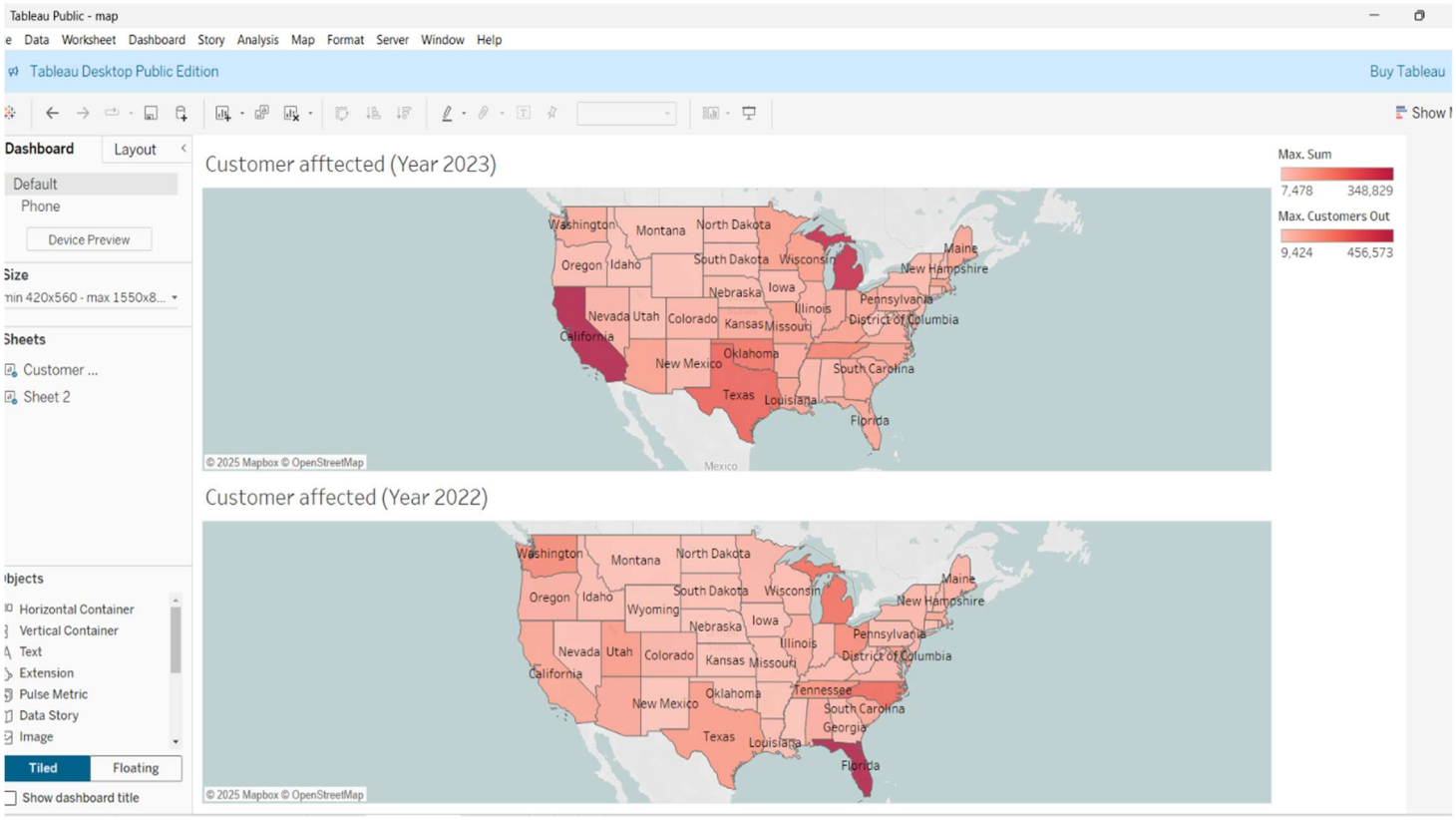
Data Visualization

Below are some of the results from my current research data science project with NASA JPL. I did some visualizations of the hazards and power outages to present my findings clearly to the team using Tableau and other visualization tools.

