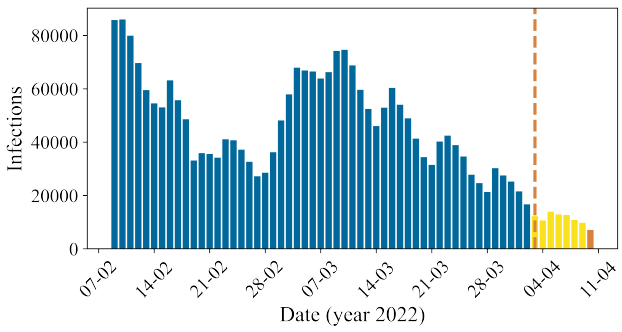
(e) Time period **D3**



(f) Time period **D4**



(g) Time period **O1**

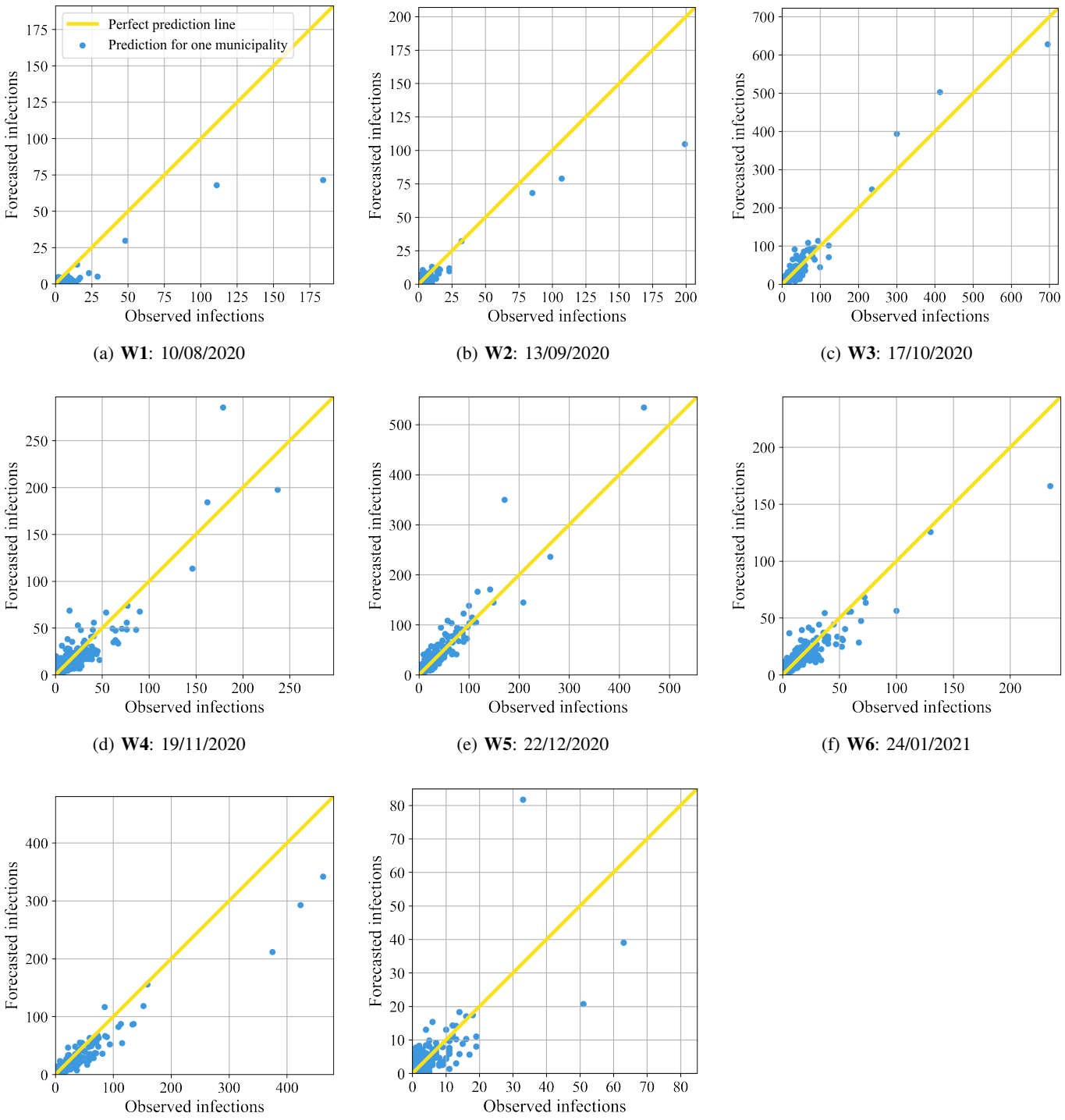


(h) Time period **O2**

Fig. 9: The aggregated number of reported COVID-19 cases in the Netherlands over the prediction days of the alpha, delta, and omicron variant time periods **A1**, **A2**, **D1**, **D2**, **D3**, **D4**, **O1**, and **O2**. We present the training set in blue, the validation set in yellow, and the test set in orange. Once the model is trained, we use data up to and including day t (dashed orange line) to predict one week ahead t+7 for the test day.

