Supplementary Material:
Time-Series Data Imputation via Realistic Masking-Guided Tri-Attention BiGRU

Paper #58

1 Performance under Different Missing Rates

To further validate the model's generalization and robustness, we artificially created missing values in the dataset using a realistic masking method, and evaluated the performance of each method on the datasets with different missing rates, as shown in Figure 1. As the missing rate increases, the imputation accuracy of all methods gradually decreases. Our proposed method still outperforms other advanced methods in all cases, demonstrating its good robustness and generalization.

2 Imputation Performance Evaluated by RMSE

Root Mean Square Error (RMSE) is a widely used evaluation metric. A lower RMSE indicates better predictive performance of the model. As shown in Table 1, BRITS performs poor on the PhysioNet2012 dataset with a high missing rate due to the error explosion problem caused by RNNs, while it performs relatively well on datasets with a low missing rate. Moreover, attention-based methods outperform RNN-based methods on datasets with a high missing rate due to the superior ability of attention mechanisms in capturing global information. In short, our method achieves better imputation performance in terms of RMSE in comparison with the other counterparts.

	PhysioNet2012	BeiJing PM2.5	Air Quality	Localization 10%	Average Rank
Mean	0.7714±0.070	0.7644±0.007	0.6668±0.054	0.7853±0.011	7.50
Median	0.7367±0.016	0.8390±0.007	0.6973±0.053	0.8270±0.011	7.50
KNN	0.7995±0.017	0.7252±0.008	0.6126±0.060	0.7245±0.013	6.50
MRNN	0.8148±0.011	0.5544±0.016	0.5368±0.061	1.0029±0.011	7.50
BRITS	4.2431±7.298	0.3243±0.013	0.3579±0.053	0.5631±0.010	4.75
Transformer	0.4891±0.048	0.3655±0.016	0.3772±0.064	0.3478±0.014	3.25
MTSIT	0.6815±0.016	0.4197±0.014	0.4841±0.067	0.4531±0.008	4.50
SAITS	0.4653±0.030	0.3371±0.013	0.3537±0.061	0.3601±0.011	2.50
Ours	**0.4632±0.031**	**0.3112±0.015**	**0.3267±0.060**	**0.3329±0.016**	**1.00**

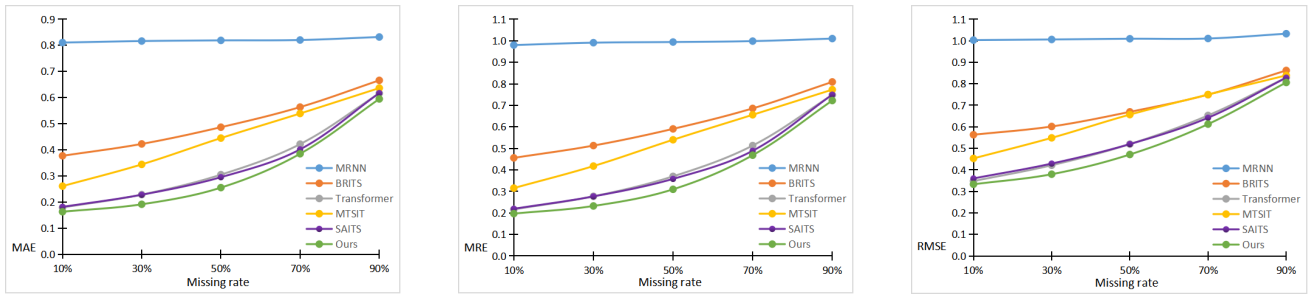**Table 1**: Comparison of imputation performance on RMSE.

Figure 1: Comparison of MAE (left), MRE(middle), and RMSE (right) for different missing rates.