

Dual-Forecaster: A Multimodal Time Series Model Integrating Descriptive and Predictive Texts

Table 9. Forecasting result on existing multimodal time series datasets (adding UniTime, AutoTimes and Chronos). The best result is highlighted in **bold** and the second best is highlighted in underlined.

Methods		Dual-Forecaster	Dual-Forecaster w/o Future Texts	DLinear	FITS	PatchTST	iTransformer	MM-TSlib	TGForecaster	Time-LLM	UniTime	AutoTimes	Chronos												
Metric		MSE	MAE	MSE	MAE	MSE	MAE	MSE	MAE	MSE	MAE	MSE	MAE												
Weather-captioned	36	0.0297	0.1174	0.0337	<u>0.1306</u>	0.0677	0.1926	0.0628	0.1849	0.0525	0.1650	0.0558	0.1719	0.0575	0.1792	0.0600	0.1928	0.0449	0.1613	0.0506	0.1763	0.0521	0.1775	<u>0.0298</u>	<u>0.1087</u>
Time-MMD-Climate	8	0.8619	0.7597	<u>0.9896</u>	0.8106	2.9057	1.4165	1.5498	0.9776	1.0975	0.8054	1.1392	0.8194	1.1386	0.8212	1.0849	0.8114	1.3398	0.9217			1.4193	0.9431	1.0479	0.8404
Time-MMD-Economy	8	0.1831	0.3389	<u>0.1852</u>	<u>0.3425</u>	8.1634	2.5406	0.2766	0.4184	0.1960	0.3512	0.1963	0.3493	0.2066	0.3583	0.2108	0.3641	0.2310	0.3858			0.2410	0.3915	0.2749	0.4232
Time-MMD-SocialGood	8	1.2554	0.5317	<u>1.2768</u>	<u>0.5627</u>	4.3273	1.8199	1.7277	0.6789	1.7509	0.5761	1.7128	<u>0.5379</u>	1.8615	0.5550	1.5318	0.6074	1.5172	0.6106			1.5850	0.6438	1.4734	0.6090
Time-MMD-Traffic	8	0.1802	0.3039	<u>0.1824</u>	0.3089	4.3517	1.8561	0.3542	0.4570	0.1828	<u>0.2591</u>	0.1917	0.2503	0.1892	0.2491	0.2168	0.3052	0.2299	0.3370			0.2894	0.4023	0.3891	0.4919
Time-MMD-Energy	12	0.0936	0.2162	<u>0.0937</u>	<u>0.2206</u>	1.2069	0.8204	0.2893	0.4086	0.1031	0.2217	0.1123	0.2415	0.1146	0.2472	0.1482	0.2911	0.1263	0.2619	0.1158	0.2527	0.2940	0.4070	0.1200	0.2301
Time-MMD-Health-US	12	0.9515	0.6160	1.0255	0.6391	2.2140	1.0484	2.2509	1.1193	1.1000	0.7233	1.0467	0.6573	<u>0.9710</u>	<u>0.6308</u>	1.3074	0.7823	1.1728	0.7331	1.0753	0.7117	2.4537	1.1330	1.5416	0.7668
Time-MMD-Health-AFR	12	<u>0.0049</u>	0.0540	0.0049	0.0541	0.0572	0.2002	0.0076	0.0650	0.0072	0.0707	0.0057	0.0577	0.0052	0.0550	0.0057	0.0532	0.0058	0.0547	0.0049	<u>0.0502</u>	0.0344	0.1347	0.0044	0.0465

Table 10. Ablation study results of different pre-trained models on ETTm2 dataset.

		RoBERTa		GPT2	
Metric		MSE	MAE	MSE	MAE
ETTM2	96	0.8469	0.5756	0.8522	0.5749

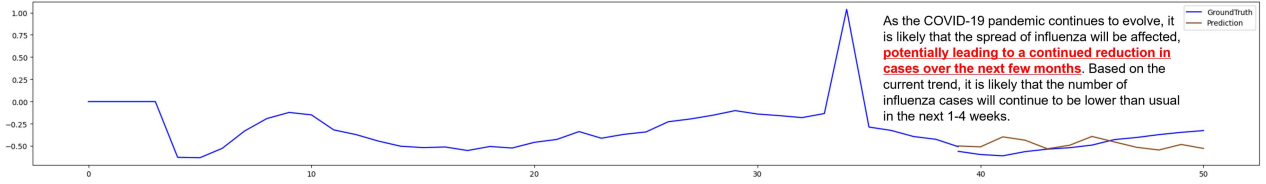


Figure 17. Visualization of an example from Time-MMD-Health-US with predictive text placed in the upper-right corner under the input-40-predict-12 settings. Blue lines are the ground truths and brown lines are the model predictions.

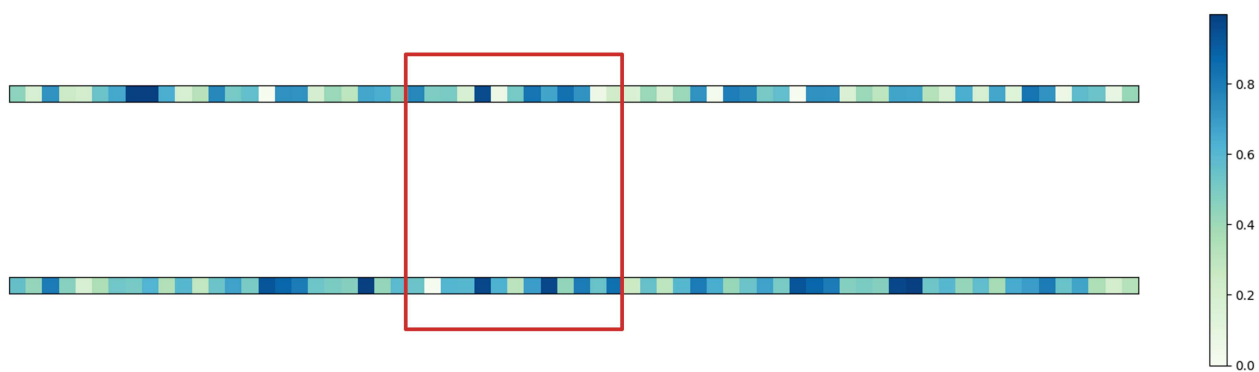


Figure 18. Attention map visualizing the relationship between the last time series token embedding and future text tokens. Case comes from the Time-MMD-Health-US dataset. The red bounding box corresponds to the red-highlighted positions in the predictive text.