- Data Visualization of wildfire across the United States in year 2013 using the fire intensity level as the basic parameter.

https://drive.google.com/file/d/1oTXB8CIlOXsGiyvLQFHVvCEtDSgDtx5j/view?usp=sharing

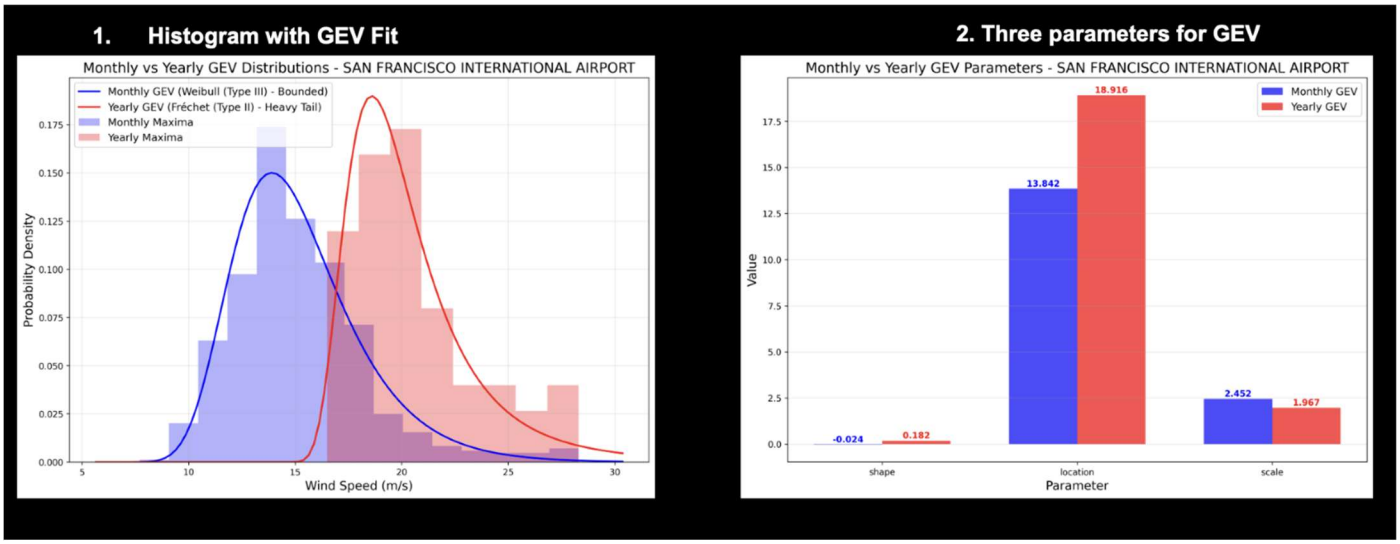
- This interactive dashboard visualizes and compares the number of customers affected by power outages across U.S. states in the years 2022 and 2023. The dashboard is based on real telemetry data filtered from county-level records and helps visualize which states were most affected in each year.



This makes it easy to spot patterns in outages over time and across different regions. It can help decision-makers understand where and when outages are most common.

