

Project 3

Home Value & Temperature City Map



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Project Goal

- Climate can have a very real effect on home prices. As global climate change continues to trend, its effects are felt around the world in very real ways. Analyzing climate data can help identify potential effect of temperature on home values in major cities in the United States
- This application can help identify trends in precipitation to identify potential changes in housing prices. Average city temperature trends are going to be used to flag housing price hotspots.

City Selection

When choosing major cities within the U.S. for analysis, it's essential to select a diverse range to get a comprehensive understanding of how temperature might influence home values (1 bedroom). This means considering cities from different geographic regions, with varying climates, and with distinct economic and social profiles.

We chose 14 major U.S. cities, spread across different climatic zones and representing different parts of the country:

Northeast: New York City, NY & Boston, MA:

Southeast: Miami, FL & Atlanta, GA

Midwest: Chicago, IL & Minneapolis, MN

South: Dallas, TX & Houston, TX

West: Los Angeles, CA & San Francisco, CA & Seattle, WA

Mountain West: Denver, CO

Desert Southwest: Phoenix, AZ & Las Vegas, NV

Datasets

Weather Forecast API

Seamless integration of high-resolution weather models with up to 16 days forecast

Weather Forecast

DWD ICON
NDA GFS
MeteoFrance
ECMWF
JMA
MET Norway
GEM

Location and Time

Location:

Coordinates

List

Latitude
52.52

Longitude
13.41

Timezone
Not set (GMT+0)

Search

Time:

Forecast Length

Time Interval

Forecast days
7 days (default)

End days
0 (default)

By default, we provide forecasts for 7 days, but you can access forecasts for up to 16 days. If you're interested in past weather data, you can use the [Past Days](#) feature to access archived forecasts.

Hourly Weather Variables

☒ Temperature (2 m)

Relative Humidity (2 m)

Dewpoint (2 m)

Apparent Temperature

Precipitation Probability

Precipitation (rain + showers + snow)

Weathercode

SeaLevel Pressure

Surface Pressure

Cloudcover Total

Cloudcover Low

Cloudcover Mid

Wind Speed (10 m)

Wind Speed (80 m)

Wind Speed (100 m)

Wind Speed (180 m)

Wind Direction (10 m)

Wind Direction (80 m)

Soil Temperature (0 cm)

Soil Temperature (8 cm)

Soil Temperature (18 cm)

Soil Temperature (54 cm)

Soil Moisture (0-1 cm)

Soil Moisture (1-3 cm)

Time	temperature_2m_mean_Altitude	temperature_2m_mean_Altitude	temperature_2m_min_Altitude	temperature_2m_max_Altitude	temperature_2m_mean_Biosdon	temperature_2m_min_Biosdon	temperature_2m_max_Biosdon	temperature_2m_mean_Biosdon	temperature_2m_min_Biosdon	temperature_2m_max_Biosdon
2016-10-01	74.3	82.1	69.3	89.1	69.1	74.0	49.2			
2016-10-02	72.1	77.1	66.6	85.1	66.6	64.7				
2016-10-03	69.1	72.1	66.6	82.1	61.1	48.2				
2016-10-04	68.9	76.4	64.0	84.1	65.9	46.5				
2016-10-05	69.6	74.6	64.7	86.4	68.2	47.5				
2016-10-06	67.4	73.4	62.4	81.0	74.8	50.5				
2016-10-07	64.6	66.6	63.2	64.2	76.9	52.9				
2016-10-08	66.1	72.9	61.5	85.5	78.7	55.0				
2016-10-09	67.9	75.0	62.0	86.9	69.6	53.2				
2016-10-10	67.9	76.9	62.0	81.4	66.9	45.8				
2016-10-11	66.6	72.1	61.0	47.8	65.9	36.2				
2016-10-12	66.7	74.9	58.9	58.6	63.8	55.0				
2016-10-13	56.1	67.3	47.8	51.3	56.1	47.4				
2016-10-14	46.2	62.9	37.9	44.0	46.9	38.1				
2016-10-15	53.5	69.1	42.5	39.0	47.8	31.9				
2016-10-16	57.0	72.1	45.4	45.3	62.0	35.5				
2016-10-17	60.1	68.2	54.1	54.2	69.1	43.1				
2016-10-18	64.7	72.0	59.3	62.4	72.4	57.9				
2016-10-19	66.2	69.3	55.4	62.4	70.1	54.5				
2016-10-20	66.6	68.9	62.9	46.9	55.7	37.3				
2016-10-21	60.8	65.7	58.3	44.5	61.4	32.0				
2016-10-22	59.7	58.8	54.9	62.7	63.8	39.2				
2016-10-23	59.6	75.4	48.5	50.4	61.0	41.5				
2016-10-24	62.2	70.3	54.9	42.6	61.8	48.9				
2016-10-25	57.6	69.0	47.6	48.6	56.4	41.7				
2016-10-26	62.8	76.3	53.5	57.2	69.7	48.1				
2016-10-27	64.6	71.6	52.1	57.6	64.4	52.1				
2016-10-28	61.6	65.1	42.4	57.4	59.1	39.2				

