Generating Scenarios of Temperatures for Texas

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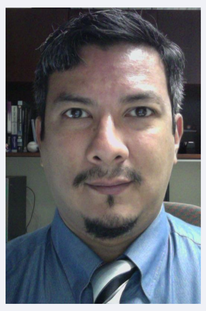


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UGREAT Research Area

The scenarios of temperatures provide a view of variations in temperatures by location. This information can be used to design a supply chain that incorporates temperature related parameters in the decision process.

Motivation or Background

Most vehicles in America use fuel that is processed from oil. Bio-fuel can be used as fuel for vehicles by converting biomass, using a pyrolysis decomposition process, into biofuel. This study of Texas temperature conditions can be used to determine the optimal locations for processing the biomass into biofuel. The temperature conditions will save energy to heat the biomass to the pyrolysis temperature prior to the conversion. Biomass collected can also be used for charcoal substitution in coal power plants.

Objectives

1. Create a statistical database of temperatures in Texas
2. Identify probabilistic functions that describe the temperature uncertainty
3. Create different maps to display the information mentioned before

Methodology

- Matlab was used to find the average of all the counties in three different ways. The overall county average using all 132 months of data from January 2008 to December 2018. Then the average of the monthly temperatures using the same data. Lastly the yearly average was used to see if there was a significant increase in yearly averages over time.
- These averages where then imported to a CSV file. Using a Matlab app that finds a distribution type that fits closest to the data. The data was split into 2 categories because of the spikes in frequency during the summer months (June, July, August). There are two distribution list containing summer months and non-summer months.
- Excel: The original data was provided from weather stations that may contain temperature information during Jan 2008 to Dec 2018. Not every county provided temperatures for every month during this period and the missing data was filled using the closest weather station with temperature information for that month that was the closest to the county's center.

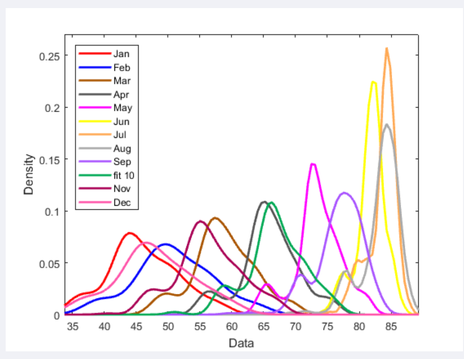

Fig. 1. Temperature Distributions

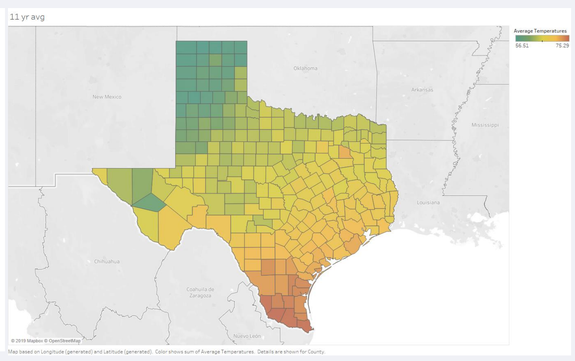

Fig. 2. Averages of eleven years

Results

Counties can be organized to find the temperature deviations from the state temperature average. The deviations were also used to find the greatest quarterly deviations above the average by county. The counties with the greatest deviation in each county were Cameron, Starr, Brooks, and Cameron in each quarter respectively.

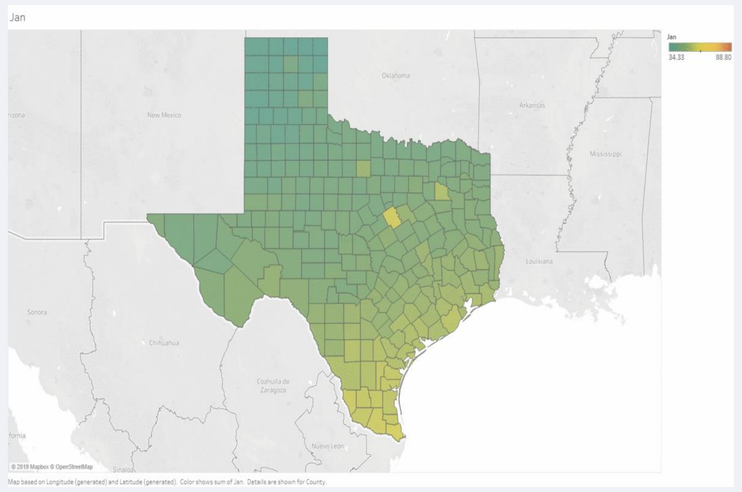

Fig. 3. Monthly averages

Skills and Experience

- Experience in Excel was used during the compiling of the data received from the National Oceanic Atmospheric Administration
- Compiling missing data to make a holistic picture of the data pulled.
- Using the filter system in Excel.
- Looping functions in matlab to cover the entire set of data.
- Finding distribution types and parameters to generate scenarios based off those distribution parameters.

What I Learned

We have learned more about Matlab coding, Tableau programs, and optimization models used to determine the best locations to open different types of facilities within the supply chain.

Future Plans

- Combine the information with precipitation data for additional factoring of ideal locations
- Apply the information to planting, distribution hubs, and conversion plants
- Use these honed skills to further research, in the workforce as well as in the degree plan we are currently in.

Acknowledgments

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References

- NCEI, National Centers for Environmental Information, 2015, URL: https://www.ncdc.noaa.gov/cdo-web/search. Accessed: Jul-17-2019