Reply to Reviewer 4

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1. Computational consumption

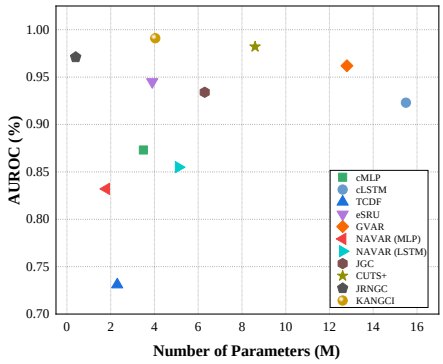

Figure 1. The number of parameters of each model (Lorenz-96 dataset, p=100, T=1000).

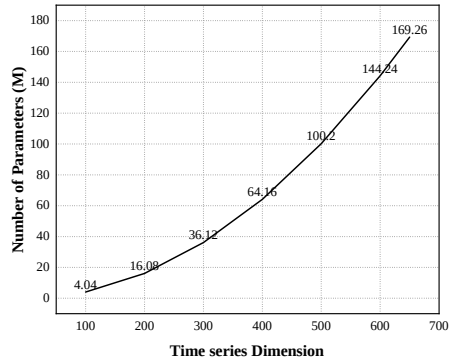

Figure 2. The trend of KANGCI's parameter as the time series dimension increases (Lorenz-96 dataset, T=1000).

2. AUPRC comparisons

Table 1. AUPRC of the Lorenz-96 dataset.

Models	AUROC		
	$p = 10$, $F = 10$ $T = 1000$	$p = 40$, $F = 40$ $T = 1000$	$p = 40$, $F = 40$ $T = 500$
cMLP	0.968±0.002	0.791±0.012	0.685±0.057
cLSTM	0.964±0.004	0.865±0.015	0.726±0.035
TCDF	0.732±0.012	0.524±0.042	0.445±0.122
eSRU	**1.0±0.00**	0.943±0.007	0.893±0.023
GVAR	**1.0±0.00**	0.925±0.009	0.886±0.036
NAVAR (MLP)	0.989±0.005	0.742±0.041	0.631±0.079
NAVAR (LSTM)	0.991±0.005	0.784±0.037	0.682±0.071
JGC	0.987±0.004	0.923±0.029	0.843±0.044
CUTS+	**1.0±0.00**	0.979±0.003	0.925±0.024
JRNGC	**1.0±0.00**	0.966±0.006	0.892±0.035
KANGCI	**1.0±0.00**	**0.990±0.003**	**0.953±0.021**

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

Models	AUROC				
	Ecoli-1	Ecoli-2	Yeast-1	Yeast-2	Yeast-3
cMLP	0.023	0.019	0.020	0.015	0.014
cLSTM	0.017	0.017	0.015	0.023	0.031
TCDF	0.012	0.011	0.014	0.014	0.013
eSRU	0.036	0.034	0.041	0.052	0.044
GVAR	0.103	0.117	0.098	0.103	0.104
NAVAR (MLP)	0.102	0.107	0.073	0.105	0.089
NAVAR (LSTM)	0.013	0.012	0.030	0.038	0.052
JGC	0.018	0.016	0.026	0.050	0.059
CUTS+	0.154	0.143	0.121	0.128	0.105
JRNGC	**0.198**	**0.202**	**0.172**	**0.142**	0.130
KANGCI	0.177	0.163	0.154	0.138	**0.132**

Table 3. AUPRC of the VAR dataset.

Models	AUROC		
	$p = 10, T = 1000$ $sparsity = 0.2$ $lag = 3$	$p = 10, T = 1000$ $sparsity = 0.3$ $lag = 3$	$p = 10, T = 1000$ $sparsity = 0.2$ $lag = 5$
cMLP	**1.0±0.00**	0.832±0.006	0.973±0.004
cLSTM	0.964±0.005	0.854±0.006	0.911±0.006
TCDF	0.812±0.013	0.681±0.012	0.734±0.012
eSRU	**1.0±0.00**	0.989±0.002	**1.0±0.00**
GVAR	**1.0±0.00**	0.985±0.003	**1.0±0.00**
NAVAR (MLP)	0.987±0.003	0.943±0.006	0.981±0.004
NAVAR (LSTM)	0.985±0.003	0.957±0.007	0.959±0.003
JGC	**1.0±0.00**	0.990±0.002	**1.0±0.00**
CUTS+	**1.0±0.00**	**1.0±0.00**	**1.0±0.00**
JRNGC	**1.0±0.00**	0.992±0.002	**1.0±0.00**
KANGCI	**1.0±0.00**	0.987±0.002	**1.0±0.00**