RegionID	SizeRank	RegionName	RegionType	StateName	State	Metro	CountyName	2000-01-31	2000-02-29	2000-03-31
6181	0	New York	city	NY	NY	New York-Newark-Jersey City, NY-NJ-PA	Queens County	161003.80432800100	161940.729936646	162939.17542453600
12647	1	Los Angeles	city	CA	CA	Los Angeles-Long Beach-Anaheim, CA	Los Angeles County	126034.02666667100	127019.68111118100	127746.54424675000
39051	2	Houston	city	TX	TX	Houston-The Woodlands-Sugar Land, TX	Harris County	79505.029450366	79963.17343202090	80023.02008087000
17428	3	Chicago	city	IL	IL	Chicago-Naperville-Evanston, IL-IN-WI	Cook County	138160.39754973000	138425.03424888000	138966.35913924000
6915	4	San Antonio	city	TX	TX	San Antonio-New Braunfels, TX	Brewar County	51361.65726959100	51282.2098418642000	51333.8040982487000
13271	5	Philadelphia	city	PA	PA	Philadelphia-Camden-Philadelphia, PA-NJ-DE-MD	Philadelphia County	73394.2135964120	73874.31984997000	76181.70720673880
40326	6	Phoenix	city	AZ	AZ	Phoenix-Mesa-Flagstaff, AZ	Maricopa County	65002.4256406257	65714.03026423180	65911.85481508930
18609	7	Las Vegas	city	NV	NV	Las Vegas-Henderson-Paradise, NV	Clark County	95487.75490811400	95473.57789098300	95497.28605045800
54296	8	San Diego	city	CA	CA	San Diego-Chula Vista-Carlsbad, CA	San Diego County	111562.1462778400	112079.12750814000	112698.28666662010
34018	9	Dallas	city	TX	TX	Dallas-Fort Worth-Arlington, TX	Dallas County	62069.2075695010	62033.65622302500	62034.9695751150
10221	10	Austin	city	TX	TX	Austin-Round Rock-Georgetown, TX	Texas County	148627.7728203100	148532.91327905000	150554.25623033000
37430	11	San Jose	city	CA	CA	San Jose-Sunnyvale-Santa Clara, CA	Santa Clara County	174780.1840251400	173396.886634100	176508.56879143000
25290	12	Jacksonville	city	FL	FL	Jacksonville, FL	Duval County	49144.94532836000	49497.20113275960	49460.01423066460
24043	13	Charlotte	city	NC	NC	Charlotte-Concord-Gastonia, NC-SC	Mecklenburg County	99993.463081117	100130.031008770100	100394.87630596900
32149	14	Indianapolis	city	IN	IN	Indianapolis-Carmel-Anderson, IN	Marion County	79794.33598319210	79790.95007755010	79503.84476504630
18172	15	Fort Worth	city	TX	TX	Dallas-Fort Worth-Arlington, TX	Tarrant County	68063.1976918107300	67943.04011172320	67961.75169021370
12121	16	Orlando	city	FL	FL	Orlando-Kissimmee-Sanford, FL	Orange County	327463.24856534500	329665.1964002480	332304.90037795900
20330	17	San Francisco	city	CA	CA	San Francisco-Oakland-Berkeley, CA	San Francisco County	56362.16603478000	56412.41771094110	56472.7786302745000
7481	18	Tucson	city	AZ	AZ	Tucson, AZ	Pima County	76283.09877581580	76251.76153718440	76347.2948474236
10020	19	Columbus	city	OH	OH	Columbus, OH	Franklin County	98846.48561095550	99203.34833636622	99445.03545908760
12700	20	Miami	city	FL	FL	Miami-Fort Lauderdale-Pompano Beach, FL	Miami-Dade County	47276.58725758000	47340.03643839960	47376.117240091800
12465	21	Louisville	city	KY	KY	Louisville/Jefferson County, KY-IN	Jefferson County	60116.86020775900	60116.86020775900	60404.07396402860
11909	22	Denver	city	CO	CO	Denver-Aurora-Lakewood, CO	El Paso County	116469.48248767500	117187.417213710	117953.94069742000
16037	24	Seattle	city	WA	WA	Seattle-Tacoma-Bellevue, WA	King County	176718.13340500000	177205.36230003000	178613.80030544000

