Supplementary materials: Appendix

Table S1 Mathematical statistical characteristics of the robotic power voltage data (Unit: V)

Dataset	Minimum	Maximum	Mean	Standard deviation	Median	Quantile
Robot #1	11.9600	12.5500	12.2750	0.1146	12.2900	12.0800
Robot #2	12.5900	13.4000	12.9304	0.2078	12.9200	12.6500
Robot #3	13.8900	15.5800	14.8990	0.3625	14.8800	14.2950

Table S2 Precision evaluation indicators of 7 prediction models in Robot #1

Method	Horizon	Precision evaluation indicator			
		MAE/V	MAPE/%	RMSE/V	SDE/V
GRU	1-step	0.0698	0.5772	0.0827	0.0529
	2-step	0.0737	0.6093	0.0870	0.0534
	3-step	0.0756	0.6249	0.0888	0.0535
DBN	1-step	0.0437	0.3605	0.0534	0.0478
	2-step	0.0460	0.3796	0.0561	0.0483
	3-step	0.0480	0.3961	0.0586	0.0488
LSTM	1-step	0.0431	0.3555	0.0526	0.0476
	2-step	0.0451	0.3726	0.0551	0.0482
	3-step	0.0472	0.3901	0.0578	0.0487
MODWT-GRU	1-step	0.0513	0.4237	0.0605	0.0338
	2-step	0.0551	0.4437	0.0620	0.0483
	3-step	0.0680	0.5619	0.0828	0.0596
MODWT-DBN	1-step	0.0141	0.1163	0.0172	0.0124
	2-step	0.0285	0.2350	0.0351	0.0289
	3-step	0.0303	0.2501	0.0376	0.0347
MODWT-LSTM	1-step	0.0128	0.1058	0.0160	0.0144
	2-step	0.0254	0.2097	0.0315	0.0297
	3-step	0.0352	0.2911	0.0436	0.0371
Sarsa-MODWT-GRU-DBN-LSTM	1-step	0.0090	0.0744	0.0112	0.0105
	2-step	0.0236	0.1947	0.0292	0.0283
	3-step	0.0285	0.2354	0.0353	0.0348

Table S3 Precision evaluation indicators of 7 prediction models in Robot #2

Method	Horizon	Precision evaluation indicator			
		MAE/V	MAPE/%	RMSE/V	SDE/V
GRU	1-step	0.0705	0.5564	0.0783	0.0363
	2-step	0.0759	0.5996	0.0834	0.0366
	3-step	0.0813	0.6424	0.0888	0.0371
DBN	1-step	0.0276	0.2175	0.0348	0.0348
	2-step	0.0277	0.2188	0.0351	0.0350
	3-step	0.0284	0.2239	0.0359	0.0359
LSTM	1-step	0.0372	0.2939	0.0452	0.0341
	2-step	0.0414	0.3268	0.0493	0.0344
	3-step	0.0471	0.3716	0.0551	0.0350
MODWT-GRU	1-step	0.0502	0.3961	0.0568	0.0291
	2-step	0.0521	0.4243	0.0578	0.0349
	3-step	0.0581	0.4622	0.0603	0.0410
MODWT-DBN	1-step	0.0106	0.0838	0.0150	0.0120
	2-step	0.0184	0.1448	0.0242	0.0229
	3-step	0.0432	0.3403	0.0502	0.0282
MODWT-LSTM	1-step	0.0141	0.1112	0.0175	0.0134
	2-step	0.0178	0.1403	0.0231	0.0228
	3-step	0.0305	0.2411	0.0372	0.0289
Sarsa-MODWT-GRU-DBN-LSTM	1-step	0.0082	0.0649	0.0109	0.0093
	2-step	0.0142	0.1303	0.0218	0.0213
	3-step	0.0283	0.2231	0.0354	0.0259

Table S4 Precision evaluation indicators of 7 prediction models in Robot #3

Method	Horizon	Precision evaluation indicator			
		MAE/V	MAPE/%	RMSE/V	SDE/V
GRU	1-step	0.0753	0.5022	0.1155	0.1148
	2-step	0.0814	0.5431	0.1262	0.1255
	3-step	0.0890	0.5942	0.1379	0.1371
DBN	1-step	0.0615	0.4121	0.1093	0.1050
	2-step	0.0676	0.4532	0.1217	0.1160
	3-step	0.0748	0.5027	0.1354	0.1279
LSTM	1-step	0.0632	0.4218	0.1076	0.1075
	2-step	0.0689	0.4607	0.1182	0.1180
	3-step	0.0757	0.5064	0.1301	0.1298
MODWT-GRU	1-step	0.0722	0.4860	0.1068	0.0948
	2-step	0.0805	0.5050	0.1149	0.1013
	3-step	0.0837	0.5247	0.1188	0.1164
MODWT-DBN	1-step	0.0240	0.1602	0.0477	0.0476
	2-step	0.0494	0.3313	0.0814	0.0766
	3-step	0.0547	0.3662	0.0991	0.0972
MODWT-LSTM	1-step	0.0365	0.2448	0.0662	0.0646
	2-step	0.0486	0.3244	0.0882	0.0881
	3-step	0.0592	0.3957	0.1051	0.1044
Sarsa-MODWT-GRU-DBN-LSTM	1-step	0.0203	0.1359	0.0372	0.0367
	2-step	0.0418	0.2797	0.0682	0.0667
	3-step	0.0516	0.3456	0.0886	0.0872

