In [ ]:
```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import torch
import torch.nn as nn
from torch.utils.data import DataLoader
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error, r2_score
```

In [ ]:
```
def remove_rows_with_missing_ratings(df):
    df.dropna(subset=['Cleanliness_rating', 'Accuracy_rating', 'Communication_ratin
    return df

def combine_description_strings(df):
    df.loc[:, 'Description'] = df['Description'].apply(lambda x: '' if pd.isna(x) (
    df = df.dropna(subset=['Description'])
    return df

def convert_bedrooms_dtype(df):
    df.loc[:,'bedrooms'] = df['bedrooms'].apply(lambda x: pd.to_numeric(x, errors=
    return df

def set_default_feature_values(df):
    df.loc[:, 'guests'] = df['guests'].apply(lambda x: 1 if pd.isna(x) else x)
    df.loc[:, 'beds'] = df['beds'].apply(lambda x: 1 if pd.isna(x) else x)
    df.loc[:, 'bathrooms'] = df['bathrooms'].apply(lambda x: 1 if pd.isna(x) else x
    df.loc[:, 'bedrooms'] = df['bedrooms'].apply(lambda x: 1 if pd.isna(x) else x)
    return df

def clean_tabular_data(df):
    df = remove_rows_with_missing_ratings(df)
    df = combine_description_strings(df)
    df = convert_bedrooms_dtype(df)
    df = set_default_feature_values(df)
    return df
```

In [ ]:
```
def check_for_nan(df):
  return df.isnull().values.any()
```

In [ ]:
```
def load_airbnb(label):
    # Load the cleaned tabular data
    df = pd.read_csv('C:/Users/dongc/Desktop/Code/python/AiCore/airbnb_model/tabula

    # Select only the numerical columns as features
    features = df.select_dtypes(include=['float', 'int'])

    # Remove the label column from the features
    features = features.drop(columns=[label])
    features = features.drop(columns=['Unnamed: 19'])
    # Select the label column as the labels
    labels = df[label].dropna()

    return (features, labels)
```

In [ ]:
```
class AirbnbNightlyPriceDataset(torch.utils.data.Dataset):
    def __init__(self, features, labels):
        # Convert the features and labels dataframes into torch tensors
        self.X = torch.tensor(features.values, dtype=torch.float32)
        self.y = torch.tensor(labels.values, dtype=torch.float32)
```

```
    def __getitem__(self, index):
        return (self.X[index], self.y[index].unsqueeze(dim=0))

    def __len__(self):
        return len(self.X)
```

In [ ]:
```
class FullyConnectedNet(nn.Module):
    def __init__(self, input_size, hidden_sizes, output_size):
        super().__init__()
        self.fc1 = nn.Linear(input_size, hidden_sizes[0])
        self.fc2 = nn.Linear(hidden_sizes[0], hidden_sizes[1])
        self.af1 = nn.ReLU()
        self.fc3 = nn.Linear(hidden_sizes[1], output_size)

    def forward(self, x):
        x = self.fc1(x)
        x = self.fc2(x)
        x = self.af1(x)
        x = self.fc3(x)
        return x
```