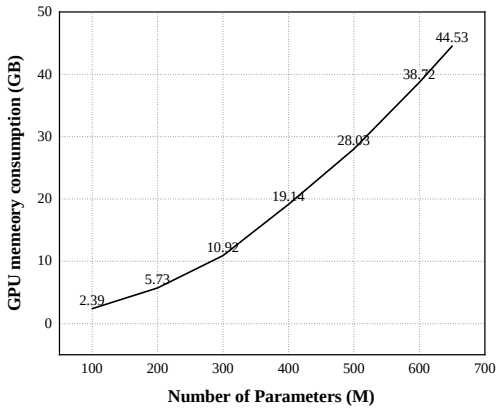

Figure 3. The trend of KANGCI's GPU memory consumption as the time series dimension increases (Lorenz-96 dataset, T=1000).

Table 4. AUPRC of the fMRI BOLD

Dateset	AUROC		
	CUTS+	JRNGC	**KANGCI**
Sim1	**0.704±0.08**	0.688±0.07	0.672±0.09
Sim2	0.694±0.07	0.682±0.06	**0.701±0.07**
Sim3	0.638±0.07	**0.651±0.08**	0.636±0.06
Sim4	**0.643±0.06**	0.632±0.06	0.601±0.03
Sim5	0.728±0.05	0.731±0.06	**0.739±0.05**
Sim6	0.734±0.06	0.729±0.07	**0.748±0.07**
Sim7	0.744±0.07	0.721±0.07	**0.793±0.07**
Sim8	0.635±0.08	0.621±0.04	**0.654±0.11**
Sim9	0.698±0.05	0.685±0.05	**0.719±0.08**
Sim10	0.678±0.04	0.663±0.08	**0.692±0.09**
Sim11	**0.695±0.05**	0.682±0.08	0.621±0.07
Sim12	0.660±0.06	0.649±0.07	**0.678±0.06**
Sim13	0.696±0.05	0.720±0.08	**0.744±0.08**
Sim14	0.657±0.04	0.642±0.06	**0.686±0.09**
Sim15	0.641±0.07	0.632±0.09	**0.659±0.07**
Sim16	0.654±0.11	0.668±0.12	**0.688±0.09**
Sim17	**0.724±0.04**	0.721±0.05	0.714±0.05
Sim18	0.710±0.06	0.696±0.08	**0.725±0.09**
Sim19	0.847±0.07	0.833±0.04	**0.873±0.03**
Sim20	0.861±0.07	0.857±0.05	**0.886±0.04**
Sim21	0.696±0.08	0.677±0.06	**0.711±0.07**
Sim22	0.727±0.04	0.722±0.06	**0.746±0.09**
Sim23	**0.551±0.06**	0.544±0.08	0.527±0.11
Sim24	0.490±0.08	**0.504±0.08**	0.476±0.09
Sim25	0.643±0.05	0.649±0.07	**0.661±0.08**
Sim26	0.561±0.09	0.561±0.08	**0.632±0.12**
Sim27	0.661±0.07	0.634±0.09	**0.672±0.08**
Sim28	0.715±0.09	0.709±0.10	**0.732±0.09**
AVG	0.681±0.07	0.675±0.09	**0.691±0.09**

