

Table 1. Experiments results of MCC on simulation data

Dataset	CHiLD	IDOL	CaRiNG	TDRL	Beta-VAE	SlowVAE	iVAE	FactorVAE	PCL	TCL
A	0.9014(0.043)	0.8415(0.033)	0.8360(0.045)	0.8234(0.025)	0.7495(0.005)	0.7738(0.022)	0.6035(0.023)	0.5094(0.031)	0.5126(0.027)	0.4053(0.021)
B	0.9414(0.037)	0.9381(0.004)	0.9412(0.001)	0.9420(0.076)	0.7533(0.045)	0.8575(0.065)	0.5238(0.054)	0.4171(0.055)	0.3839(0.011)	0.4038(0.008)
C	0.8347(0.012)	0.8012(0.031)	0.8024(0.029)	0.7969(0.018)	0.7483(0.017)	0.7420(0.087)	0.6149(0.023)	0.3215(0.098)	0.3286(0.034)	0.3564(0.012)
D	0.8407(0.016)	0.7645(0.055)	0.7883(0.082)	0.7713(0.003)	0.7078(0.015)	0.7384(0.057)	0.7101(0.090)	0.6794(0.048)	0.4517(0.004)	0.4615(0.010)
E	0.8619(0.026)	0.7220(0.057)	0.7280(0.023)	0.7020(0.032)	0.7160(0.024)	0.5151(0.077)	0.7228(0.040)	0.7407(0.043)	0.6211(0.027)	0.0690(0.058)
F	0.8083(0.002)	0.6867(0.029)	0.7231(0.024)	0.6779(0.078)	0.6667(0.034)	0.6848(0.066)	0.6906(0.035)	0.6296(0.009)	0.3840(0.150)	0.3193(0.024)
G	0.7622(0.004)	0.6477(0.045)	0.5916(0.028)	0.5550(0.066)	0.5435(0.015)	0.4514(0.005)	0.6172(0.005)	0.4922(0.001)	0.4477(0.011)	0.3851(0.026)

Table 2. Experiment results of real-world datasets for the time series generation.

Context-FID										
	ETTh	Stocks	MuJoco	fmri	Box	Gestures	Throwcatch	Discussion	Purchases	WalkDog
CHiLD	0.050(0.041)	0.017(0.000)	0.026(0.055)	0.027(0.001)	0.070(0.011)	0.017(0.004)	0.045(0.003)	0.018(0.005)	0.018(0.009)	0.008(0.004)
KoVAE	0.120(0.009)	0.095(0.013)	0.024(0.009)	1.242(0.142)	0.172(0.009)	0.089(0.023)	0.079(0.068)	0.076(0.036)	0.094(0.042)	0.068(0.034)
Diffusion-TS	0.116(0.010)	0.147(0.025)	0.013(0.001)	0.105(0.006)	0.128(0.017)	0.273(0.006)	0.135(0.011)	0.063(0.016)	0.169(0.048)	0.126(0.037)
TimeGAN	0.300(0.013)	0.103(0.013)	0.563(0.052)	1.292(0.218)	0.137(0.087)	0.110(0.081)	0.158(0.034)	0.100(0.009)	0.057(0.027)	0.089(0.013)
IDOL	0.077(0.013)	0.022(0.002)	0.062(0.012)	0.065(0.002)	0.085(0.006)	0.024(0.004)	0.054(0.002)	0.024(0.003)	0.021(0.014)	0.013(0.002)
cwVAE	0.892(0.059)	0.807(0.252)	1.010(0.195)	0.896(0.103)	0.215(0.026)	0.329(0.051)	0.284(0.025)	0.919(0.132)	1.147(0.146)	0.796(0.274)
TimeVAE	0.805(0.186)	0.215(0.035)	0.251(0.015)	14.449(0.969)	0.163(0.032)	0.063(0.006)	0.208(0.034)	0.113(0.020)	0.068(0.008)	0.332(0.104)
Correlational Score										
	ETTh	Stocks	MuJoco	fmri	Box	Gestures	Throwcatch	Discussion	Purchases	WalkDog
CHiLD	0.002(0.000)	0.005(0.000)	0.002(0.000)	0.069(0.003)	0.021(0.002)	0.040(0.003)	0.146(0.002)	0.180(0.003)	0.127(0.002)	0.345(0.002)
KoVAE	0.045(0.006)	0.007(0.002)	0.203(0.031)	8.659(0.070)	2.321(0.138)	2.160(0.330)	0.306(0.051)	1.364(0.023)	0.787(0.054)	0.807(0.012)
Diffusion-TS	0.049(0.008)	0.004(0.001)	0.193(0.027)	1.411(0.042)	0.901(0.125)	0.867(0.022)	0.949(0.243)	1.155(0.109)	0.930(0.037)	1.161(0.243)
TimeGAN	0.210(0.006)	0.063(0.005)	0.886(0.039)	23.502(0.039)	4.381(0.937)	4.843(0.620)	5.988(0.334)	17.345(0.485)	10.598(0.230)	10.577(1.334)
IDOL	0.004(0.000)	0.006(0.000)	0.002(0.000)	0.098(0.003)	0.418(0.035)	0.093(0.008)	0.208(0.007)	0.324(0.010)	0.455(0.016)	0.415(0.007)
cwVAE	0.070(0.001)	0.053(0.001)	0.050(0.001)	18.434(0.030)	0.215(0.026)	0.329(0.051)	0.284(0.025)	0.919(0.132)	1.147(0.146)	0.796(0.274)
TimeVAE	0.111(0.0200)	0.095(0.008)	0.388(0.041)	17.296(0.526)	1.206(0.118)	0.662(0.047)	0.745(0.046)	0.724(0.052)	0.847(0.013)	0.673(0.046)

Table 3. Experiment results on the climate datasets.

		Weather ^a	WeatherBench ^b	CESM2 ^c
Context-FID Score	CHiLD	0.507(0.042)	0.078(0.017)	0.018(0.003)
	KoVAE	2.131(0.637)	0.171(0.032)	0.198(0.030)
	Diffusion-TS	3.826(0.915)	1.712(0.163)	0.407(0.037)
	TimeGAN	6.434(1.398)	1.564(0.269)	3.255(0.232)
	IDOL	1.694(0.485)	0.239(0.030)	0.142(0.017)
	cwVAE	5.061(1.359)	0.409(0.056)	0.238(0.044)
Correlational Score	TimeVAE	3.910(0.858)	0.221(0.029)	0.108(0.029)
	CHiLD	0.165(0.004)	5.190(0.016)	1.250(0.009)
	KoVAE	1.620(0.012)	20.384(0.082)	10.087(0.017)
	Diffusion-TS	1.932(0.021)	63.291(0.630)	16.659(0.231)
	TimeGAN	3.438(0.020)	57.475(1.213)	20.641(0.082)
	IDOL	1.195(0.014)	34.773(0.059)	9.125(0.016)
	cwVAE	0.584(0.013)	34.690(0.131)	6.469(0.022)
	TimeVAE	0.707(0.005)	24.873(0.091)	6.363(0.022)

^a<https://www.bgc-jena.mpg.de/wetter/>^b<https://github.com/pangeo-data/WeatherBench>^c<https://causalinferencelab.com/>