<https://open-meteo.com/en/docs>

<https://www.zillow.com/research/data/>

Data Cleaning

- Combining 14 cities data into two files: Home Value and Temperature
- Covertng daily temperatures to monthly by taking averages
- Dates of temperature file and home value files matches (end of each month)

	City	Date	Temperature
0	Atlanta	2018-10-31	62.387097
1	Boston	2018-10-31	52.632258
2	Chicago	2018-10-31	56.558065
3	Dallas	2018-10-31	69.461290
4	Denver	2018-10-31	52.925806
..
835	New York	2023-09-30	67.016667
836	Phoenix	2023-09-30	88.723333
837	Seattle	2023-09-30	62.586667
838	San Francisco	2023-09-30	65.356667
839	Las Vegas	2023-09-30	82.656667

[840 rows x 3 columns]

	City	Date	HomeValue
0	New York	2018-10-31	555760.082929
1	Los Angeles	2018-10-31	514219.084852
2	Houston	2018-10-31	98022.181420
3	Chicago	2018-10-31	219703.251358
4	Phoenix	2018-10-31	137509.398162
..
835	Denver	2023-09-30	337641.110024
836	Seattle	2023-09-30	456452.684489
837	Boston	2023-09-30	592962.110639
838	Atlanta	2023-09-30	279784.056428
839	Minneapolis	2023-09-30	191168.041103

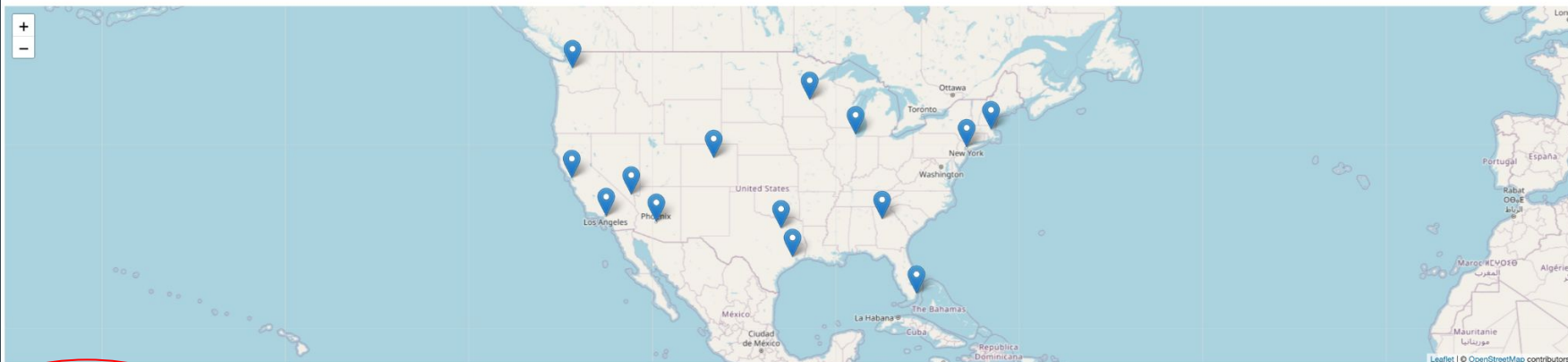
[840 rows x 3 columns]

