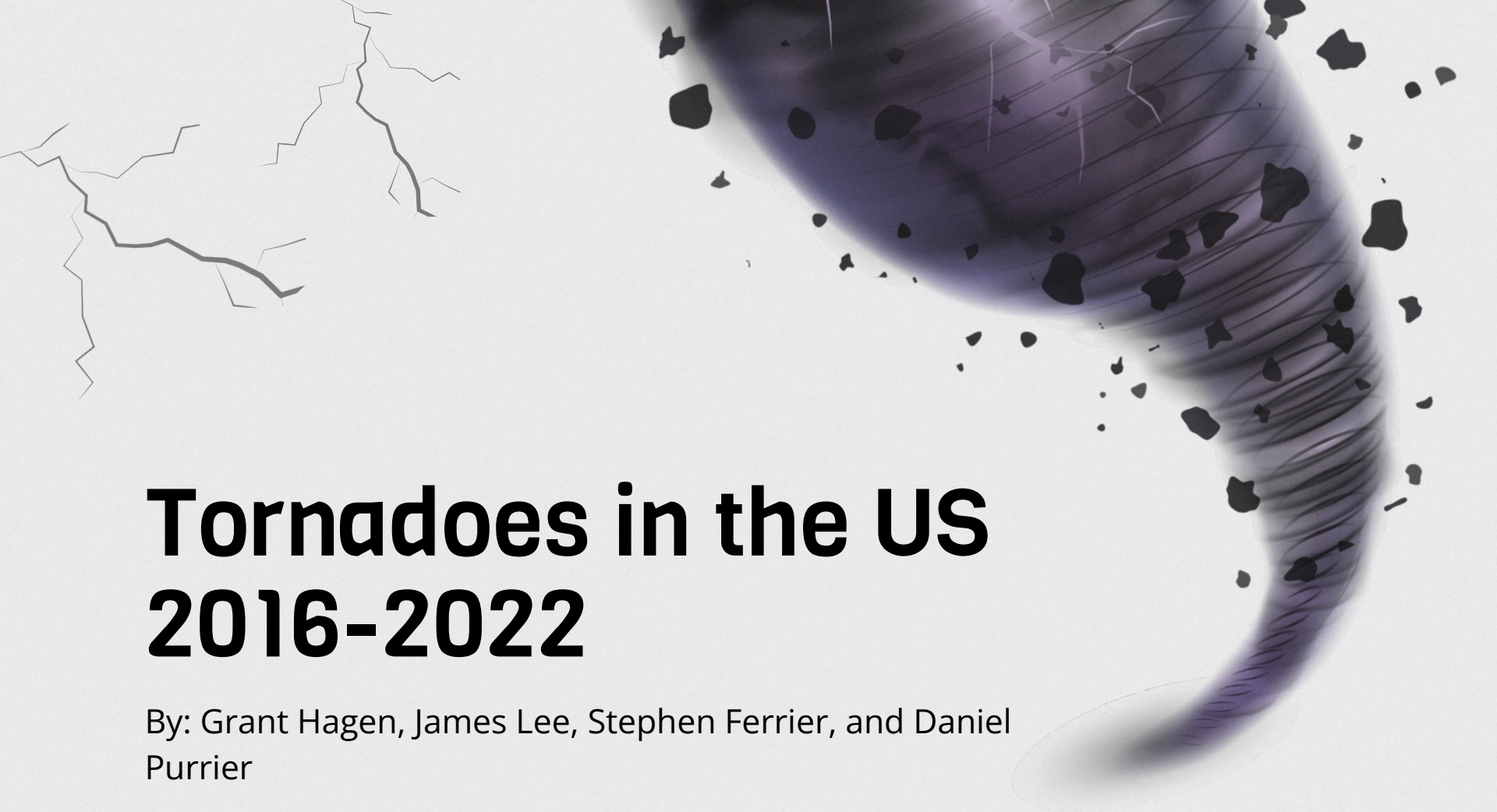

Tornadoes in the US 2016-2022

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Introduction

Data Engineering

Data Cleaning

- Dropped unwanted columns
  - Day, Time Zone, Date Time etc.
- Renaming columns
- Change data types
  - Date From Object to Date
- Created Season Column
  - Created Dictionary and Assigned Season Based on Month
- Exported Cleaned Data To New Excel File
- Created SQLite File Based Off of Cleaned Data

EDA

```
# switch on user_year
if user_year != 'All':
    where_clause = f"yr = {user_year}"
else:
    where_clause = f"yr > 2000"

# build the query
query = f"""
    SELECT
        yr,
        state,
        category,
        loss,
        start_lat,
        start_longitude,
        end_latitude,
        end_longitude,
        distance_traveled,
        width
    FROM
        tornadoes
    WHERE
        {where_clause}
    ORDER BY
        date DESC;
"""
```

```
# build the query
if user_seasons != 'All':
    where_clause = f"seasons = {user_seasons}"
else:
    where_clause = "1 = 1"

query = f"""
    SELECT
        yr,
        month,
        state,
        category,
        injuries,
        fatalities,
        seasons
    FROM
        tornadoes
    WHERE
        {where_clause}
    ORDER BY
        date DESC;
"""
```

