COMP40610 Visual Exploration Tool Design Document

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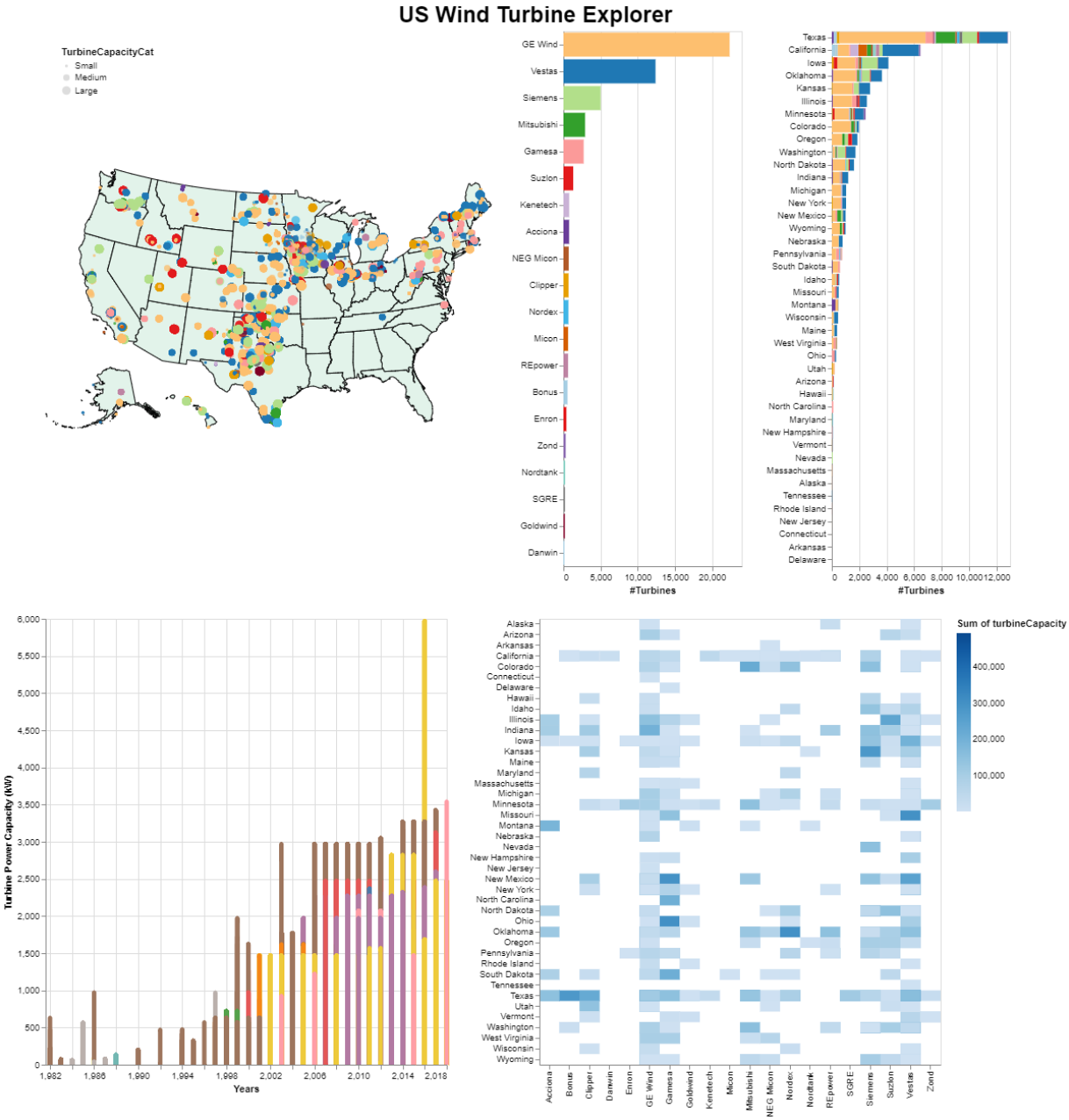
Title:
US Wind Turbine Explorer

Screenshot:



A web page for usage of our tool can be found here

Dataset overview:

This dataset was adapted from the US Wind Turbine dataset. The initial dataset contains information on all wind turbines constructed in the US up until 2018. The position (latitude and longitude), state, turbine capacity, manufacturer, and project information are among the features of the turbines. We created a new version of this dataset with a new ordinal variable that represents the size of the turbine's power capability using Python/Jupiter Notebook. The power capacity of the turbine was divided into three groups or bins ([0, 1500, 2050]) to compute this variable.

Design considerations

This should provide an overview of your visualisation, a discussion of why you used specific encoding/interaction options, and the pros/cons of your visualisation vs alternatives.

Overall goal: Our overall goal with this tool was to enable the exploration of the relationship between the power capacity of wind farms, the manufacturer that constructed the turbine, the year it was and the geographic location (state).

Our main three tasks that we wished to investigate through this tool were:

- How do newer installations compare to older turbines?
- Which states have the most turbines/create the most power?
- Which manufacturers have the most turbines/create the most power?

Bar charts:

We had two stacked bar charts:

1. Count of turbines per manufacturer
2. Count of turbines per state

We decided to sort each chart according to the state/manufacturer with the highest to the lowest count of turbines.

Colour was used to indicate the different turbine manufacturers, and the specific colour codes were used from here, to make the chosen colour palette colour-blind friendly.

Instead of a stacked bar chart, grouped bar charts or small multiples was another possibility to visualise the numerous states/manufacturers, however, we felt that it was sufficient to be able to compare the total count of the two categorical variables as usage of the other graphs' interactions would be sufficient to show various subsets.

Histogram:

The histogram we created shows the power capacity of each turbine per year
We initially thought to use a strip plot but this suffered from severe overplotting as well as no additional analysis being able to be made to suit our original goals, which is why we made use of a bar chart to see state and manufacturer turbines per year as well as the evolution of the turbines.

Dot plot map:

The map we created shows the spread of the different turbines across America, with each dot being sized according to the capacity of power it generates, and coloured according to the manufacturer that built it. The main disadvantage is that this map suffers from overpopulation where even with opacity it can be hard to distinguish individual turbines in areas of concentration. However, this was easily overcome by the integration of the 3 charts which

allows subsets to be shown. We also added a feature to allow specific subsets of the population to show according to the amount of power each turbine has the capacity for.

Interaction consideration:
The primary interaction method we used was cross-filtering. Users can select sections of the data in one chart, which would filter the data in the other charts as well. For example, if users select specific power capacity(s), state(s), manufacturer(s) and/or year(s) from the three chats and the map the aggregated is displayed in the heatmap shown, however, futher selections can also be made from each chart, with each having a distinct data characteristic that can be selected. Together, these enable the user to investigate the connection between these three characteristics, eg, which state/manufacturer has the highest count of turbines or which year fares the best in terms of power?

For further analysis of our tool please consult our individual video presentations attached in the zip file.