GeoVis: an interactive map to visualize common climate indicators

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Compiled April 18, 2024

Geovis is a map rendering of the United States that aims to provide climate enthusiasts or curious individuals with an interactive webpage to visualize common climate indicators such as wind speed, precipitation, and temperature. With the increase in greenhouse gas emissions around the world, it is crucial to visualize such trends that leverages ones understand in climate change. To compile this project, we utilized datasets from Kaggle. Our visualization garnered much important feedback, with many feedback being appreciative of our minimalistic and intuitive design. We found that many testers were curious at our web application because they were found to be clicking on multiple things for the sake of visualizing the data.

1. INTRODUCTION AND BACKGROUND

We are both climate enthusiasts, which is why we decided to pursue a project that was closely related to visualizing climate. Our intention of creating this project was to provide a platform for individuals to visualize common climate indicators such as wind speed, precipitation, and temperature. We believe that with the increase in greenhouse gas emissions around the world, it is crucial to visualize such trends that leverages ones understand in climate change. Creating a map visualization was what we believed to be the most intuitive way to visualize data, we were inspired by wind fm and earth nullschool. These sites provide the user with great flexibility in manipulating and showing specific climate indicators, something that we took inspiration in creating our own.

2. DATA COLLECTION

To compile this project, we primarily utilized datasets of type csv. There are two types of data that we had to process, one is for every airport, and another for every county.

A. Airport Data

Utilizing airports was the most intuitive way to gather weather data. Initially we had planned to use large global datasets, such as NOAA ICOADS, but we found it expensive, given the size of the dataset being 31 million rows and 75 columns. Not only that, but the points that were collected over the United States were so abundant, that it was difficult to visualize and also hindered our efforts to make it interactive. Instead, we pivoted over to a dataset that was more manageable, which was the weather data for 265 airports in the United States. This dataset was much more manageable, with 265 airports. Airports resembled a cleaner visualization as well, as some states have at most 3 major airports, making it simple to visualize the difference.

Processing the data was by no means simple. There wasn't a dataset that was "perfect" for our project, so we had to look for multiple datasets. The datasets we found was always missing some key features. Our airport weather data, while it was useful in providing us with the weather data, it was missing the latitude and longitude of the airports. We had to find another dataset that provided us with the latitude and longitude of the airports. We had to merge these two datasets together to create a dataset that had both the weather data and the latitude and longitude of the airports. However, it would be simple if we could just merge the two datasets together to create one, but we ran into one problem. The airport dataset providing us with climate information contained only 265 airports, while our other dataset contained over 3375 datapoints, which are all the airports in the United States.

3. VISUALIZATION AND CHOICES

Here is visualization and choices

4. FEEDBACK

5. FEATURE CONTRIBUTION

6. CHALLENGES

7. WORK DISTRIBUTION

A. Muhammad Alafifi

B. Jiawei Wu

For our visualization, I was responsible for gathering and processing all the datasets relating to the airports as well as the climate data on each airport. I was responsible for implementing the time slider and its functionalities, creating the rendering of the US map, plotting the airports in their respective location, selecting colors for their respective climate indicators, and creating the pop-up window that shows the climate data of each

airport. I was also responsible for creating the legend that shows the range of values for each climate indicator. In addition, I also implemented a selection for the climate indicators for the airport points for users to switch between temperature, dew point, wind speed, humidity, and air pressure.

For our project write up, I was responsible for writing the abstract, [1] introduction and background, [2a] data collection for the airport data.

8. FIGURES AND TABLES

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Figures and Tables should be labelled and referenced in the standard way using the `\label{}` and `\ref{}` commands.

A. Sample Figure

Figure 1 shows an example figure.

Fig. 1. Dark-field image of a point absorber.

B. Sample Table

Table 1 shows an example table.

Table 1. Shape Functions for Quadratic Line Elements

local node	$\{N\}_m$	$\{\Phi_i\}_m$ $(i = x, y, z)$
$m = 1$	$L_1(2L_1 - 1)$	Φ_{i1}
$m = 2$	$L_2(2L_2 - 1)$	Φ_{i2}
$m = 3$	$L_3 = 4L_1L_2$	Φ_{i3}

9. SAMPLE EQUATION

Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \cdots + X_n}{n} = \frac{1}{n}\sum_{i}^{n} X_i \qquad (1)$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

10. SAMPLE ALGORITHM

Algorithms can be included using the commands as shown in algorithm 1.

Algorithm 1. Euclid's algorithm

```
procedure EUCLID(a, b)                ▷ The g.c.d. of a and b
    r ← a mod b
    while r ≠ 0 do                    ▷ We have the answer if r is 0
        a ← b
        b ← r
        r ← a mod b
    return b                          ▷ The gcd is b
```

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Fig. 2. Terahertz focusing metalens.

B. Sample Dataset Citation

1. M. Partridge, "Spectra evolution during coating," figshare (2014), http://dx.doi.org/10.6084/m9.figshare.1004612.

C. Sample Code Citation

2. C. Rivers, "Epipy: Python tools for epidemiology," Figshare (2014) [retrieved 13 May 2015], http://dx.doi.org/10.6084/m9.figshare.1005064.

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