

CE888-7-SP-CO

Data Science and Decision Making

Assignment-1

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## Project Description:

As a data scientist, being able to predict the availability of surplus energy (solar or wind energy) at least 24 hours in advance based on past data.

## Instructions to run code:

1. Extract the files from the zip folder.
2. Place the weather data in the same folder as the downloaded code.
3. Launch jupyter lab in the same folder.
4. Find ds\_project\_exploration.ipynb named file and open it.
5. Install all the necessary libraries mentioned in the code.
6. Run all the cells sequentially.
7. Find Modeling.ipynb in the folder and repeat steps 5 and 6.

## Assumptions Made:

Assumptions	Value (if applicable)	Reference (if applicable)
average house size in UK	76 m <sup>2</sup>	<a href="https://shrinkthatfootprint.com/how-big-is-a-house/#:~:text=The%20average%20house%20size%20in,2%20(1%2C948%20ft2).">https://shrinkthatfootprint.com/how-big-is-a-house/#:~:text=The%20average%20house%20size%20in,2%20(1%2C948%20ft2).</a>
average electricity usage per hour in the UK	8.5kWh/24 = 0.354kWh	<a href="https://www.utilitybidder.co.uk/compare-business-energy/what-is-the-average-household-energy-usage/#:~:text=What%20is%20the%20average%20electricity,factors%20that%20affect%20this%20figure.">https://www.utilitybidder.co.uk/compare-business-energy/what-is-the-average-household-energy-usage/#:~:text=What%20is%20the%20average%20electricity,factors%20that%20affect%20this%20figure.</a>
average energy used in kWh per meter square	0.004657895	<a href="https://www.ofgem.gov.uk/information-consumers/energy-advice-households/average-gas-and-electricity-use-explained">https://www.ofgem.gov.uk/information-consumers/energy-advice-households/average-gas-and-electricity-use-explained</a>
no. of clients to provide energy for	100	
1 kWh = 3.6 MJ		<a href="https://www.inchcalculator.com/convert/kilowatt-hour-to-megajoule/">https://www.inchcalculator.com/convert/kilowatt-hour-to-megajoule/</a>
energy required by household in MJ per meter square	0.016768421	
energy consumed by all the clients	1.676842105	
Energy consumption rate to increase once free energy provided	3 times	
Total energy consumed after increased consumption	5.030526315	
if the total energy is more than the threshold, we get surplus energy		Above calculations
For wind energy:		

Power = $0.5 \rho \pi R^2 V^3$ , $R=12\text{m}$ , $\rho = 1.225 \text{ kg/m}^3$		<a href="https://www.e-education.psu.edu/emsc297/node/649">https://www.e-education.psu.edu/emsc297/node/649</a>
min. wind speed to meet threshold using above formula and values stated in the link	17.15 kph	
assuming that when precip = 0, there is no precipitation and hence preciptype is no longer required, hence filling in those blanks with 'na' as 'Not Applicable'		in dataset of brighton for all null values in preciptype, precip = 0

<b>Conclusion from above assumptions for threshold values:</b>		
min. wind speed to get surplus energy		17.15 kph
min. solar energy to get surplus energy		1.676842105