



# STORM CHASERS

*Taylor Bohl  
Harish Korrapati  
Corey Lawson-Enos  
Rhiana Schafer  
Ishanjit Sidhu*

# PROJECT BACKGROUND & DESCRIPTION

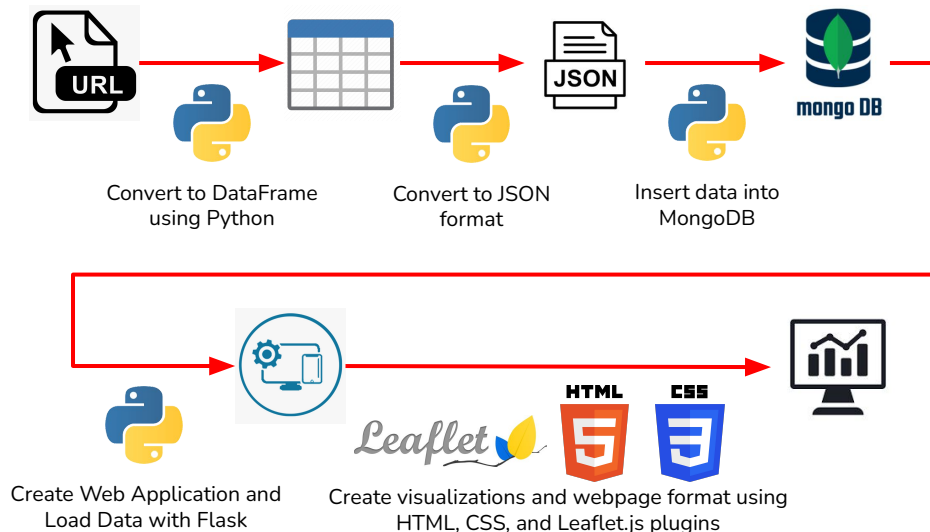
## Summary

We analyzed the **location, intensity, and frequency** of **US tornadoes** from the last **two months**, and visually displayed findings on a web application.

## Methods

- Determine topic of interest
- Research, gather, and narrow data sources
- Pull data from API into dataframe
- Converted dataframe into JSON format
- Organized and stored data in MongoDB
- Used Python Flask to power web application
- Created 3 visualizations using Leaflet
  - Tornado Path Tracker
  - Tornado Location Heatmap
  - Tornado Intensity Analysis

## Workflow



# DATASET

## Source

### National Climatic Data Center (NCDC)

Severe Weather Data Inventory: NEXRAD Level-3 Radar identifying Tornado Vortex Signatures

Source URL: <https://www.ncdc.noaa.gov/swdiws/>

Basic API syntax: <https://www.ncdc.noaa.gov/swdiws/{outputFormat}/{dataset}/{dateRange}>

Significance	Column Name	Description
What?	Cell_ID	ID of storm
	Cell_Type	Type of Rotation, TVS indicates tornado
When?	zTime	Measure of time used in meteorology (UTC time)
Where?	Shape	Point (Lat, Lon)
	WSR_ID	ID of tower/radar collecting the data
	Azimuth	Angular direction of storm in degrees
	Range	Distance of the storm from radar station
How Intense?	MXDV	(Maximum Delta Velocity)- a combination indicator of size and shape of the storm
	Max_Shear	Change in wind speed and/or direction with height

## Additional Created Columns

Primary Key Cell ID + Date

Concat.

Date	YYYY-MM-DD
Time	HH:MM:SS
Year	YYYY
Month	MM
Latitude	Lat
Longitude	Lon

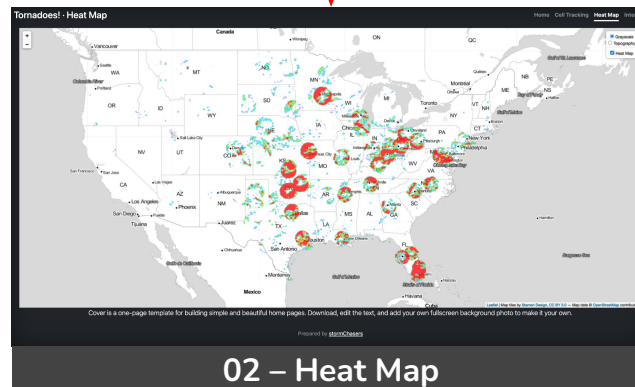
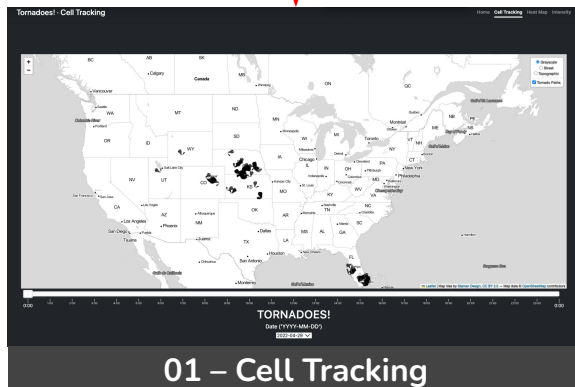
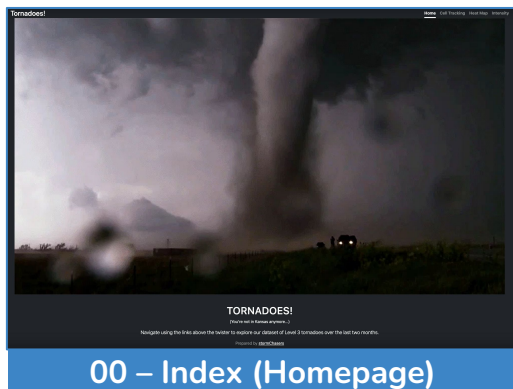
Parse

