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# House Price Prediction (Beginner Friendly + Visualizations)
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# Step 1: Libraries import karo
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
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_squared_error

# Step 2: Dataset load karo
data = fetch_california_housing()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['PRICE'] = data.target

print("Dataset shape:", df.shape)
df.head()

# Step 3: Features (X) aur Target (y)
X = df.drop('PRICE', axis=1)
y = df['PRICE']

# Step 4: Train-test split
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42)

# Step 5: Model choose karo
model = LinearRegression()

# Step 6: Model train karo
model.fit(X_train, y_train)

# Step 7: Predictions
y_pred = model.predict(X_test)

# Step 8: Model evaluation
mse = mean_squared_error(y_test, y_pred)
rmse = mse ** 0.5
print("Model RMSE:", rmse)

# Step 9: Example prediction (Warning free)
sample_house = X_test.iloc[[0]]  # double brackets fix warning
pred_price = model.predict(sample_house)[0]
print("Example house price prediction:", round(pred_price, 3))

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# Step 10: Optional Visualizations
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# 1. Price distribution
plt.figure(figsize=(8,5))
sns.histplot(df['PRICE'], bins=50, kde=True)
plt.title("Distribution of House Prices")
plt.xlabel("Price (in $100,000)")
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plt.ylabel("Count")
plt.show()

# 2. Feature correlation heatmap
plt.figure(figsize=(10,8))
sns.heatmap(df.corr(), annot=True, cmap='coolwarm')
plt.title("Feature Correlation Heatmap")
plt.show()

# 3. Rooms vs Price scatter
plt.figure(figsize=(8,5))
sns.scatterplot(x='AveRooms', y='PRICE', data=df)
plt.title("Average Rooms vs Price")
plt.xlabel("Average Rooms")
plt.ylabel("Price")
plt.show()
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Dataset shape: (20640, 9)
Model RMSE: 0.7455813830127764
Example house price prediction: 0.719
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