CLIMATE CHANGE DURING MINNESOTA'S WINTERS

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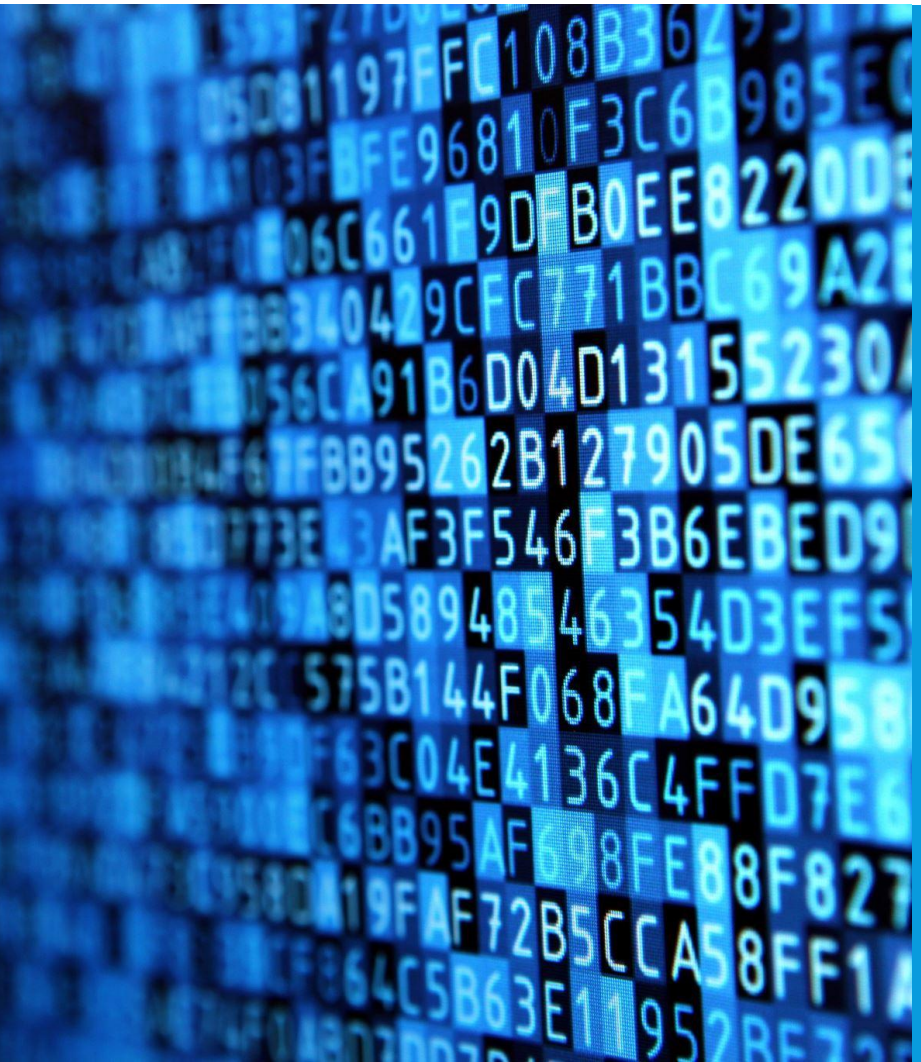
PROJECT SCOPE

We were interested in determining how climate change has affected Minnesota winters with regards to outdoor activities. These changes are acutely felt in Minnesota where winter activities (e.g., ice fishing, skiing, sledding, etc.) are an important of our culture and lifestyle. Due to these changes, these activities are at risk.

DATA SOURCE



We used weather data from Kaggle that ranged from 1871 – 2020. We appended the data with data through April 9, 2023 from the Minnesota Department of Resources. Data includes min/max temperature, precipitation, snow, and current snow depth for the Twin Cities area, Minnesota.