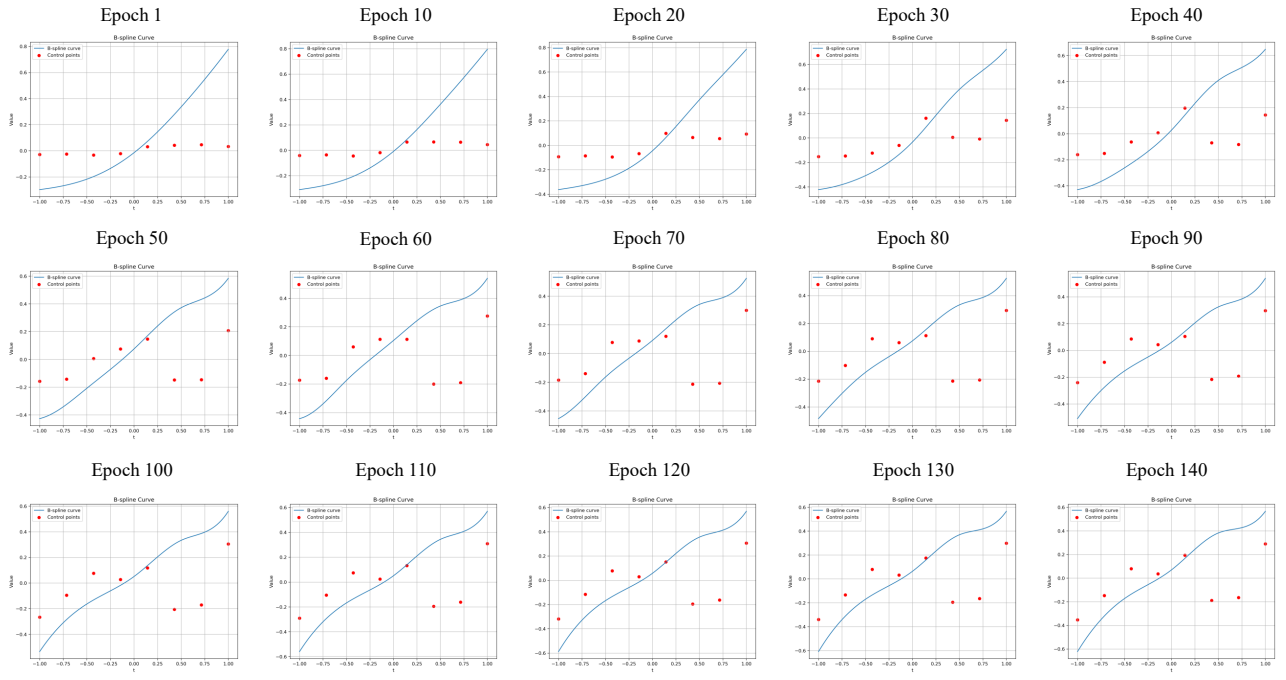

Figure 4. The visualization of the *spline*(x) function during the causal inference.

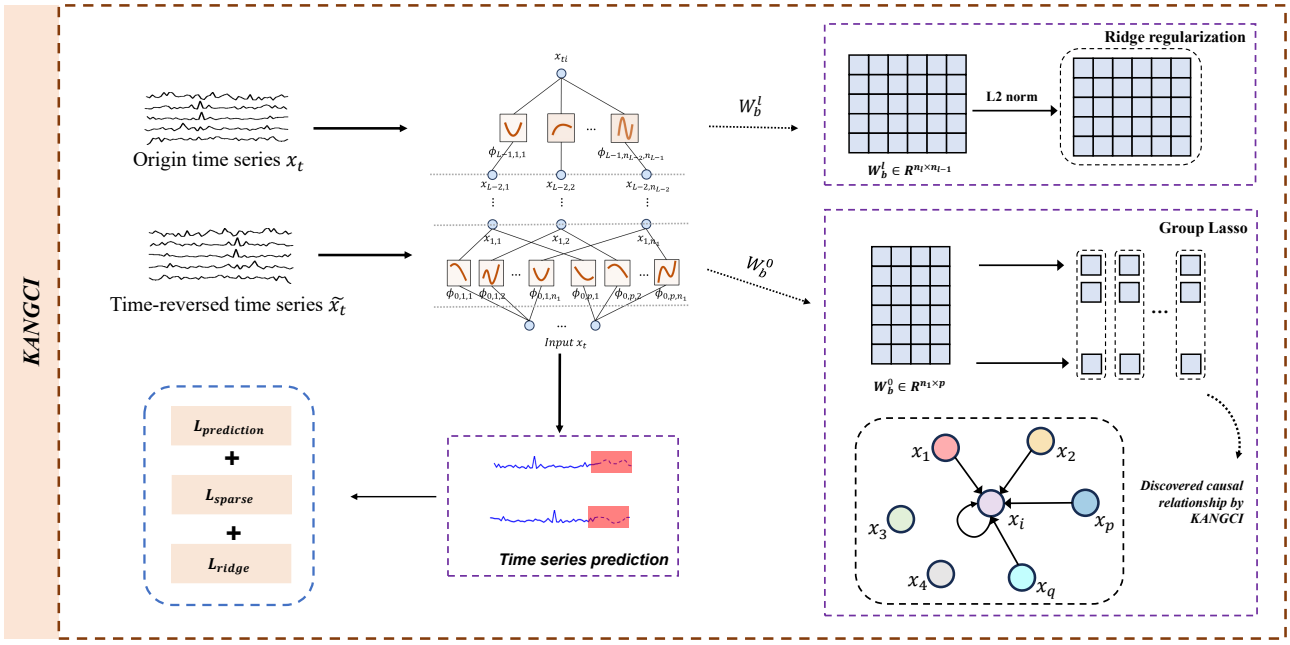

Figure 5. The architecture of KANGCI.