

Can Wind Power be used to Provide Sustainable Energy to Electric Vehicles?

**Mid-Year Report Submitted to:
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1. Progress to Date

Once the excel files of the wind power generation and electric vehicle charging sets had been downloaded into Matlab, they needed to be quality controlled. Due to the large amount of data points contained in the sets there were times when data was unable to be collected, and those time periods are left blank. To fill these empty data points I used a linear approximation based on the surrounding data.

The next step was to create monthly separation within the sets. The sets were given as one long string of values, with no way easy way to find when each point was measured. A vector is an array of numbers that has one dimension, essentially a list of numbers. To analyze the data, the strings of numbers need to be separated by the appropriate time vectors. By finding out how many hours were in each month I was able to create the necessary vectors for time. The four time vectors I created were: 15 minutes intervals for the years 2011 and 2012 and 1 hour intervals for the years 2011 and 2012.

With my four time vectors I was able to start running tests on the data. For each vector, I wrote code to determine three different correlation values, Pearson, Kendall and Spearman. The same pattern was apparent in all three of the correlation values. During the spring and summer months, the wind data and electric vehicle data were significantly more correlated than during the fall and winter months.

Two different sets can show a strong correlation, but it is possible for the correlation to be insignificant. Two completely random sets of data could appear to be correlated by chance, so it is necessary to check the significance of the correlation. To test the significance of the correlation, you create a null hypothesis and then attempt to disprove it. The null hypothesis I used was that the two data sets were uncorrelated.

Using my null hypothesis, I wrote code to determine the t-values of each correlation coefficient value. The t-value is a measure of the significance of your correlation coefficient value. The t-values are compared to a critical t-value, which is based on the size of data sets and how confident you want to be about your conclusions. If a t-value is less than the critical t-value, then the correlation coefficient is not significant.

Using a confidence interval of 95%, a standard confidence interval, all of the t-values for the spring and summer months were greater than the critical t-value, making those correlation coefficient values significant.

2. Other Activities & Next Steps

During the month of March, I will be putting together a presentation of my research that I will give at the National Conference on Undergraduate Research (NCUR), which takes place at the University of Kentucky from April 3-5. I am continuing to update my research with current data as I prepare for NCUR. During the spring quarter, I will be writing a conference paper, which will also be submitted to NCUR.