Parse

# WEBPAGE PATHS

Each of the three routes holds an interactive visualization:

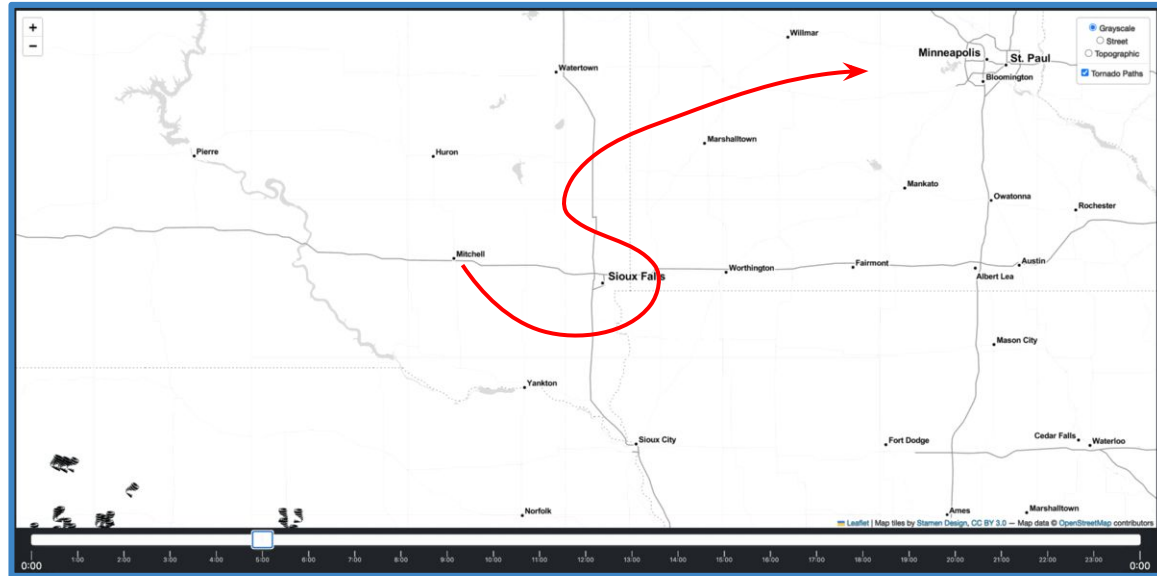
- **01 – Cell Tracking:** displays cumulative path of tornadoes given a user-inputted date (dropdown) and time (slider) across the US
- **02 – Heat Map:** visualizes geographic concentration of tornado frequency across the US
- **03 – Intensity:** demonstrates the effect incident date and velocity have on tornado intensity (wind shear)



# INTERACTIVE DEMONSTRATION



# 01 – CELL TRACKING EXAMPLE



*Cumulative path of several EF1 tornadoes that struck Sioux Falls, SD on May 30, 2022*



*Damage to an antenna*



*Damage to farm buildings*

# LEARNINGS, PAIN POINTS & FUTURE ENHANCEMENTS

## Pain Points

Taylor

Plug-in documentation, dataset size limitations

Harish

Better understanding data documentation, data definitions, and limitations of datasets

Corey

Geojson export size limitations ("Please Work"), marker rotation, event handling, plug-in source documentation

Rhiana

Appropriate formatting of data both to and from MongoDB

Ishan

Data Structure: Vertical vs Horizontal

## Corrective Actions

- Embed slider event handling in a single function to simplify code further; alternatively, html option for slider other than `<div>` to permit 'onchange'?
- Geojson format import into MongoDB was too large, threw error - imported same info in a different format to fix.
- Removing object ID from MongoDB output before chart/map generation
- Data Structure: Able to loop through list and create a dictionary to restructure data