Extreme Value Analysis

Generalized Extreme Value Distribution (GEV) Curve of each hazard

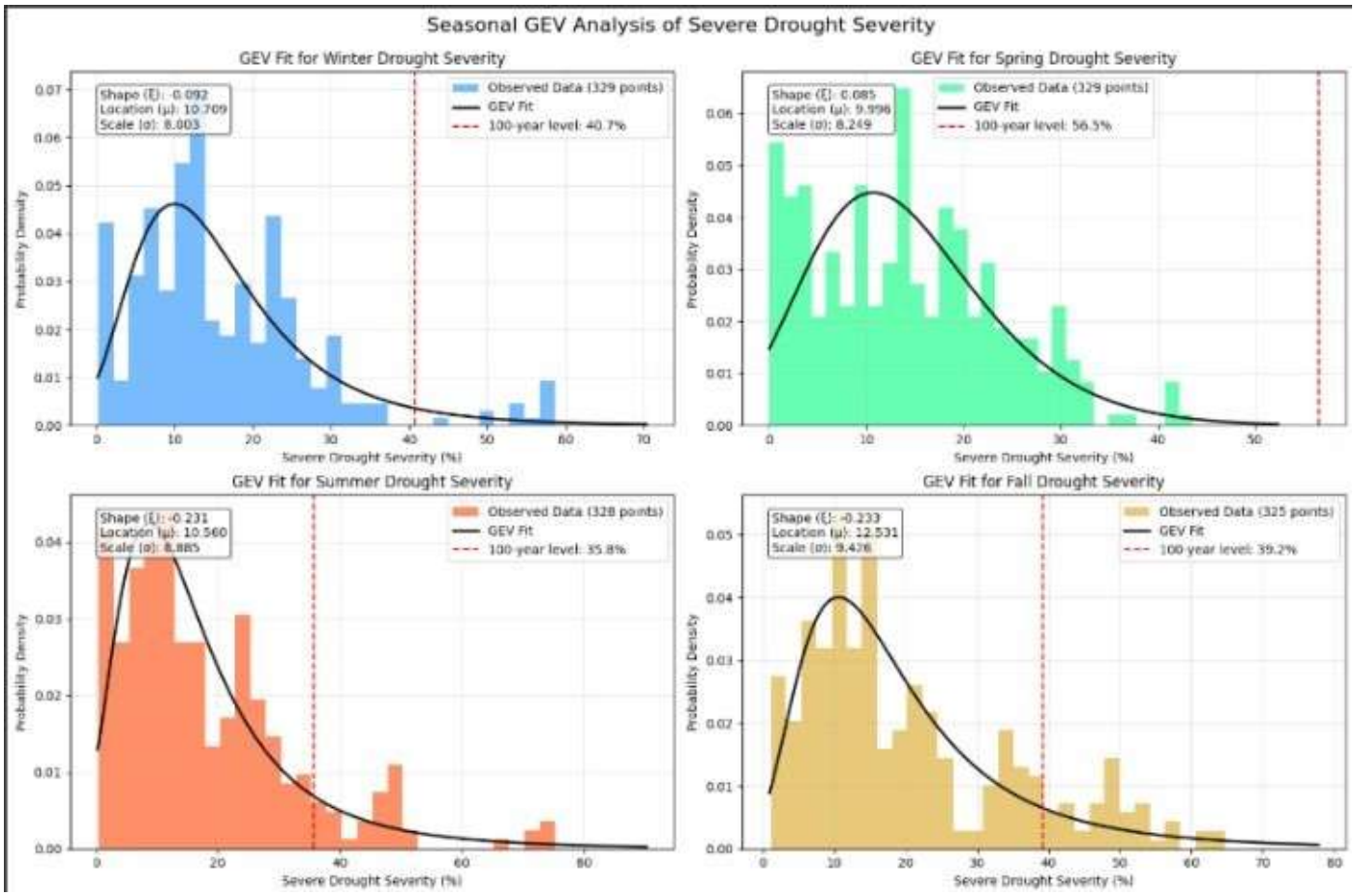


Left plot; Histogram with GEV Fit:

- Compares monthly vs yearly GEV distributions for wind speed.
- Blue curve represents the monthly maxima; red curve shows the yearly maxima.
- The aim is to evaluate whether annual extreme values differ significantly from monthly observations, which is key for return period estimation.

Right plot; GEV Parameters Comparison:

- A bar plot comparing shape, location, and scale parameters for monthly vs yearly GEV models.
- The parameters are essential in defining the GEV distribution:
    - Shape (ξ): tail behavior (fat/heavy vs bounded).
    - Location (μ): central tendency.
    - Scale (σ): spread of the distribution.

