

Renewable Energy Forecasting with Echo State Networks

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Abstract

The abstract goes here. As a general guide, you should provide a concise (150-250 words) summary of your article - introduction, methodology, results, and conclusion. Avoid using abbreviations and acronyms unless the abbreviation/acronym is used repeatedly in the abstract. There should be no references in the abstract.

Keywords: FIXME, key words, go here, like:, simulation, spent nuclear fuel

1. Methodology

2. Results

3. Acknowledgments

This work was made possible with the support
5 from the people at University of Illinois at Urbana-
Champaign (UIUC) Facilities & Services. In par-
ticular, Morgan White, Mike Marquissee, and Mike
Larson. It was also aided by other members of
the Advanced Reactors and Fuel Cycles (ARFC)
10 group, in particular Nathan Ryan. This work is
supported by the Nuclear Regulatory Commission
Fellowship Program. Prof. Huff is supported by
the Nuclear Regulatory Commission Faculty De-
velopment Program (award NRC-HQ-84-14-G-0054
15 Program B), the Blue Waters sustained-petascale
computing project supported by the National Sci-
ence Foundation (awards OCI-0725070 and ACI-
1238993) and the state of Illinois, the DOE ARPA-E
MEITNER Program (award DE-AR0000983), and
20 the DOE H2@Scale Program (Award Number: DE-
EE0008832)

References

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Table 1: Tabulated error for 48-hour ahead wind forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting wind energy alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Wind Energy	0.001285	0.001727	[-]	[-]
Wind + Sun Elevation	0.000739	0.001181	-42.49	-31.62
Wind + Humidity	0.000901	0.001304	-29.88	-24.49
Wind + Pressure	0.000689	0.001235	-46.38	-28.49
Wind + Wet Bulb Temp.	0.000965	0.001373	-24.90	-20.50
Wind + Dry Bulb Temp.	0.001059	0.001393	-17.59	-19.34
Wind + Wind Speed	0.001873	0.002437	+45.76	+41.11

Table 2: Tabulated error for 4-hour ahead wind forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting wind energy alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Wind Energy	0.001434	0.001801	[-]	[-]
Wind + Sun Elevation	0.000905	0.001388	-36.89	-22.93
Wind + Humidity	0.001082	0.001424	-24.55	-20.93
Wind + Pressure	0.000845	0.001425	-41.07	-20.88
Wind + Wet Bulb Temp.	0.000999	0.001559	-30.33	-13.44
Wind + Dry Bulb Temp.	0.001057	0.001562	-26.29	-13.27
Wind + Wind Speed	0.001498	0.001797	+4.46	-0.2221

Table 3: Tabulated error for 48-hour ahead solar energy forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting solar energy alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Solar Energy	0.001367	0.002242	[-]	[-]
Solar + Sun Elevation	0.000932	0.001327	-31.82	-40.81
Solar + Humidity	0.001091	0.001688	-20.19	-24.71
Solar + Pressure	0.000830	0.001422	-39.28	-36.57
Solar + Wet Bulb Temp.	0.001304	0.001806	-4.609	-19.45
Solar + Dry Bulb Temp.	0.001263	0.001674	-7.608	-25.33
Solar + Wind Speed	0.001820	0.002624	+33.14	+17.04

Table 4: Tabulated error for 4-hour ahead solar energy forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting solar energy alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Solar Energy	0.000059	0.000068	[-]	[-]
Solar + Sun Elevation	0.000137	0.000146	+132.2	+114.7
Solar + Humidity	0.000128	0.000153	+116.9	+125.0
Solar + Pressure	0.000059	0.000076	0.0	+11.76
Solar + Wet Bulb Temp.	0.000152	0.000166	+157.6	+144.1
Solar + Dry Bulb Temp.	0.000065	0.000079	+10.17	+16.18
Solar + Wind Speed	0.000505	0.000660	+755.9	+870.6

Table 5: Tabulated error for 48-hour ahead total electricity demand forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting electricity demand alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Total Demand	0.000157	0.000197	[-]	[-]
Demand + Sun Elevation	0.000126	0.000170	-19.74	-13.70
Demand + Humidity	0.000361	0.000474	+129.9	+140.6
Demand + Pressure	0.000085	0.000136	-45.86	-30.96
Demand + Wet Bulb Temp.	0.000228	0.000267	+45.22	+35.53
Demand + Dry Bulb Temp.	0.000271	0.000345	+72.61	+75.13
Demand + Wind Speed	0.000785	0.001424	+400.0	+622.8

Table 6: Tabulated error for 4-hour ahead total electricity demand forecasts with various coupled quantities. Improvement indicates the percentage improvement over the base case of forecasting electricity demand alone.

Scenario	MAE	RMSE	Improvement MAE (%)	Improvement RMSE (%)
Total Demand	0.000073	0.000079	[-]	[-]
Demand + Sun Elevation	0.000051	0.000059	-30.14	-25.32
Demand + Humidity	0.000221	0.000246	+202.7	+211.4
Demand + Pressure	0.000041	0.000051	-43.84	-35.44
Demand + Wet Bulb Temp.	0.000110	0.000128	+50.68	+62.02
Demand + Dry Bulb Temp.	0.000131	0.000142	+79.45	+79.75
Demand + Wind Speed	0.000812	0.001297	+1012	+1541