Data and Codes for "A Case Study of Space-time Performance Comparison of Wind Turbines on a Wind Farm"

Version 2

[Version 2 corrects typos in Section 3, the reproducibility workflow table, and notes some result differences due to the DSWE version update.]

1. Computer and software environment

Hardware and Operating System: Any operating system capable of installing R software (Windows/MacOS/Ubuntu etc.) with a recommended RAM of 4 GB or above.

Software used: R (https://www.R-project.org/)

Required R package: DSWE version 1.2 or above available at: https://github.com/TAMU-AML/DSWE-Package

2. Explanation of the header of the data files

Header name	Meaning
time_stamp	Time stamp.
wind_speed	10-min average wind speed, in unit of m/s
wind_direction	10-min average wind direction, in unit of degree
ambient_temp	10-min average ambient temperature, in unit of $^\circ$C.
terrain	Terrain complexity classification. An integer. Not used.
active_power	10-min normalized power output, between 0 and 1.
sd_wd	10-min standard deviation of wind direction, in degrees.
turbulence_intensity	10-min turbulence intensity.
X-coordinate*	The anonymized horizontal coordinate value of a turbine
Y-coordinate*	The anonymized vertical coordinate value of a turbine

* Note: These values maintain the relative positional accuracy between turbines.

The datasets used in Section 4.1 are from https://aml.engr.tamu.edu/book-dswe/dswe-datasets/, the Turbine Upgrade Dataset. The data files are explained in the Datasets Description file on the same website.

3. Reproducing the results in the paper

[Dataset4 comprises a total of 66 files. The Dataset4 is not yet approved by the data owner for public release. We are sorry for the inconvenience.]

Which results to reproduce	Data File	Code File	Output
Table ~~2~~ 3	Dataset1.csv	Code_Table2.r	The two column values in Table ~~2~~ 3
Table ~~3~~ 4 (See note below)	Turbine Upgrade Dataset (Pitch Angle Pair, Table7.3).csv	Code_Table3.r	The two rows of "Our estimate" and "Our estimate/r'" in Table ~~3~~ 4.
Figure 3	Dataset2.csv	Code_Figure3.r	The six plots, in one PDF file
Figure 4	Dataset3_1.csv, Dataset3_2.csv	Code_Figure4.r	The two plots, in one PDF file
Figure 5	Dataset4.csv	Code_Figure5.r	The boxplots, in one PDF file
Figure 6	Dataset4.csv	Code_Figure6.r	The boxplots, in one PDF file
Figure 7	Dataset4.csv, Dataset_location.csv	Code_Figure7.r	Four PDF figure files, corresponding to Figure 7a, 7b, 7c, 7d, respectively
Figure 8	Dataset4.csv, Dataset_location.csv	Code_Figure8.r	Four PDF figure files, corresponding to Figure 8a, 8b, 8c, 8d, respectively.
Figure 9	Dataset4.csv, Dataset_location.csv	Code_Figure9.r	Four PDF figure files, corresponding to Figure 9a, 9b, 9c, 9d, respectively.

Note: The results in Table 4 included in the paper were produced by the DSWE version 1.3.4. Those results are still reproducible if using the same version of DSWE. Since then, DSWE went through some changes and updates. When using DSWE 1.5.1 version (the latest version as of May 10, 2022) and setting the optimization method to 'L-BFGS-B' (because version 1.3.4's default optimization setting was 'L-BFGS-B'), the results corresponding to the second row in Table 4 are then

v1.5.1 ('L-BFGS-B')	Our estimate	1.43%	2.07%	2.88%	3.54%	4.2%	4.67%	5.51%	5.96%
	Our estimate/r'	1.14	1.11	1.16	1.14	1.12	1.07	1.11	1.06