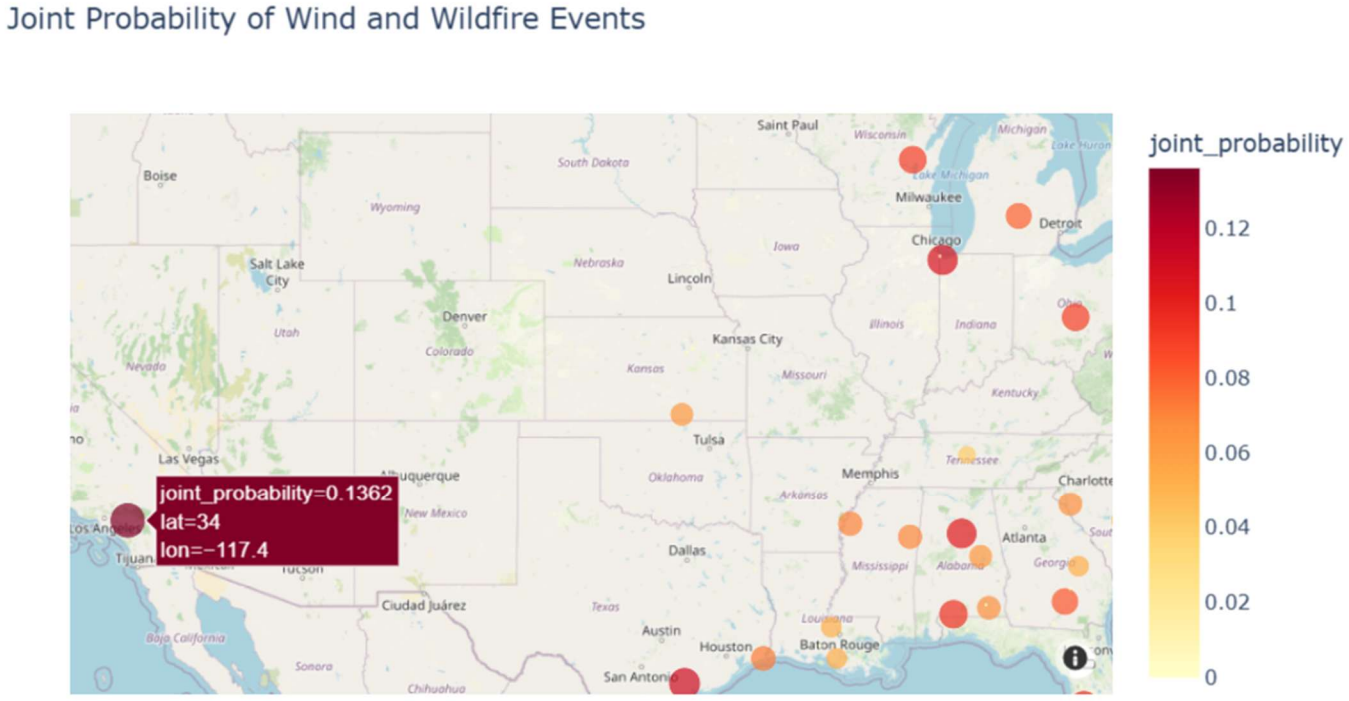


This figure presents Generalized Extreme Value (GEV) distribution fits for severe drought severity broken down by season (Winter, Spring, Summer, and Fall).

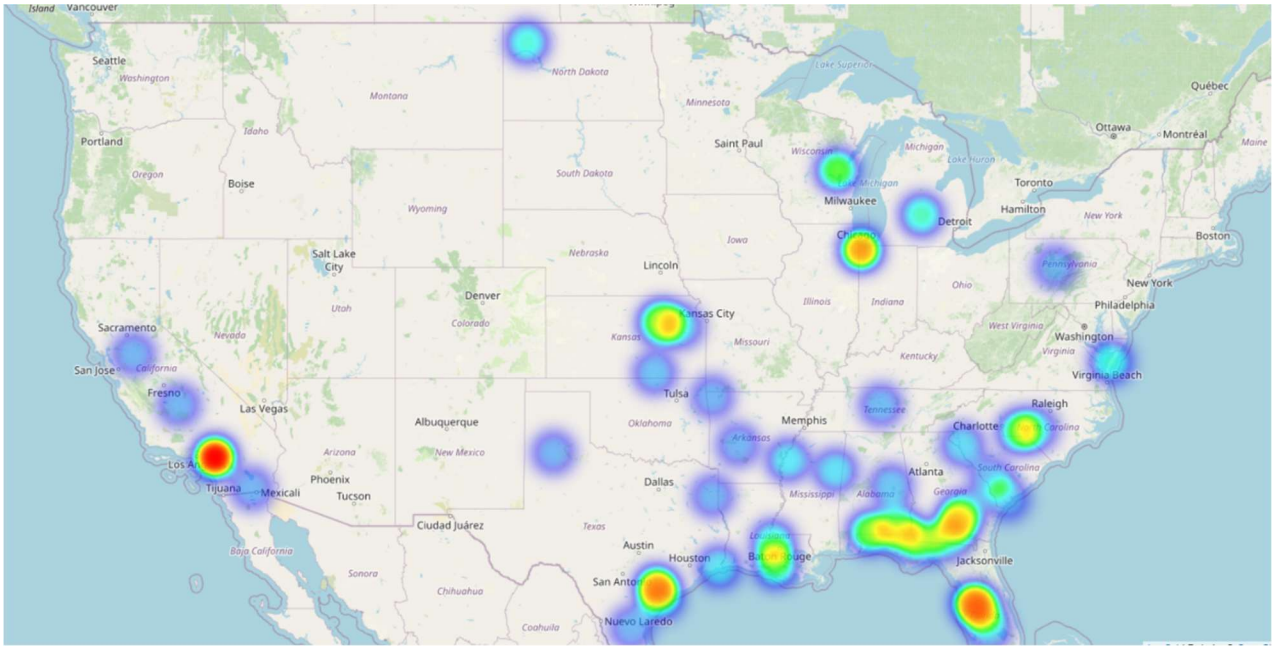
Purpose:

- To understand how extreme drought events vary seasonally
- For example, Spring has a 100-year severity level of 56.57%, indicating higher seasonal extremes compared to Winter (40.7%) or Summer (35.8%).

