Final Project Documentation & Demo

Project code (¼ - 1/2 page)

1. Github repo for your final project code:
   https://github.com/jiaqili0803/SI_507_final_proj.git
2. README:
   # The main part is final_web.py. Just open and run it, the interface will begin and you can interact with it via the terminal command line. finalTree.py is just a reference to our tree code.
   # During the interaction, your replies to some questions will generate a Tree of your answer data. And the Tree data will be used to determine the data visualization pics for you.
   # To run the code, you need to use an API key. My API key is put in the code, but has limitations with a free account to access these 2 Web APIs. You can also create your own key by registering on two API websites:
   1. https://www.weatherbit.io/api/weather-history-daily
   2. https://api-docs.iqair.com/?version=latest

   # To run this program, you should have the numpy, request, and plotly graph objects packages installed.
   # Also, the program will automatically save the json.file of the data you collected and update it in the folder of json_file.

Data sources (½ - 1 page)

I used 2 Web API I haven't used before that requires API key✣(which sum to 8 challenge points):

1. Historical Weather API (daily) needs an API key I have not used before. Nearly 4-month (120 records) for daily weather data, including wind, rain, sunshine……
   - Documentation: https://www.weatherbit.io/api/weather-history-daily
   - Format: JSON file
   - I use my free account API key to access data
   - Summary: Nearly 4-month (120 records) for daily weather data, including 6 important attributes, which can be visualized to user with any city in US and any time/date range:
     - wind_spd: Average wind speed (Default m/s)
     - temp: Average temperature (default Celsius)
     - rh: Average relative humidity (%)
     - precip_gpm: Accumulated precipitation
     - solar_rad: Average solar radiation (W/M^2)
     - max_uv: Maximum UV Index (0-11+)

2. AirVisual API needs an API key I have not used before. Nearly 323 records for air quality data for cities in the US.
    - Documentation: https://api-docs.iqair.com/?version=latest
    - Format: JSON file
    - I use my free account API key to access data
    - Summary: Nearly 323 records for air quality data for cities in the US, which will show to users with any city in the US.

Data Structure (½ - 1 page)

1. Tree structure example:

```
#########################
######## The Tree #######
#########################

Question1: Do you want to know solar radiation?
+-Question2: Do you want to know UV Index?
| +-('Yes', 'Yes')
| `-('Yes', 'No')
`-Question2: Do you want to know UV Index??
| +-('No', 'Yes')
| `-('No', 'No')
```

```
# tree example:
#                   Question1
#                  /         \
#                 Y           N
#                /             \
#             Ques2           Ques2
#            /     \         /     \
#         (Y, Y)  (Y, N)   (N, Y)  (N, N)
#
# (Q1, (Q2, (Y,Y), (Y,N)), (Q2, (N,Y), (N,N))
```

2. A python file that constructs your graphs or trees from your stored data using classes: finalTree.py
3. Data screenshots:


```
{
    "timezone": "America/New_York",
    "state_code": "NC",
    "country_code": "US",
    "lat": 35.7721,
    "lon": -78.63861,
    "city_name": "Raleigh",
    "station_id": "723060-13722",
    "data": [
        {
            "rh": 89.7,
            "max_wind_spd_ts": 1629140400,
            "t_ghi": 7641.4,
            "max_wind_spd": 4.6,
            "solar_rad": 125.4,
            "wind_gust_spd": 4.6,
            "max_temp_ts": 1629140400,
            "min_temp_ts": 1629097200,
            "clouds": 97,
            "max_dni": 921.7,
            "precip_gpm": 4,
            "wind_spd": 1.8,
            "slp": 1019.5,
            "ts": 1629086400,
            "max_ghi": 963,
            "temp": 25.1,
            "pres": 1004.2,
            "dni": 409.6,
            "dewpt": 23,
            "snow": 0,
            "dhi": 51.4,
            "precip": 4,
            "wind_dir": 121,
            "max_dhi": 122.1,
            "ghi": 318.4,
            "max_temp": 31.7,
            "t_dni": 9830.8,
            "max_uv": 4.1,
            "t_dhi": 1232.7,
            "datetime": "2021-08-16",
            "t_solar_rad": 3010.6,
            "min_temp": 22.2,
            "max_wind_dir": 121,
            "snow_depth": null
        },
        {
            "rh": 91,
```


