import pandas as pd

import matplotlib.pyplot as plt

# Load survey data

data = pd.read\_csv("/CSV\_FILE\_MAG.csv")

# Display first few rows

print(data.head())

# 2D Visualization of raw data

plt.scatter(data['Longitude'], data['Latitude'], c=data['Gravity (mGal)'], cmap='viridis')

plt.colorbar(label="Gravity Anomaly (mGal)")

plt.xlabel("Longitude")

plt.ylabel("Latitude")

plt.title("Gravity Anomalies")

plt.show()

def bouguer\_correction(gravity, elevation, density=2.67):

    """

    Apply Bouguer correction to gravity data.

    gravity: Observed gravity (mGal).

    elevation: Elevation above sea level (m).

    density: Density contrast (g/cm³).

    """

    return gravity - 0.0419 \* density \* elevation

# Apply correction to data

data['corrected\_gravity'] = bouguer\_correction(data['Gravity (mGal)'], data['Elevation (m)'])

threshold = data['corrected\_gravity'].mean() + 2 \* data['corrected\_gravity'].std()

anomalies = data[data['corrected\_gravity'] > threshold]

plt.scatter(data['Longitude'], data['Latitude'], c=data['corrected\_gravity'], cmap='viridis', label='Gravity Data')

plt.scatter(anomalies['Longitude'], anomalies['Latitude'], c='purple', label='Anomalies')

plt.colorbar(label="Corrected Gravity (mGal)")

plt.xlabel("Longitude")

plt.ylabel("Latitude")

plt.legend()

plt.title("Gravity Anomalies with Detected Anomalies")

plt.show()

import numpy as np

def gravity\_anomaly\_sphere(x, x0, z0, radius, density):

    """

    Simulate gravity anomaly caused by a sphere.

    x: Observation points (m).

    x0, z0: Sphere center coordinates (m).

    radius: Sphere radius (m).

    density: Density contrast (kg/m³).

    """

    G = 6.67430e-11  # Gravitational constant

    r = np.sqrt((x - x0)\*\*2 + z0\*\*2)

    return (4/3) \* np.pi \* G \* density \* radius\*\*3 \* z0 / (r\*\*3)

# Simulate anomaly

x = np.linspace(-1000, 1000, 500)

synthetic\_anomaly = gravity\_anomaly\_sphere(x, 0, 500, 200, 500)

# Plot synthetic anomaly

plt.plot(x, synthetic\_anomaly, label="Synthetic Gravity Anomaly")

plt.xlabel("Distance (m)")

plt.ylabel("Gravity Anomaly (mGal)")

plt.title("Modeled Gravity Anomaly for a Mineral Deposit")

plt.legend()

plt.grid()

plt.show()