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# Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import fetch_california_housing
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error,
mean_squared_error, r2_score

# Load dataset
housing = fetch_california_housing()
data = pd.DataFrame(housing.data,
columns=housing.feature_names)
data['Target'] = housing.target

# --- Simple Linear Regression (using one feature) ---
print("----- Simple Linear Regression (1 Feature)
-----")
X_simple = data[['MedInc']] # Using only 'MedInc'
feature
y = data['Target']

# Split data
X_train_s, X_test_s, y_train_s, y_test_s =
train_test_split(X_simple, y, test_size=0.2,
random_state=42)
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# Train model
model_simple = LinearRegression()
model_simple.fit(X_train_s, y_train_s)

# Predict
y_pred_s = model_simple.predict(X_test_s)

# Evaluation
print("MAE:", mean_absolute_error(y_test_s, y_pred_s))
print("MSE:", mean_squared_error(y_test_s, y_pred_s))
print("R2 Score:", r2_score(y_test_s, y_pred_s))
print("Intercept:", model_simple.intercept_)
print("Coefficient:", model_simple.coef_[0])

# Plot
plt.figure(figsize=(8,5))
plt.scatter(X_test_s, y_test_s, color='blue', alpha=0.5,
label='Actual')
plt.plot(X_test_s, y_pred_s, color='red', linewidth=2,
label='Regression Line')
plt.title('Simple Linear Regression: MedInc vs House
Value')
plt.xlabel('Median Income (MedInc)')
plt.ylabel('House Value')
plt.legend()
plt.show()
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# --- Multiple Linear Regression (using all features)
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print("\n----- Multiple Linear Regression (All
Features) -----")
X_multi = data.drop('Target', axis=1)
y = data['Target']

# Split data
X_train_m, X_test_m, y_train_m, y_test_m =
train_test_split(X_multi, y, test_size=0.2,
random_state=42)

# Train model
model_multi = LinearRegression()
model_multi.fit(X_train_m, y_train_m)

# Predict
y_pred_m = model_multi.predict(X_test_m)

# Evaluation
print("MAE:", mean_absolute_error(y_test_m,
y_pred_m))
print("MSE:", mean_squared_error(y_test_m, y_pred_m))
print("R2 Score:", r2_score(y_test_m, y_pred_m))
print("Intercept:", model_multi.intercept_)
print("Coefficients:")
for feature, coef in zip(X_multi.columns,
model_multi.coef_):
    print(f" {feature}: {coef}")
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