B Correlation Plots

In Figure 10 and Figure 11, we visualize the correlation between the observed and the predicted number of reported SARS-Cov-2 infections for the 14 time periods we evaluated. The blue dots indicate the test day forecasts for all 344 municipalities, and the yellow line indicates that the prediction is perfect.

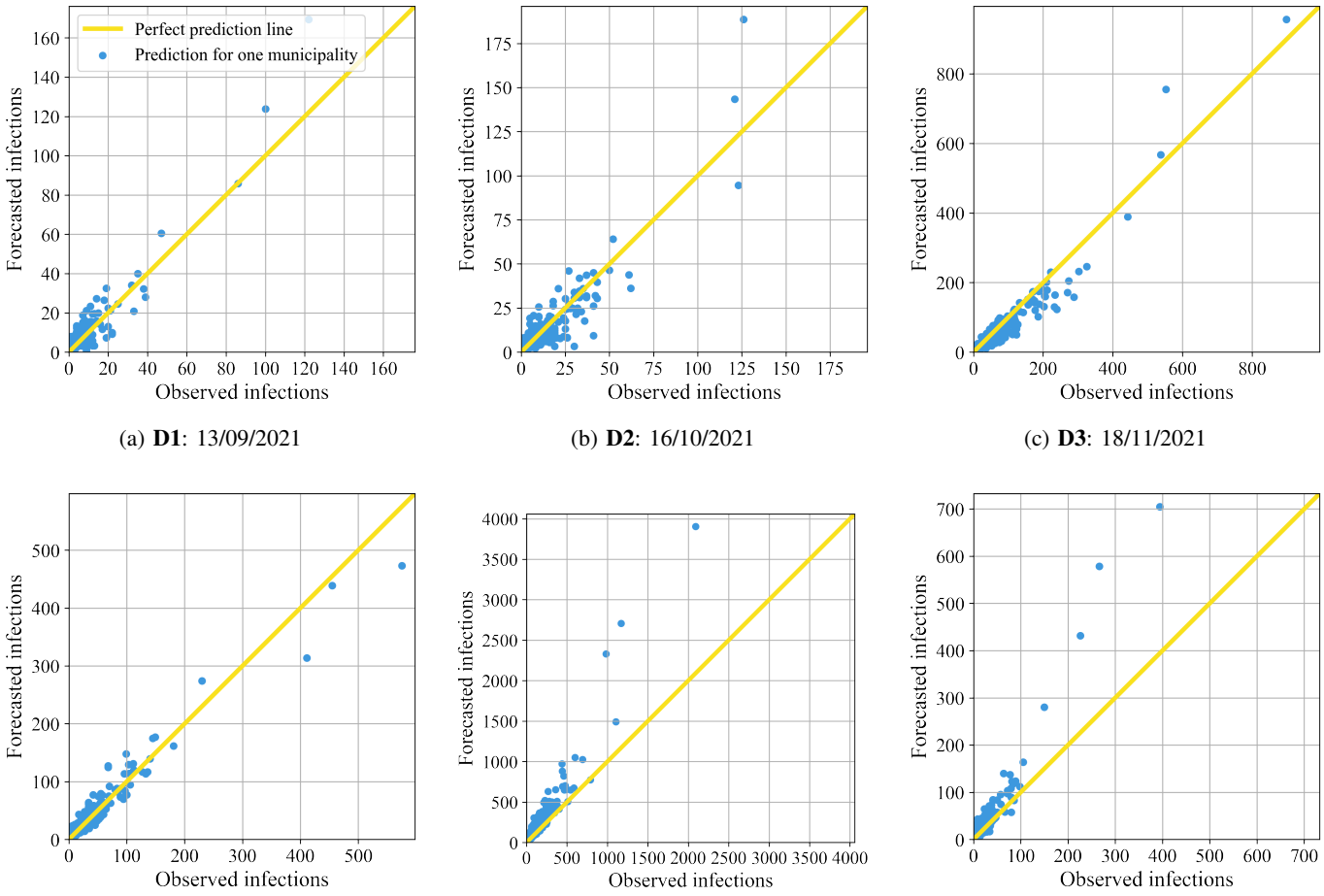


(a) **W1**: 10/08/2020 (b) **W2**: 13/09/2020 (c) **W3**: 17/10/2020

(d) **W4**: 19/11/2020 (e) **W5**: 22/12/2020 (f) **W6**: 24/01/2021

(g) **A1**: 03/05/2021 (h) **A2**: 13/06/2021

Fig. 10: The correlation between the observed and forecasted number of reported SARS-Cov-2 infections during the wild type and alpha periods **W1**, **W2**, **W3**, **W4**, **W5**, **W6**, **A1**, and **A2**. The blue dots correspond to the forecasts for each municipality on the test day of the related time period. When a dot lies on the yellow diagonal line, it means that the prediction is perfect.