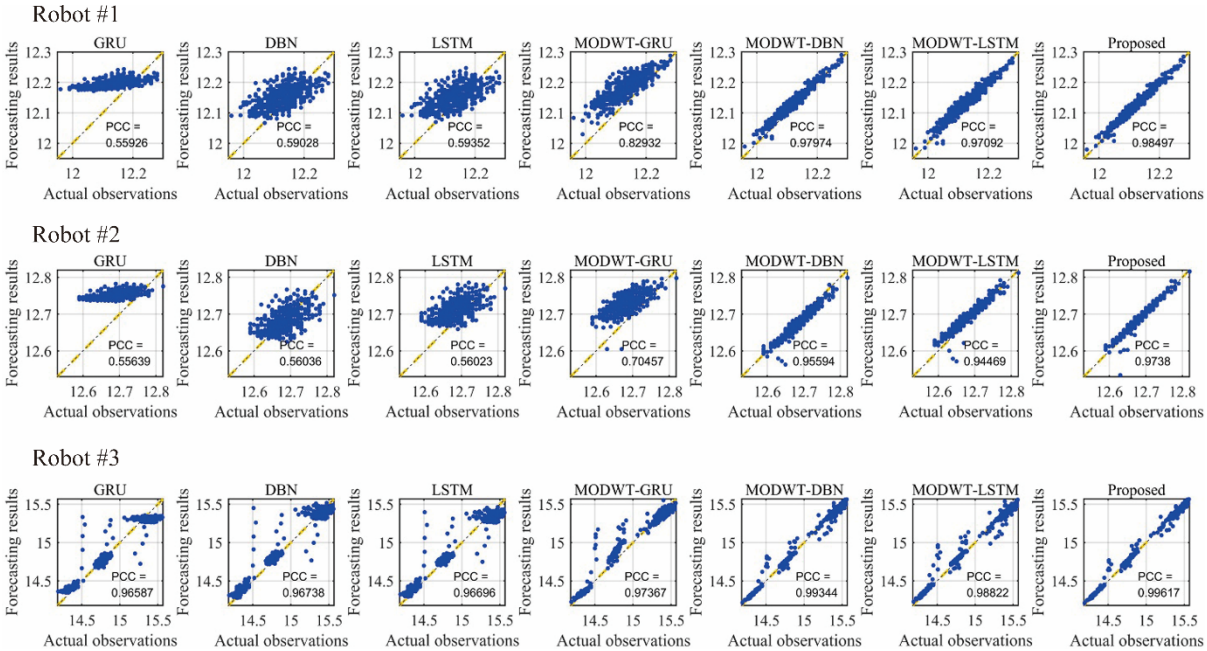

Figure S1 Scatter plot of 1-step forecasting results for 7 prediction models in Robots #1−#3 (Note: PCC represents the Pearson correlation coefficient)

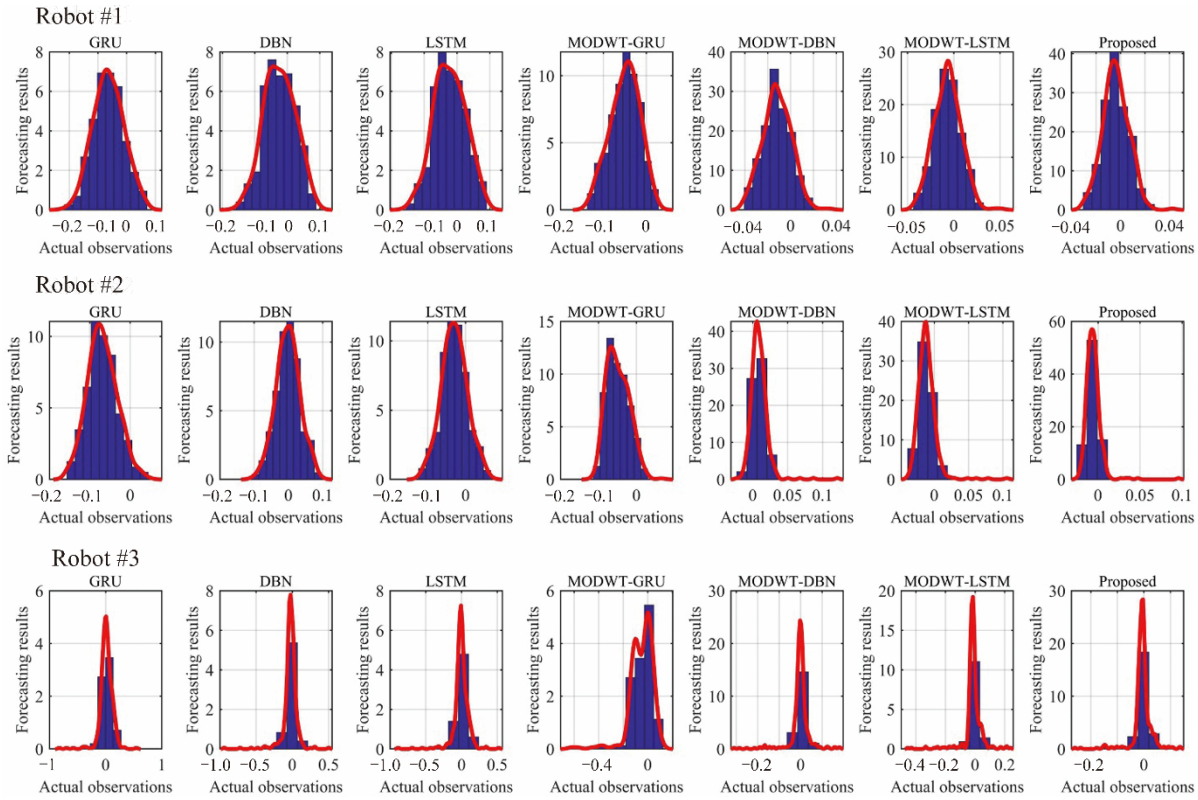

Figure S2 Kernel density estimation and square distribution diagram of 1-step forecasting results for 7 prediction models in Robots #1−#3