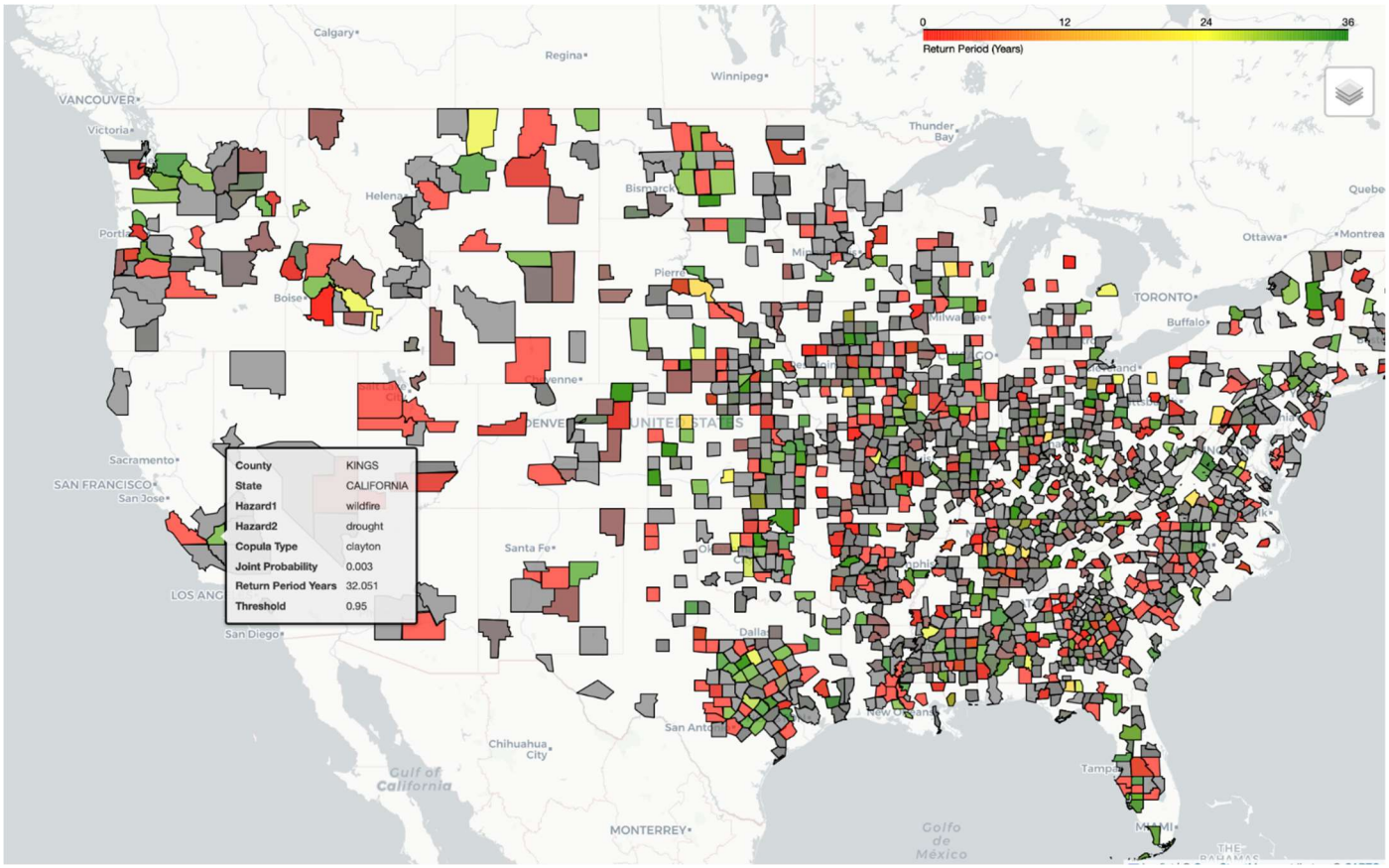
Copula-based Visualization (Mutli-Variate Extreme value Theory) of Hazards (Wind, Wildfire, and Droughts)



Heat Map – Hazard Intensity Zones (Wind & Wildfire)



Drought-Wildfire Risk Analysis Map



Multi-Hazard Risk Analysis of 3 hazards (Interdependencies of 2 hazards at a time)

https://drive.google.com/file/d/1tEFaC3eeuJl9wXUKer7cjP-REfCQityt/view?usp=sharing

The above video shows the visualization (html version) of 3 hazards with 2 pair each along with their interdependencies and indicates how mostly two hazards can occur together and their risk analysis.