import pandas as pd

import numpy as np

from sklearn.ensemble import GradientBoostingRegressor

from sklearn.model\_selection import train\_test\_split

# Load the data

data = pd.read\_csv(r" ")

# Prepare the features and target variable

X = data[["PANI Dose (wt%)", "Temperature (°C)", "Concentration"]]

y = data["Response"]

# Convert the concentration feature to numerical values (One-Hot encoding or mapping)

concentration\_mapping = {"10ppm": 10, "30ppm": 30, "50ppm": 50}

X.loc[:, "Concentration"] = X["Concentration"].map(concentration\_mapping)

# Split the dataset into training and testing sets

X\_train, X\_test, y\_train, y\_test = train\_test\_split(X, y, test\_size=0.2, random\_state=42)

# Train the Gradient Boosting model

gbr = GradientBoostingRegressor(random\_state=42)

gbr.fit(X\_train, y\_train)

# Prepare the input data for predictions (Concentration = 10, 30, 50; Temperature = 300°C; Dose = 10, 25, 50)

prediction\_input = pd.DataFrame({

"PANI Dose (wt%)": [10, 25, 50] \* 3,

"Temperature (°C)": [300] \* 9,

"Concentration": [10] \* 3 + [30] \* 3 + [50] \* 3

})

# Make predictions

predictions = gbr.predict(prediction\_input)

# Output the prediction results

prediction\_input["Predicted Response"] = predictions

print(prediction\_input)