App and App Helper

```python
# Bar Graph Query
def get_bar(self, user_seasons):

    # User Input
    if user_seasons != 'All':
        where_clause = f"seasons LIKE '{user_seasons}'"
    else:
        where_clause = "1 = 1"

    # Query
    query = f"""
        SELECT
            yr,
            category,
            injuries,
            fatalities
        FROM
            tornadoes
        WHERE
            {where_clause}
        ORDER BY
            category ASC;
    """

    # Convert data into dictionary
    df = pd.read_sql(text(query), con = self.engine)
    data = df.to_dict(orient="records")
    return(data)
```

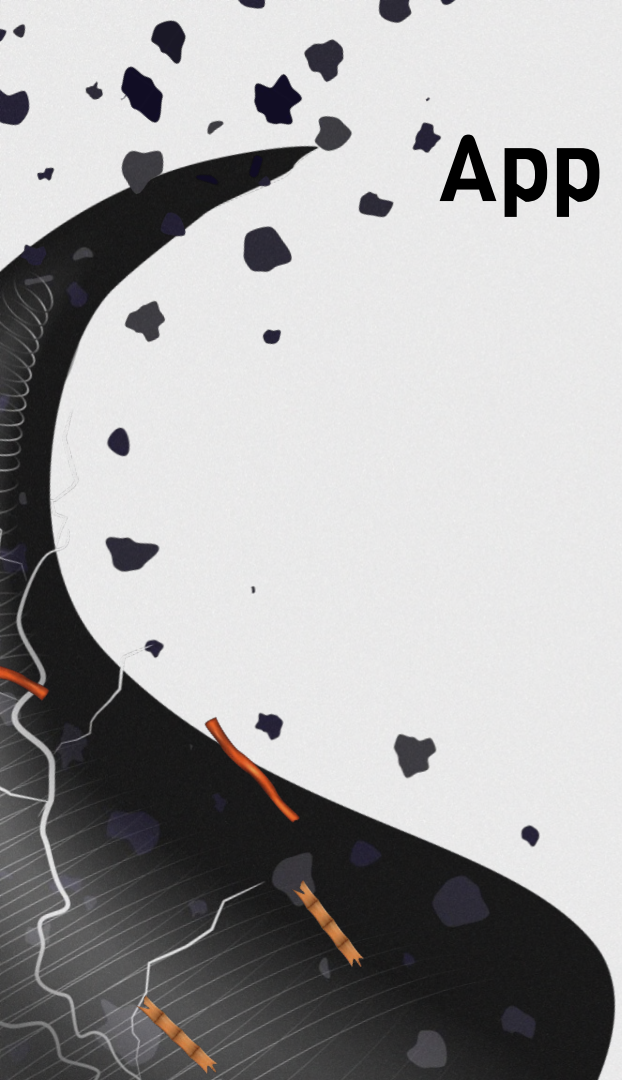
```python
# Map Query
def get_map(self, year):

    # User Input
    if year != -1:
        where_clause = f"yr = {year}"
    else:
        where_clause = f"yr > 2000"

    # Query
    query = f"""
        SELECT
            yr,
            state,
            category,
            loss,
            start_lat,
            start_longitude,
            end_latitude,
            end_longitude,
            distance_traveled,
            width
        FROM
            tornadoes
        WHERE
            {where_clause};
    """

    # Convert data into dictionary
    df = pd.read_sql(text(query), con = self.engine)
    data = df.to_dict(orient="records")
    return(data)
```

App and App Helper Cont



```python
# HTML ROUTES
@app.route("/")
def index():
    return render_template("home.html")

@app.route("/dashboard")
def dashboard():
    return render_template("dashboard.html")

@app.route("/map")
def map():
    return render_template("map.html")

@app.route("/about_us")
def about_us():
    return render_template("about_us.html")

# Dashboard SQL Query
@app.route("/api/v1.0/get_dashboard/<user_seasons>")
def get_dashboard(user_seasons):
    bar_data = sql.get_bar(user_seasons)
    pie_data = sql.get_pie(user_seasons)
    table_data = sql.get_table(user_seasons)
    data = {
        "bar_data": bar_data,
        "pie_data": pie_data,
        "table_data": table_data,
    }
    return(jsonify(data))

# Map SQL Query
@app.route("/api/map/<year>")
def get_map(year):
    year = int(year)
    map_data = sql.get_map(year)
    return(jsonify(map_data))
```