(a) **D1**: 13/09/2021 (b) **D2**: 16/10/2021 (c) **D3**: 18/11/2021

(d) **D4**: 20/12/2021 (e) **O1**: 14/03/2022 (f) **O2**: 10/04/2022

Fig. 11: The correlation between the observed and forecasted number of reported SARS-Cov-2 infections during the delta and omicron variant periods **D1**, **D2**, **D3**, **D4**, **O1**, and **O2**. The blue dots correspond to the forecasts for each municipality on the test day of the related time period. When a dot lies on the yellow diagonal line, it means that the prediction is perfect.

C One Day Ahead Prediction

In Table XIII to Table XV, we summarize the performance of our model, its components, and the baselines for one day ahead prediction.

TABLE XIII: The root mean squared errors (RMSE) for t+1 prediction of our model, its parts, and the baselines for all 14 time periods.

RMSE (↓)	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**A1**	**A2**	**D1**	**D2**	**D3**	**D4**	**O1**	**O2**
PD	6.23	3.95	11.60	11.46	15.35	8.75	23.40	3.63	.90	6.44	36.07	15.00	55.58	16.99
HA	10.29	7.61	34.76	19.69	18.17	14.45	19.04	22.31	13.92	8.26	77.86	17.43	101.18	169.68
***HA*$_{\textbf{window}}$**	.70	.17	1.03	0.67	13.02	6.54	8.90	3.89	5.73	.39	2.89	3.35	102.09	24.54
EB	7.24	3.37	12.97	12.17	16.28	9.29	25.24	.57	5.05	7.70	44.60	15.69	57.92	4.81
GRU	**5.65**	**2.55**	**10.58**	11.15	16.29	6.70	**12.06**	3.46	**4.81**	**5.37**	31.61	**11.09**	157.10	40.83
GATv2	8.18	6.57	13.84	13.33	19.82	10.14	15.38	8.08	5.48	7.17	38.87	24.87	126.55	59.97
Model	**5.65**	2.92	11.41	**9.70**	17.06	6.81	16.22	**3.45**	4.87	5.43	**23.39**	12.95	79.90	**13.19**

TABLE XIV: The coefficients of determination (R^2) for t+1 prediction of our model, its parts, and the baselines for all 14 time periods.

R^2(↑)	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**A1**	**A2**	**D1**	**D2**	**D3**	**D4**	**O1**	**O2**
PD	0.736	0.911	0.946	0.765	0.829	0.789	0.714	0.599	.808	0.815	0.803	0.915	0.902	0.725
HA	0.281	0.671	0.516	0.307	0.761	0.423	0.811	<0	<0	0.695	0.081	0.886	0.675	<0
***HA*$_{\textbf{window}}$**	.779	.943	.951	.796	0.877	0.882	.814	0.541	0.737	.870	.836	.933	0.669	0.425
EB	0.644	0.935	0.933	0.735	0.808	0.762	0.668	.613	0.796	0.777	0.699	0.907	0.893	.790
GRU	**0.783**	**0.963**	**0.955**	0.778	0.807	0.876	**0.924**	0.636	**0.815**	**0.871**	0.849	**0.954**	0.217	<0
GATv2	0.545	0.755	0.923	0.682	0.715	0.716	0.877	<0	0.760	0.771	0.771	0.768	0.492	<0
Model	**0.783**	0.952	0.948	**0.832**	0.789	0.872	0.863	**0.637**	0.810	0.864	**0.917**	0.937	0.797	**0.834**

TABLE XV: Average relative RMSE for t+1 prediction performance of our model with respect to its parts and the baselines for each COVID-19 variant and in total.

RMSE (↓)	**WT**	$\boldsymbol{\alpha}$	$\boldsymbol{\delta}$	$\boldsymbol{o}$	**Avg**
PD	-10.6%	-17.8%	-16.3%	10.7%	-10.2%
HA	-47.3%	-49.7%	-48.7%	-56.6%	-49.4%
***HA*$_{\textbf{window}}$**	3.5%	-12.8%	-11.5%	-34.0%	-8.5%
EB	-14.9%	-19.6%	-24.5%	13.5%	-14.9%
GRU	2.6%	17.1%	-1.7%	-58.4%	-5.3%
GATv2	-29.7%	-25.9%	-30.8%	-57.4%	-33.4%

TABLE XVI: Average coefficient of determination (R^2) for t+1 prediction of our model, its parts, and the baselines for each COVID-19 variant and in total.

R^2(↑)	**WT**	$\boldsymbol{\alpha}$	$\boldsymbol{\delta}$	$\boldsymbol{o}$	**Avg**
PD	0.829	0.657	0.835	0.814	.804
HA	0.493	0.406	0.416	0.338	0.436
***HA*$_{\textbf{window}}$**	**.871**	.678	.844	0.547	0.790
EB	0.803	0.641	0.795	**.842**	0.783
GRU	0.860	**0.780**	0.872	0.109	0.745
GATv2	0.723	0.439	0.768	0.246	0.627
Model	0.863	0.750	**0.882**	0.816	**0.845**