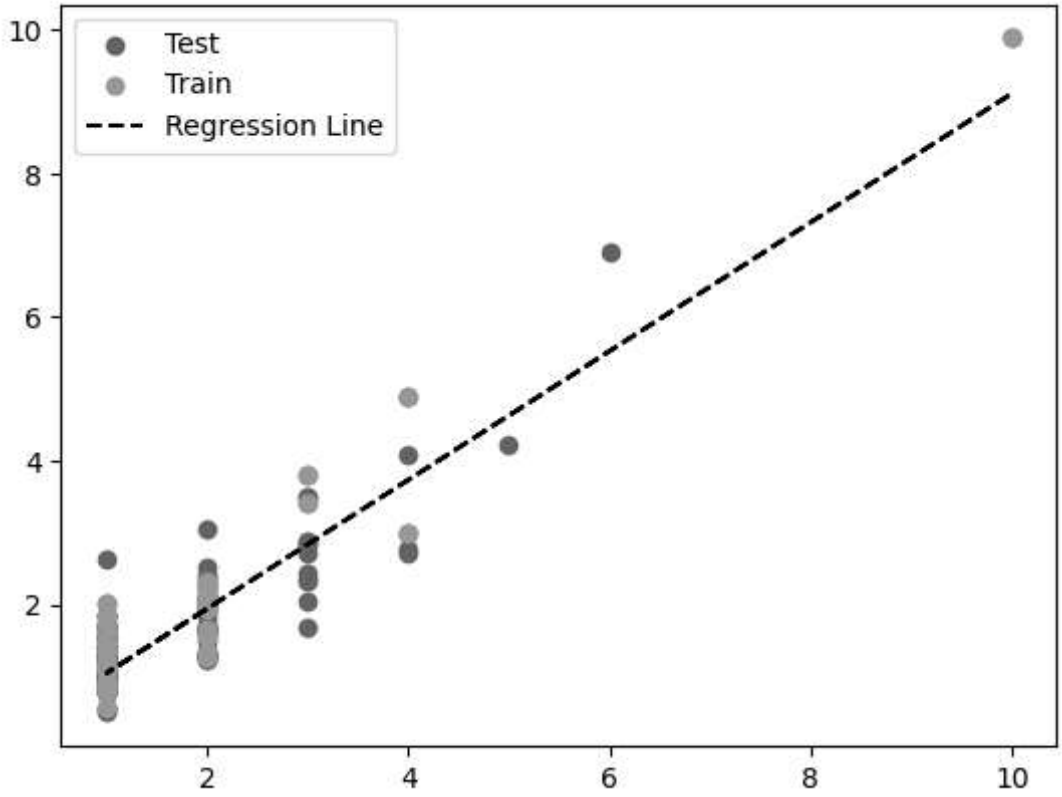
In [ ]:
```
def train(model, dataloader, num_epochs, optimiser, criterion):
    optimiser = optimiser
    criterion = criterion
    for epoch in range(10):
        for i, (X, y) in enumerate(dataloader):
            # Forward pass
            try:
                output = model(X)
            except Exception as e:
                print(f"Error occurred on row {i}: {e}")
                continue

            loss = criterion(output, y)

            # Backward pass
            optimiser.zero_grad()
            loss.backward()
            optimiser.step()

        # Break out of loop after first epoch
        break
```

