Lab7

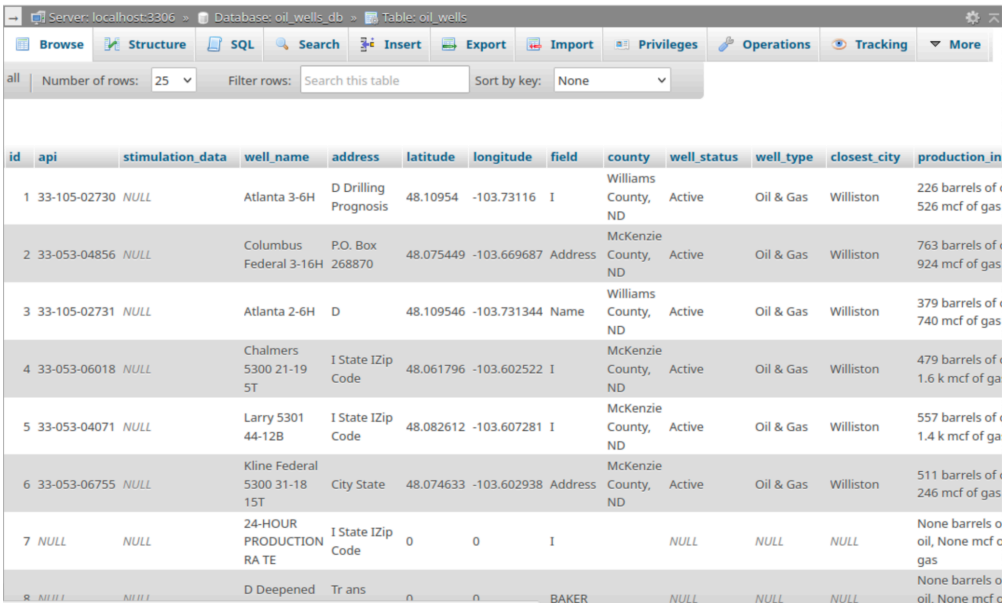
1. Team Details

Name	USC ID
Chenxiao Yu	6024079123
Yiqing Hong	4395913002

2. Github Link:
https://github.com/AiChiMoCha/SP25_DSCI560/tree/main/lab7

3. YouTube Link
https://youtu.be/SB-JDe2YclQ

4. Webpage and Mapping
Firstly, we use Flask to connect to MySQL and fetch the well data in the backend.



id	api	stimulation_data	well_name	address	latitude	longitude	field	county	well_status	well_type	closest_city	production_in
1	33-105-02730	NULL	Atlanta 3-6H	D Drilling Prognosis	48.10954	-103.73116	I	Williams County, ND	Active	Oil & Gas	Williston	226 barrels of 526 mcf of gas
2	33-053-04856	NULL	Columbus Federal 3-16H	P.O. Box 268870	48.075449	-103.669687	Address	McKenzie County, ND	Active	Oil & Gas	Williston	763 barrels of 924 mcf of gas
3	33-105-02731	NULL	Atlanta 2-6H	D	48.109546	-103.731344	Name	Williams County, ND	Active	Oil & Gas	Williston	379 barrels of 740 mcf of gas
4	33-053-06018	NULL	Chalmers 5300 21-19 5T	I State IZip Code	48.061796	-103.602522	I	McKenzie County, ND	Active	Oil & Gas	Williston	479 barrels of 1.6 k mcf of ga
5	33-053-04071	NULL	Larry 5301 44-12B	I State IZip Code	48.082612	-103.607281	I	McKenzie County, ND	Active	Oil & Gas	Williston	557 barrels of 1.4 k mcf of ga
6	33-053-06755	NULL	Kline Federal 5300 31-18 15T	City State	48.074633	-103.602938	Address	McKenzie County, ND	Active	Oil & Gas	Williston	511 barrels of 246 mcf of gas
7	NULL	NULL	24-HOUR PRODUCTION RA TE	I State IZip Code	0	0	I		NULL	NULL	NULL	None barrels o oil, None mcf o gas
8	NULL	NULL	D Deepened	Tr ans	0	0	BAKER		NULL	NULL	NULL	None barrels o oil, None mcf o

```python
@app.route("/api/wells")
def api_wells():
    # Retrieve all records from the oil_wells table
    with engine.connect() as conn:
        result = conn.execute(text("SELECT * FROM oil_wells"))
        wells = result.mappings().all()

    # Convert result set to a list of dictionaries and return as JSON
    wells_list = [dict(well) for well in wells]
    return jsonify(wells_list)
```

Then, in the front end, we fetched the well data from the Flask API, displayed the wells on a map with markers, and showed the well details in a popup when a marker was clicked.