DATA PREPARATION

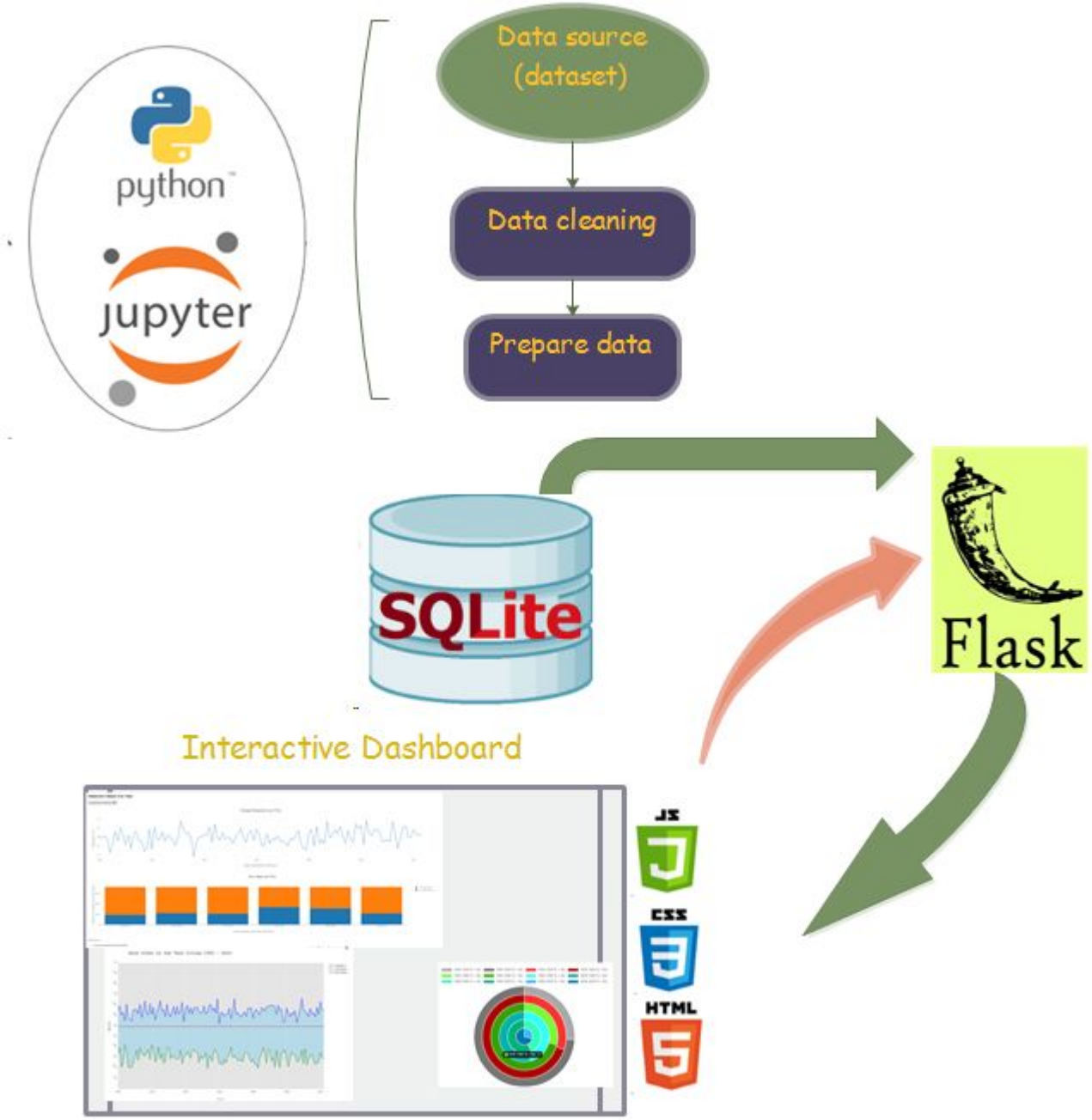
- **Data cleaning:**
  - Filtered to include data only after 1900 (for completeness)
  - Changed "trace amounts" to 0
- **Data transformation**:
  - Added a season column in order to summarize data by Dec-Feb winter season
  - Created variable for snow cover

```
:
#Create new seasons variable that defines each winter season,Dec-Feb as a year
for ind in seasons.index:
    if seasons["Month"][ind] == 1 or seasons["Month"][ind] == 2:
        seasons['Season'][ind] = seasons['Year'][ind]
    elif seasons["Month"][ind] == 12:
        seasons['Season'][ind] = seasons['Year'][ind] + 1
```

```
#Create variable for days with more than 6 inches of snow cover
for ind in seasons.index:
    if seasons["SnowDepth"][ind] >= 6:
        seasons['SnowBase_6in'][ind] = 1
    else:
        seasons['SnowBase_6in'][ind] = 0
```

DATA ARCHITECTURE

- We used Python and Jupyter Notebook to prepare the data for the SQLite database. Then we used Javascript, HTML and CSS to create the data visualizations with Plotly js and Chart js.



CONCLUSIONS

After 1960 there were nine winters with an average max temperature of 30 degrees or greater, compared to only five such winters in the 60 years prior.

Between 1960 - 1980, the percentage of days with greater than six inches of snow was 46%.

Between 1981 - 2000, the percentage of days with greater than six inches of snow was 43%.

Between 2001 - 2020, the percentage of days with greater than six inches of snow was 29%.

The time between the first and last snow has been relatively steady over the past 122 years.

QUESTIONS?