In [ ]:
```
if __name__ == "__main__":
    # Load the tabular data
    df = pd.read_csv('C:/Users/dongc/Desktop/Code/python/AiCore/airbnb_model/tabula

    # Clean the data
    df = clean_tabular_data(df)

    # Save the processed data
    df.to_csv('C:/Users/dongc/Desktop/Code/python/AiCore/airbnb_model/tabular_data/

    # Load the cleaned tabular data
    features, labels = load_airbnb(label='bedrooms')

    # Split the data into training and test sets
    X_train, X_test, y_train, y_test = train_test_split(features, labels, test_siz

    # Define the dataloaders
    batch_size = 128
    train_dataloader = DataLoader(AirbnbNightlyPriceDataset(X_train, y_train), bat
    test_dataloader = DataLoader(AirbnbNightlyPriceDataset(X_test, y_test), batch_
```

```
# Define the model
input_size = X_train.shape[1]
hidden_sizes = [5,3]
output_size = 1
model = FullyConnectedNet(input_size,hidden_sizes,output_size)

# Define the optimizer and criterion
optimiser = torch.optim.SGD(model.parameters(), lr=0.00002, momentum=0.7)
criterion = torch.nn.MSELoss()

# Train the model
model.train()
loss_accum=0

for epoch in range(10000):

    for i, (X, y) in enumerate(train_dataloader):

        # Forward pass
        output = model(X)

        loss = criterion(output, y)
        loss_accum +=loss.item()

        # Backward pass
        optimiser.zero_grad()
        loss.backward()
        optimiser.step()

# Test the model
model.eval()
with torch.no_grad():
    y_pred = []
    for X, y in test_dataloader:
        output = model(X)
        y_pred.append(output.numpy())
    y_pred = np.concatenate(y_pred)

# Calculate the root mean squared error
rmse = np.sqrt(mean_squared_error(y_test, y_pred))
r2_val = r2_score(y_test, y_pred)
print(f"Root Mean Squared Error: {rmse}")
print(f"R2 value: {r2_val}")

# Log results into logs
output_for_log = output.detach().numpy()
y_for_log = y.detach().numpy()

# Convert the lists of predicted and true labels to numpy arrays
if isinstance(y_test,pd.Series):
    y_test = y_test.to_numpy().flatten()
else:
    y_test = y_test.flatten()

y_pred = y_pred.flatten()

# Pull out the array within the list

# Create a figure and axis
fig, ax = plt.subplots()

# Plot the real labels on the x-axis and the predictions on the y-axis
ax.scatter(y_test, y_pred, label='Test')
```

```
    if len(y_for_log) == len(output_for_log):
        output_log = output_for_log
        ax.scatter(y_for_log, output_log, label = 'Train')

    # Fit a line to the data
    coefficients = np.polyfit(y_test, y_pred, 1)

    # Create a function object for the fitted line
    fit_fn = np.poly1d(coefficients)

    # Plot the fitted line
    ax.plot(y_test, fit_fn(y_test), '--k', label='Regression Line')

    # Add a legend and show the plot
    ax.legend()

    # Add a legend and show the plot
    ax.legend()
    plt.show()
```

```
C:\Users\dongc\AppData\Local\Temp\ipykernel_18028\2710890931.py:11: FutureWarning:
In a future version, `df.iloc[:, i] = newvals` will attempt to set the values inpl
ace instead of always setting a new array. To retain the old behavior, use either
`df[df.columns[i]] = newvals` or, if columns are non-unique, `df.isetitem(i, newva
ls)`
  df.loc[:,'bedrooms'] = df['bedrooms'].apply(lambda x: pd.to_numeric(x, errors='c
oerce')).dropna()
Index(['ID', 'Category', 'Title', 'Description', 'Amenities', 'Location',
       'guests', 'beds', 'bathrooms', 'Price_Night', 'Cleanliness_rating',
       'Accuracy_rating', 'Communication_rating', 'Location_rating',
       'Check-in_rating', 'Value_rating', 'amenities_count', 'url', 'bedrooms',
       'Unnamed: 19'],
      dtype='object')
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 890 entries, 0 to 889
Data columns (total 20 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   ID                    890 non-null    object
 1   Category              890 non-null    object
 2   Title                 890 non-null    object
 3   Description           830 non-null    object
 4   Amenities             890 non-null    object
 5   Location              890 non-null    object
 6   guests                890 non-null    object
 7   beds                  890 non-null    float64
 8   bathrooms             890 non-null    float64
 9   Price_Night           890 non-null    int64
 10  Cleanliness_rating    890 non-null    float64
 11  Accuracy_rating       890 non-null    float64
 12  Communication_rating  890 non-null    float64
 13  Location_rating       890 non-null    float64
 14  Check-in_rating       890 non-null    float64
 15  Value_rating          890 non-null    float64
 16  amenities_count       890 non-null    float64
 17  url                   890 non-null    object
 18  bedrooms              890 non-null    float64
 19  Unnamed: 19           1 non-null      float64
dtypes: float64(11), int64(1), object(8)
memory usage: 139.2+ KB
None
Root Mean Squared Error: 0.4536785915907015
R2 value: 0.8197330828340523
```


Test
Train
Regression Line
10
8
6
4
2
2
4
6
8
10