Capture of a record of Historical Weather data

```
{
    "Alabama": [
        "Birmingham",
        "Cuba",
        "Decatur",
        "Empire",
        "Homewood",
        "Hoover",
        "Huntsville",
        "Irondale",
        "Madison",
        "McCalla",
        "Mobile",
        "Montgomery",
        "Tillmans Corner",
        "Uniontown"
    ],
    "Alaska": [
        "Anchor Point",
        "Anchorage",
        "Barrow",
        "College",
        "Dillingham",
        "Eagle River",
        "Ester",
        "Fairbanks",
        "Farmers Loop",
        "Haines",
        "Healy",
        "Homer",
        "Juneau",
        "Ketchikan",
        "Knik-Fairview",
        "Kotzebue",
        "Nome",
        "North Pole",
        "Palmer",
        "Tok",
        "Valdez",
        "Willow"
    ],
    "Arizona": [
        "Ajo",
```


Air quality data-city

```
{
    "status": "success",
    "data": {
        "city": "Ann Arbor",
        "state": "Michigan",
        "country": "USA",
        "location": {
            "type": "Point",
            "coordinates": [
                -83.738751,
                42.296027
            ]
        },
        "current": {
            "weather": {
                "ts": "2021-12-17T07:00:00.000Z",
                "tp": 1,
                "pr": 1016,
                "hu": 67,
                "ws": 0.89,
                "wd": 275,
                "ic": "01n"
            },
            "pollution": {
                "ts": "2021-12-17T07:00:00.000Z",
                "aqius": 17,
                "mainus": "p2",
                "aqicn": 6,
                "maincn": "p2"
            }
```


Air quality data-one city detailed data

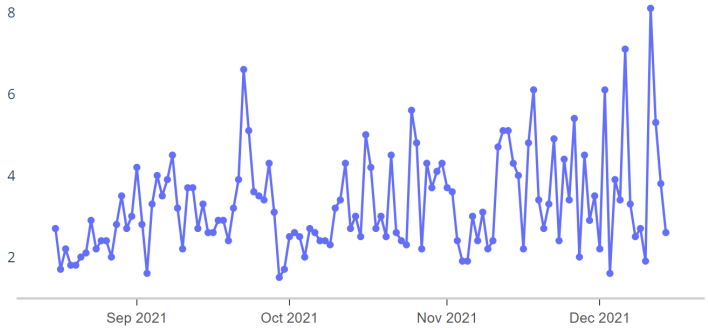
4. During the interaction, user replies to some questions will generate a Tree of answer data. And the Tree data will be used to determine the data visualization pics for users.

Interaction and Presentation Options (½ - 1 page)

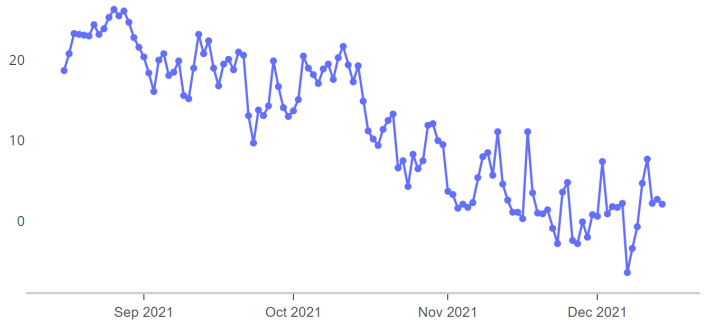
```
Which city do you live ? : Ann Arbor
Which state do you live ? : Michigan
Start Date you want to know ?  (e.g.2021-8-16) : 2021-08-16
End Date you want to know ?  (e.g.2021-8-16) : 2021-12-15
Question1: Do you want to know solar radiation?  yes
Question2: Do you want to know UV Index?  yes
('Yes', 'Yes')

#########################
######## The Tree #######
#########################

Question1: Do you want to know solar radiation?
+-Question2: Do you want to know UV Index?
| +-('Yes', 'Yes')
| `-('Yes', 'No')
`-Question2: Do you want to know UV Index??
| +-('No', 'Yes')
| `-('No', 'No')
The AQI for your position now is : 28
```