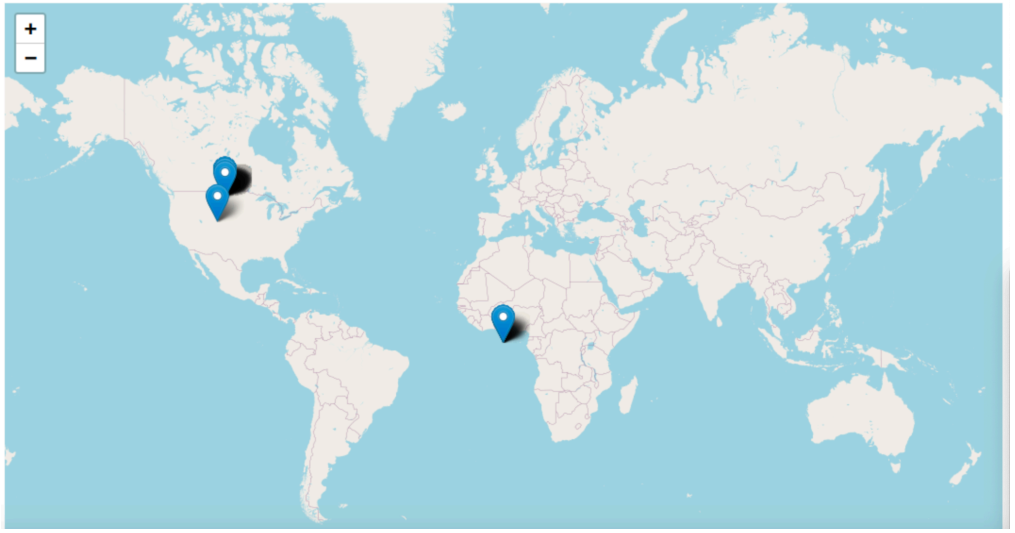
```python
@app.route("/")
def index():
    # HTML template containing a Leaflet map and frontend script
    html = '''
    <!DOCTYPE html>
    <html>
    <head>
        <title>Oil Well Map</title>
        <meta charset="utf-8" />
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <!-- Include Leaflet styles and scripts -->
        <link rel="stylesheet" href="https://unpkg.com/leaflet/dist/leaflet.css" />
        <script src="https://unpkg.com/leaflet/dist/leaflet.js"></script>
        <style>
            #map { width: 100%; height: 600px; }
        </style>
    </head>
    <body>
        <h1>Oil Well Map</h1>
        <div id="map"></div>
        <script>
            // Initialize the map with a default center and zoom level
            var map = L.map('map').setView([0, 0], 2);

            // Add OpenStreetMap tile layer
            L.tileLayer('https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png', {
                maxZoom: 18
            }).addTo(map);

            // Fetch oil well data from API
            fetch('/api/wells')
                .then(response => response.json())
                .then(data => {
                    console.log("Raw well data:", data);

                    data.forEach(function(well, index) {
                        console.log("Well", index, "Raw coordinates:", well.latitude, well.long
                        if (!well.latitude || !well.longitude) {
```

We can run app.py in terminal:

```
^C(myenv) kara@hyq:~/Desktop/hyq_4395913002/scripts/lab7$ python app.py
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment.
 Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
127.0.0.1 - - [01/Mar/2025 21:45:39] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [01/Mar/2025 21:45:40] "GET /api/wells HTTP/1.1" 200 -
127.0.0.1 - - [01/Mar/2025 21:45:40] "GET /favicon.ico HTTP/1.1" 404 -
127.0.0.1 - - [01/Mar/2025 21:47:44] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [01/Mar/2025 21:47:45] "GET /api/wells HTTP/1.1" 200 -
```

And open the website:

Oil Well Map



When we click on the markers, the information of the wells will pop up:

Oil Well Map