Application Features

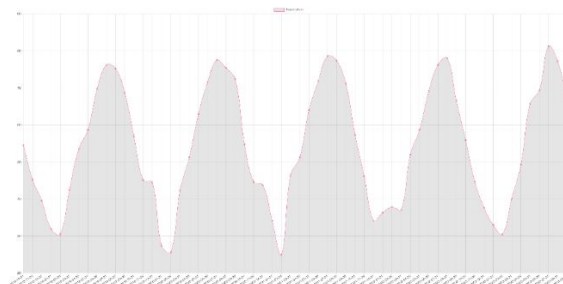
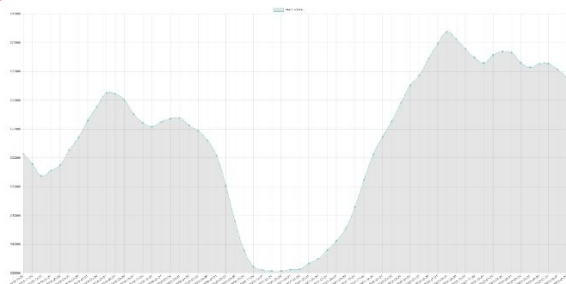
- Default map of the US with 14 cities marked. Zoom into each city when clicked on.
- Drop down menu: 14 cities to choose from, map automatically zoomed into each city when selected
- Home Value chart for the past five years data (monthly), automatically shown according to the city selected
- Temperature chart for past five years data (monthly), automatically shown according to the city selected

Default Screen

Home Value & Temperature City Map

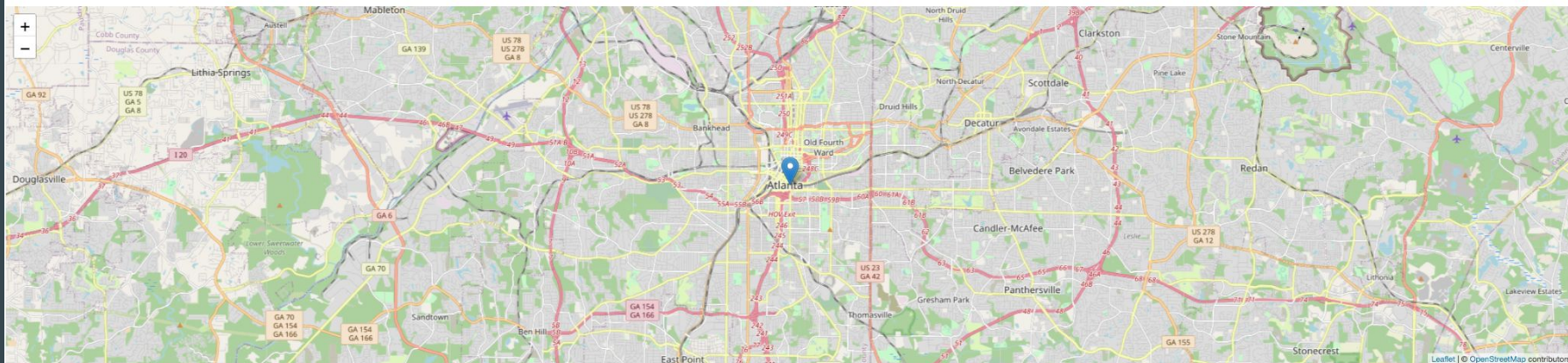


Select a city: New York

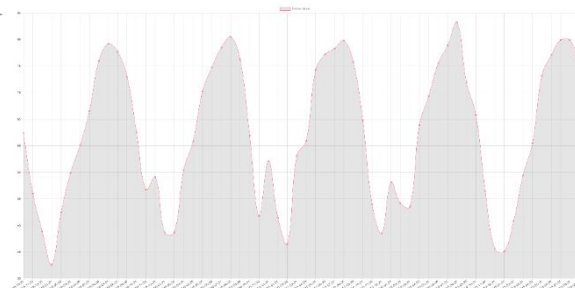
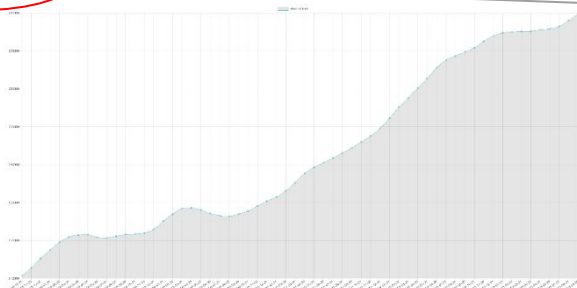