Example interaction in command line

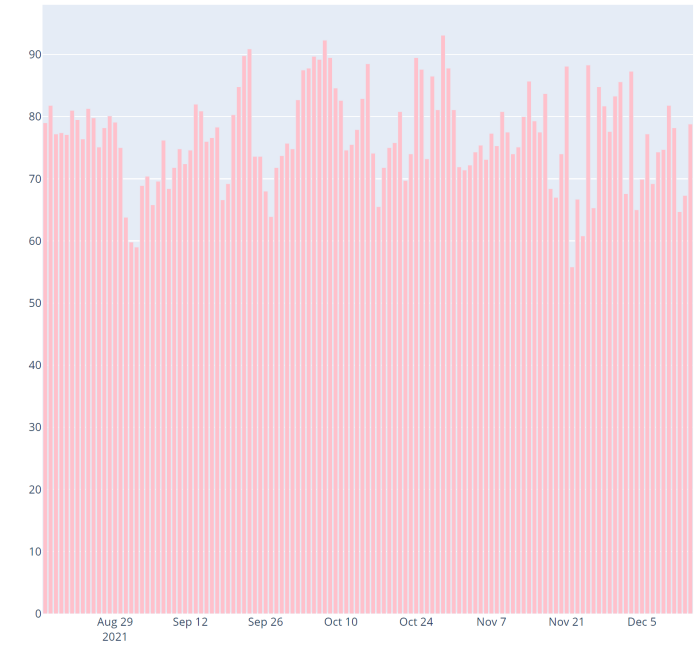
Average wind speed (Default m/s)



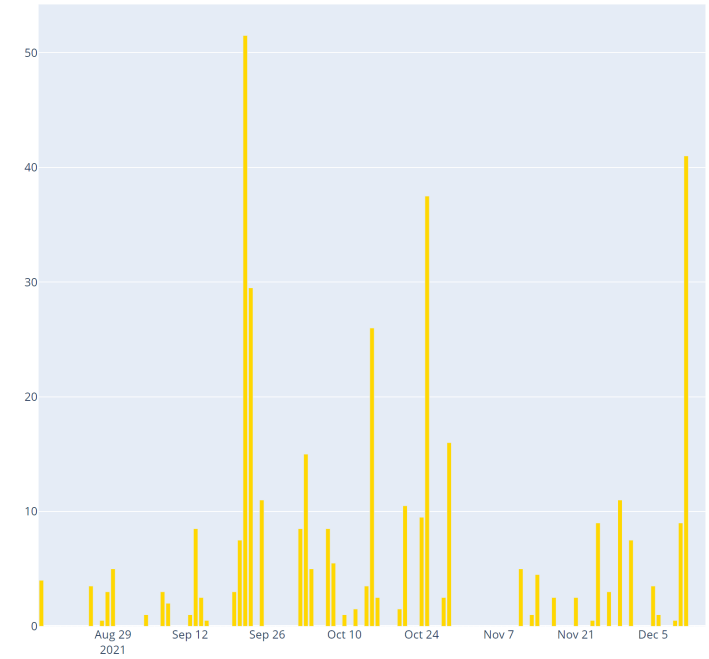
Average temperature (default Celcius)



