

CSEE5590/490: Big Data Programming

Project Proposal (Increment 1)

Project Title: Energy Demand Analysis in Spain

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Goals and Objectives:

- Motivation:
 - o Forecasting in energy markets is one exceedingly helpful tool in making the transition to a renewable-based electrical infrastructure, as stated in “Tackling Climate Change with Machine Learning” (see resources for link to paper). Our goal is to demonstrate this by leveraging Big Data analysis tools on a dataset that consists of energy usage and weather data for five large cities in Spain.
- Significance:
 - o Predict energy usage to increase efficiency of electrical production
 - o Predict energy price
 - o Locate areas that would benefit from renewable energies
- Objectives:
 - o Predict energy usage based on the weather
 - o Predict energy prices by:
 - Time of day
 - Day of the week
 - Time of year
 - o Analyze the factors that affect the fluctuations in energy usage, as well as the sources of energy
- Features:

<ul style="list-style-type: none">o dt_iso (datetime index localized to CET)o generation biomass (in MW)o generation fossil brown coal/lignite (in MW)o generation fossil coal-derived gas (in MW)o generation fossil gas (in MW)o generation fossil hard coal (in MW)o generation fossil oil (in MW)o generation fossil oil shale (in MW)	<ul style="list-style-type: none">o generation fossil peat (in MW)o generation geothermal (in MW)o city_nameo temp (in kelvin)o temp_min (in kelvin)o temp_max (in kelvin)o pressure (in hPa)o humidity (in %)o wind_speed (in m/s)o wind_deg (wind direction)o rain_1h (rain in last hour in mm)
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Storytelling – “Chapter 1 Life”:

- Who:
 - o This data has the ability to impact every community that uses an electrical grid. Not only is it advantageous at the individual level to be able to predict the cost of an electric bill, but it is also extremely helpful to be able to predict energy usage at a macro level as communities across the globe begin to make the transition to renewable energies in response to climate change.
- What:
 - o We seek to analyze the patterns of weather and energy uses and use them to predict energy demand and price. While the short-term results have the potential to improve 24-hour and hour-by-hour predictions, this work also has the potential to help identify areas that would most benefit from the introduction of renewable energy.
- When:
 - o This data was collected between 2015 - 2019.
- Where:
 - o The data is collected from the five largest cities in Spain: Madrid, Barcelona, Valencia, Seville, and Bilbao.
- Why:
 - o By improving forecasting, we can increase the efficiency of a power grid and help reduce the usage of peak demand on power plants, which are generally less efficient than their counterparts. As stated in the motivation, forecasting in energy markets is an exceedingly helpful tool in making the transition to a renewable-based electrical infrastructure.

Contribution of Work:

Claire: Storytelling – “Chapter 1 Life” idea generation (15%)

Wes: Storytelling – “Chapter 1 Life” idea generation (15%)

Scott: Storytelling – “Chapter 1 Life” idea generation (15%)

Shelby: Goals and Objections, Storytelling synthetization (15%)

References:

“Tackling Climate Change with Machine Learning”

<https://arxiv.org/abs/1906.05433>

“Hourly energy demand generation and weather – Electrical demand, generation by type, prices and weather in Space”

https://www.kaggle.com/nicholasjhana/energy-consumption-generation-prices-and-weather?select=weather_features.csv