When a city is selected from the dropdown menu

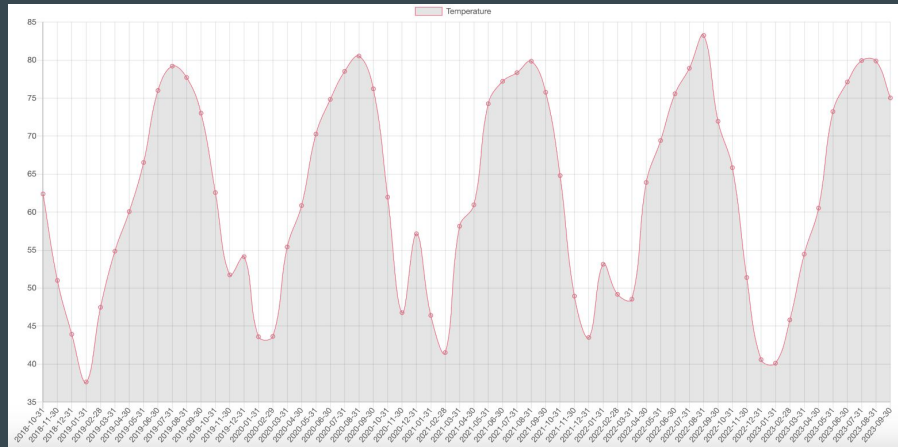
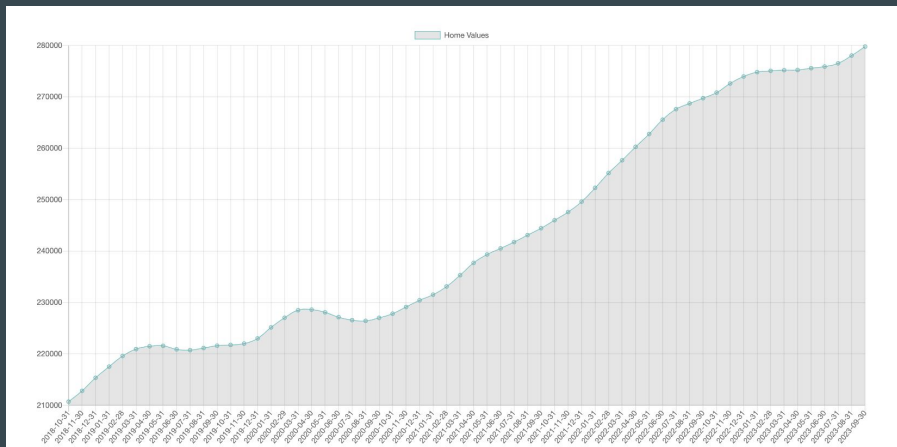
Home Value & Temperature City Map



Select a city: Atlanta



Zoom into the Charts



Summary

1. HTML Structure:

Map & Selector: A web page is set up with a map area, a city selector dropdown, and two canvas elements for charts.

Containers: The map, selector, and charts are wrapped in divs for styling.

2. Styling:

The map, selector, and charts are styled using CSS for better appearance and layout.

3. Map Initialization:

Leaflet Map: A map is created using the Leaflet library and centered on the U.S.

City Markers: Markers for various cities are added to the map.

Swipe & Zoom: Touch swipe gestures and smooth zoom transitions are implemented for map navigation.

4. City Selector:

The dropdown is populated with the names of the cities, and a change listener is attached for updating the map view and charts when a city is selected.

Summary Cont.

5. Home Value Chart:

Data Fetching: A function is set up to fetch home value data from a server-side API.

Chart Drawing: The data is used to draw a line chart using Chart.js.

Update Function: A function is provided to update the chart based on the selected city.

6. Temperature Chart:

Similar to the home value chart, functions are created for fetching temperature data, drawing the temperature chart, and updating the chart based on the selected city.

7. Miscellaneous Scripts:

Additional scripts are included for examples and checks related to a Results variable, although this variable is not defined or used elsewhere in the provided code.

8. Event Listeners:

Event listeners are set up to update the charts and map view when a city is selected from the dropdown.

Conclusion

In our analysis of 14 major U.S. cities, we observed a **significant decrease in home values** for **San Francisco**, **Seattle**, and **Minneapolis**. In contrast, the remaining 11 cities exhibited a **predominantly upward trend** in housing prices. Despite these trends, our data did not reveal a consistent correlation between temperature variations and home values across these cities. **This indicates that temperature alone may not be a decisive factor in determining property prices.**

Nevertheless, our application aims to serve as a valuable resource for potential homebuyers, helping them incorporate climate considerations into their decision-making process. While the relationship between temperature and home values remains inconclusive, we believe our tool provides users with additional insights to make informed choices.

Due to time constraints, we were unable to implement certain features, such as tracking sunshine hours, monitoring air quality, and expanding our focus to include a variety of home types, beyond single-bedroom properties. These are areas we aim to address in future updates to enhance the functionality and comprehensiveness of our application.

Thank You