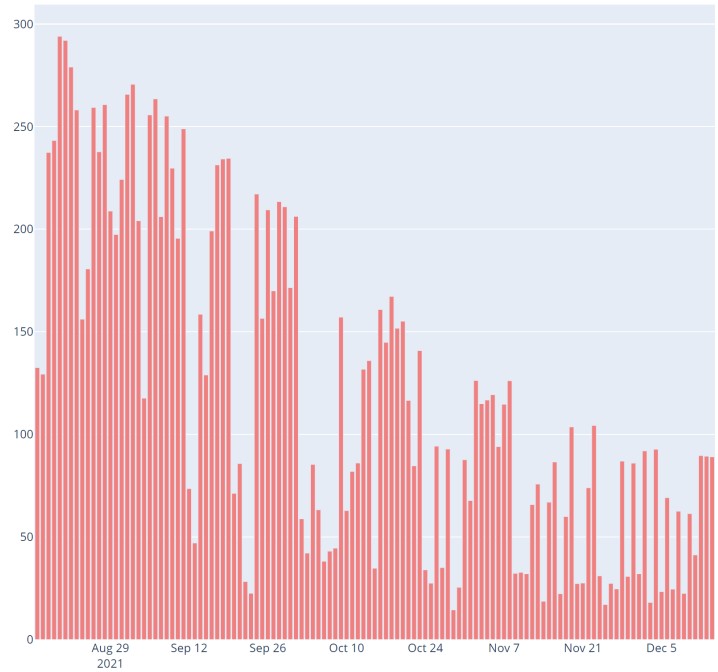
Average relative humidity (%)

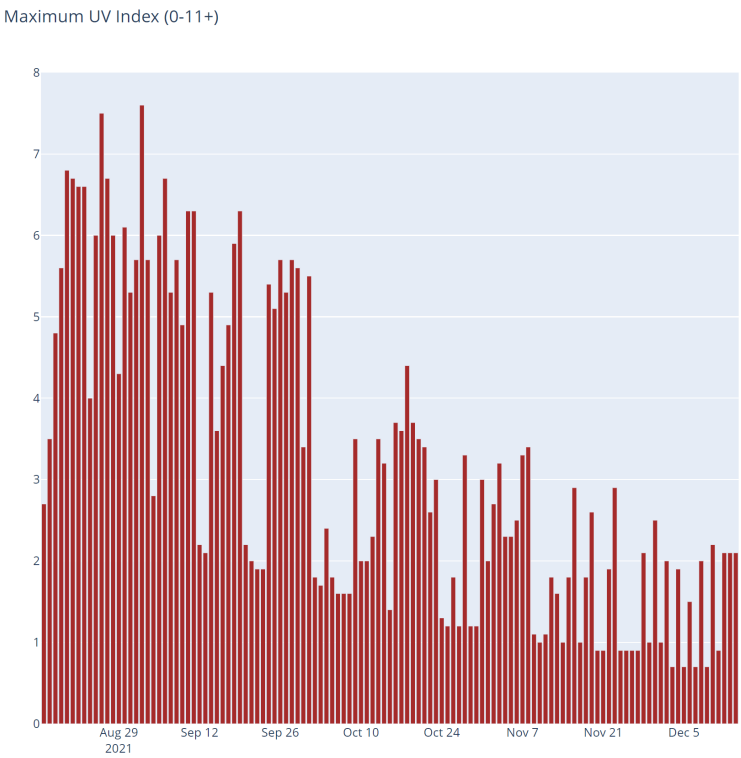


Accumulated precipitation



Average solar radiation (W/M^2)





Example fig output to show to users by plotly

I will present data by using both 1) userCommand Line interface 2) plotly visualization graph.

Steps:

- User can input their city, state, time/date range, to get the basic interactive 4 figures of:
  - wind_spd: Average wind speed (Default m/s)
  - temp: Average temperature (default Celsius)
  - rh: Average relative humidity (%)
  - precip_gpm: Accumulated precipitation
- And then they need to answer 2 questions (4 options: Y/Y, Y/N, N/N, N/Y):
  - Question1: Do you want to know about solar radiation?
  - Question2: Do you want to know the UV Index?
- The Tree will catch and store their answer data to determine whether show them the other 2 figures(solar radiation, UV Index):
  - solar_rad: Average solar radiation (W/M^2)
  - max_uv: Maximum UV Index (0-11+)
- Lastly, the program will trigger the AQI web API to show users the AQI near them.

Demo Link

Provide link to demo video:
https://drive.google.com/file/d/1LHbdaj4GPwcgRd1VsVoFG8Ezgovx6UhT/view?usp=sharing