Website Demonstration

Findings

- What states have the most tornadoes?
  - Texas
- What year had the most tornadoes?
  - 2019 with 1517 tornadoes
- What were the most destructive tornadoes?
  - Category 3 tornadoes accounted for 64.7% of the total losses in $
  - Category 3 caused the greatest amount of injuries and category 4 the most fatalities

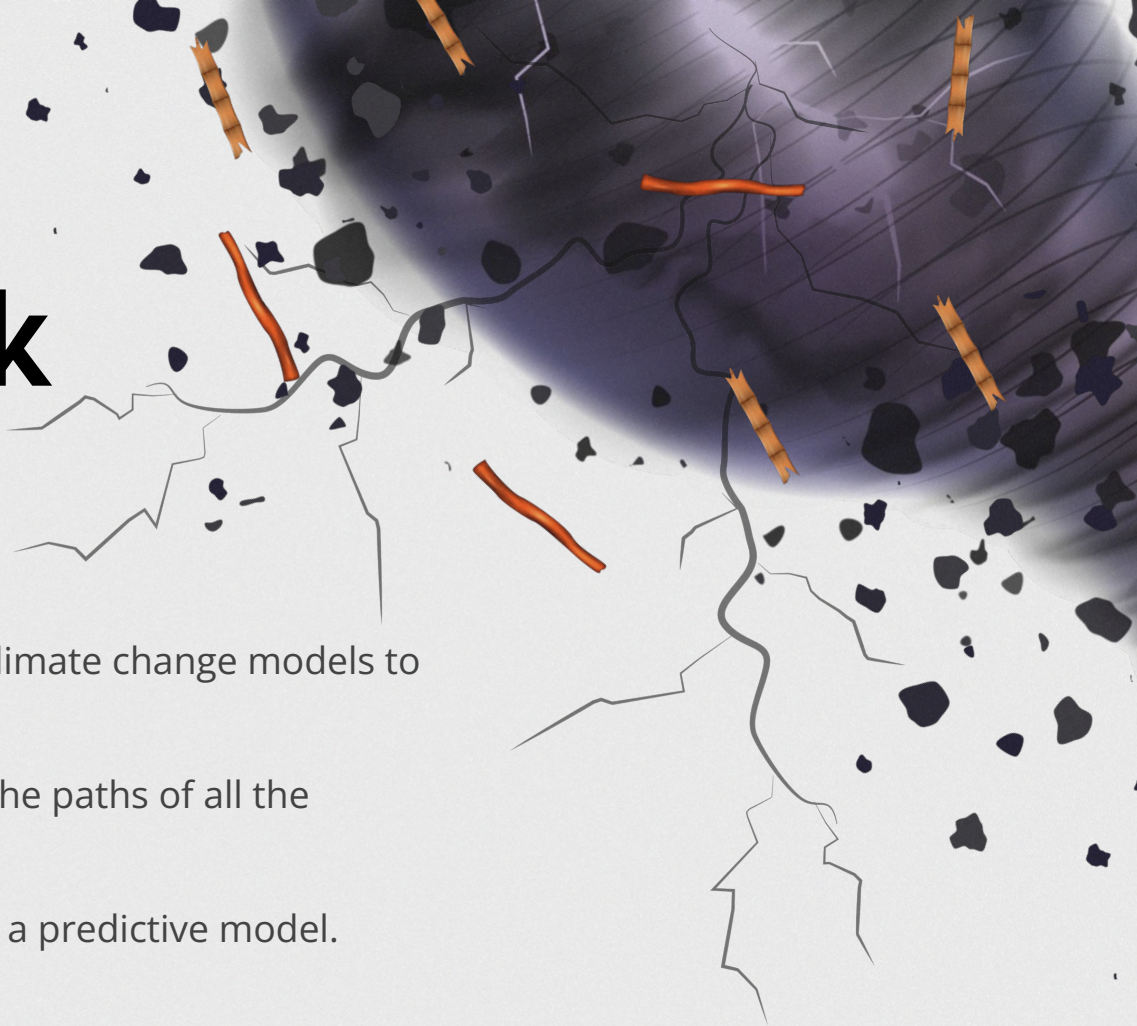
Conclusions

- The most common type of tornado are category 0 and category 1, showing that these lighter storm patterns make up the majority of our data.
- Category 3 and 4 are the greatest threat to life and property, while category 1 and 2 occur the most.
  - The U.S. hasn’t seen a category 5 since 2013.
- The Great Plains of the Central United States get the most tornadoes

Limitations

- We only have 2016-2022 data points
- Our data is only for the U.S.
- Accounting Bias: Tornadoes are recorded at the county level. All tornadoes regardless of rating are counted but some weaker storms with minimal losses might be missed or under reported.

Future Work



- Future work could help incorporate climate change models to measure the impact.
- We could create a map that showed the paths of all the tornadoes.
- Incorporating AI models to help build a predictive model.