Reply to Reviewer 3

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1. Performance of MLCAUSALITY

We tested the model MLCAUSALITY that the reviewer suggested for comparison (Fulmyk et al., 2023), the results are shown in Table 1, 2, 3, 4, 5.

Table 1. AUROC of the Lorenz-96 dataset.

Models	AUROC		
	$p = 10, F = 10$ $T = 1000$	$p = 40, F = 40$ $T = 1000$	$p = 40, F = 40$ $T = 500$
MLCAUSALITY	0.812±0.03	0.679±0.05	0.523±0.05
KANGCI	1.0±0.00	0.991±0.003	0.966±0.015

Table 2. AUROC of the Dream-3 dataset, T=966, p=100

Models	AUROC				
	Ecoli-1	Ecoli-2	Yeast-1	Yeast-2	Yeast-3
MLCAUSALITY	0.492	0.486	0.510	0.523	0.496
KANGCI	0.758	0.680	0.667	0.552	0.562

Table 3. AUROC of the Dream-4 dataset, T=210, p=100

Models	AUROC				
	Gene-1	Gene-2	Gene-3	Gene-4	Gene-5
MLCAUSALITY	0.512	0.518	0.495	0.502	0.501
KANGCI	0.747	0.591	0.602	0.613	0.601

Table 4. AUROC of the VAR dataset.

Models	AUROC		
	$p = 10, T = 1000$ $sparsity = 0.2$ $lag = 3$	$p = 10, T = 1000$ $sparsity = 0.3$ $lag = 3$	$p = 10, T = 1000$ $sparsity = 0.2$ $lag = 5$
MLCAUSALITY	0.852±0.11	0.834±0.009	0.817±0.011
KANGCI	1.0±0.00	0.993±0.003	1.0±0.00

2. Tuning the threshold of Fusion algorithm

In this section, we further analyze the impact of the threshold on the results. We selected the Dream-3 dataset and fine-tuned the threshold from 0.01 to 0.5, with an interval of 0.05. The AUROC results are shown in the Table 6.

Table 5. AUROC of the fMRI Bold signal

Models	AUROC				
	Sim-1	Sim-2	Sim-3	Sim-4	Sim-5
MLCAUSALITY	0.598±0.04	0.601±0.03	0.655±0.03	0.599±0.01	0.623±0.04
KANGCI	0.809±0.08	0.838±0.03	0.875±0.02	0.902±0.02	0.856±0.05
	Sim-6	Sim-7	Sim-8	Sim-9	Sim-10
MLCAUSALITY	0.604±0.03	0.617±0.03	0.622±0.04	0.553±0.03	0.641±0.04
KANGCI	0.922±0.02	0.895±0.04	0.763±0.08	0.824±0.08	0.780±0.07
	Sim-11	Sim-12	Sim-13	Sim-14	Sim-15
MLCAUSALITY	0.603±0.03	0.596±0.02	0.575±0.04	0.599±0.03	0.588±0.05
KANGCI	0.823±0.03	0.847±0.03	0.749±0.08	0.788±0.08	0.736±0.08
	Sim-16	Sim-17	Sim-18	Sim-19	Sim-20
MLCAUSALITY	0.581±0.02	0.577±0.03	0.497±0.04	0.512±0.06	0.511±0.05
KANGCI	0.721±0.09	0.853±0.03	0.806±0.06	0.872±0.03	0.909±0.03
	Sim-21	Sim-22	Sim-23	Sim-24	Sim-25
MLCAUSALITY	0.697±0.07	0.606±0.05	0.620±0.06	0.552±0.05	0.608±0.04
KANGCI	0.805±0.07	0.811±0.06	0.664±0.08	0.560±0.09	0.742±0.08
	Sim-26	Sim-27	Sim-28		
MLCAUSALITY	0.574±0.03	0.573±0.02	0.592±0.06		
KANGCI	0.702±0.09	0.736±0.08	0.809±0.07		

Table 6. Tuning the threshold on Dream-3 dataset.

Dataset	Threshold					
	0.01	0.05	0.10	0.15	0.20	0.25
Ecoli-1	0.756	0.757	0.758	0.760	0.761	0.761
Ecoli-2	0.677	0.680	0.681	0.683	0.677	0.677
Yeast-1	0.667	0.667	0.667	0.667	0.667	0.667
Yeast-2	0.549	0.552	0.552	0.552	0.552	0.546
Yeast-3	0.512	0.512	0.512	0.512	0.512	0.512
	0.30	0.35	0.40	0.45	0.50	
Ecoli-1	0.759	0.755	0.745	0.734	0.734	
Ecoli-2	0.676	0.675	0.663	0.652	0.641	
Yeast-1	0.667	0.667	0.667	0.667	0.667	
Yeast-2	0.543	0.542	0.535	0.533	0.521	
Yeast-3	0.562	0.562	0.562	0.562	0.562	

References

Fulmyk, W. et al. Nonlinear granger causality using kernel ridge regression. *arXiv preprint arXiv:2309.05107*, 2023.