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Data Science

API Description

For this activity I used the Open-Meteo Forecast API, a free public weather API that requires no API key. The API provides access to real-time, historical, and forecast weather data for any geographic location. Requests are made using latitude and longitude coordinates, and the response is returned in JSON format.

Data Retrieved

I retrieved hourly forecast data for Denver, Colorado (latitude 39.74, longitude –104.98) over a 3-day period. The JSON response included arrays of hourly values for:

- timestamp (date and time in ISO format)
- temperature in °C (2 meters above ground)
- windspeed in km/h (10 meters above ground)
- wind direction in degrees (meteorological standard)
- weather code (numeric code describing conditions, e.g., 0 = clear sky)

This JSON feed was then parsed and converted into a structured CSV file with columns: `timestamp, latitude, longitude, timezone, temperature_c, windspeed_kmh, winddirection_deg, weathercode`.

Each row represents one hourly observation/forecast, creating a tabular dataset that can be easily analyzed or visualized.

Screenshot of the code and the csv

Gener

```python
# Fetch hourly weather data for multiple hours/days

from urllib import request, parse
import json, csv, os

WX_URL = "https://api.open-meteo.com/v1/forecast"

# ---- settings ----
lat, lon = 39.73915, -104.9847   # Denver coords
out_csv = "weather_hourly.csv"
days = 3  # how many days ahead
# ------------------

def fetch_hourly(lat, lon, days=1):
    params = {
        "latitude": lat,
        "longitude": lon,
        "hourly": "temperature_2m,windspeed_10m,winddirection_10m,weathercode",
        "forecast_days": days,
        "timezone": "auto",
    }
    url = f"{WX_URL}?{parse.urlencode(params)}"
    with request.urlopen(url, timeout=30) as resp:
        return json.loads(resp.read().decode("utf-8"))

data = fetch_hourly(lat, lon, days)

hours = data["hourly"]
rows = []
for i, t in enumerate(hours["time"]):
    rows.append({
        "timestamp": t,
        "latitude": data["latitude"],
        "longitude": data["longitude"],
        "timezone": data["timezone"],
        "temperature_c": hours["temperature_2m"][i],
        "windspeed_kmh": hours["windspeed_10m"][i],
        "winddirection_deg": hours["winddirection_10m"][i],
        "weathercode": hours["weathercode"][i],
    })

# Save to CSV
cols = list(rows[0].keys())
with open(out_csv, "w", newline="", encoding="utf-8") as f:
    w = csv.DictWriter(f, fieldnames=cols)
    w.writeheader()
    w.writerows(rows)

print(f"[done] Wrote {len(rows)} rows to {os.path.abspath(out_csv)}")
print("First 3 rows:", rows[:3])
```

6] ✓ 0.7s

weather_hourly.csv > data

```csv
timestamp,latitude,longitude,timezone,temperature_c,windspeed_kmh,winddirection_deg,weathercode
2025-09-01T00:00,39.746895,-104.987076,America/Denver,15.1,7.6,265,0
2025-09-01T01:00,39.746895,-104.987076,America/Denver,13.9,1.0,135,0
2025-09-01T02:00,39.746895,-104.987076,America/Denver,13.3,5.9,166,0
2025-09-01T03:00,39.746895,-104.987076,America/Denver,12.3,6.6,202,0
2025-09-01T04:00,39.746895,-104.987076,America/Denver,11.7,7.1,210,0
2025-09-01T05:00,39.746895,-104.987076,America/Denver,10.6,5.9,166,0
2025-09-01T06:00,39.746895,-104.987076,America/Denver,10.8,7.4,209,0
2025-09-01T07:00,39.746895,-104.987076,America/Denver,10.3,5.7,235,0
2025-09-01T08:00,39.746895,-104.987076,America/Denver,13.9,5.0,210,0
2025-09-01T09:00,39.746895,-104.987076,America/Denver,19.0,2.3,231,0
2025-09-01T10:00,39.746895,-104.987076,America/Denver,21.9,7.2,37,0
2025-09-01T11:00,39.746895,-104.987076,America/Denver,24.1,7.7,37,0
2025-09-01T12:00,39.746895,-104.987076,America/Denver,26.2,8.6,33,0
2025-09-01T13:00,39.746895,-104.987076,America/Denver,27.5,10.5,52,0
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2025-09-01T16:00,39.746895,-104.987076,America/Denver,28.9,12.4,36,0
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2025-09-01T18:00,39.746895,-104.987076,America/Denver,27.8,13.0,46,0
2025-09-01T19:00,39.746895,-104.987076,America/Denver,26.9,8.2,23,0
2025-09-01T20:00,39.746895,-104.987076,America/Denver,23.2,11.4,77,0
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2025-09-01T22:00,39.746895,-104.987076,America/Denver,19.8,4.7,122,0
2025-09-01T23:00,39.746895,-104.987076,America/Denver,18.1,7.3,279,0
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2025-09-02T05:00,39.746895,-104.987076,America/Denver,12.8,6.9,186,0
2025-09-02T06:00,39.746895,-104.987076,America/Denver,12.1,5.1,231,0
2025-09-02T07:00,39.746895,-104.987076,America/Denver,11.8,3.4,252,0
2025-09-02T08:00,39.746895,-104.987076,America/Denver,15.1,1.6,207,0
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2025-09-02T13:00,39.746895,-104.987076,America/Denver,29.4,8.0,54,0
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2025-09-02T15:00,39.746895,-104.987076,America/Denver,30.7,11.7,47,3
2025-09-02T16:00,39.746895,-104.987076,America/Denver,30.3,12.5,46,3
2025-09-02T17:00,39.746895,-104.987076,America/Denver,30.0,13.6,17,0
2025-09-02T18:00,39.746895,-104.987076,America/Denver,29.3,8.7,353,3
2025-09-02T19:00,39.746895,-104.987076,America/Denver,27.3,18.8,36,3
2025-09-02T20:00,39.746895,-104.987076,America/Denver,23.5,14.2,74,1
2025-09-02T21:00,39.746895,-104.987076,America/Denver,21.1,9.6,290,0
2025-09-02T22:00,39.746895,-104.987076,America/Denver,20.0,9.0,254,0
2025-09-02T23:00,39.746895,-104.987076,America/Denver,18.8,8.2,229,0
2025-09-03T00:00,39.746895,-104.987076,America/Denver,17.9,7.7,191,0
2025-09-03T01:00,39.746895,-104.987076,America/Denver,16.6,7.6,175,0
2025-09-03T02:00,39.746895,-104.987076,America/Denver,15.8,9.5,189,0
2025-09-03T03:00,39.746895,-104.987076,America/Denver,14.9,7.7,191,0
2025-09-03T04:00,39.746895,-104.987076,America/Denver,14.2,7.6,180,0
2025-09-03T05:00,39.746895,-104.987076,America/Denver,13.7,9.4,212,0
2025-09-03T06:00,39.746895,-104.987076,America/Denver,14.4,9.1,198,1
2025-09-03T07:00,39.746895,-104.987076,America/Denver,14.5,8.1,212,0
2025-09-03T08:00,39.746895,-104.987076,America/Denver,16.7,5.6,333,0
2025-09-03T09:00,39.746895,-104.987076,America/Denver,20.5,4.9,17,0
2025-09-03T10:00,39.746895,-104.987076,America/Denver,25.4,7.6,357,0
2025-09-03T11:00,39.746895,-104.987076,America/Denver,27.0,21.9,25,0
```