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import pandas as pd
import numpy as np
from sklearn.preprocessing import StandardScaler
from sklearn.neighbors import NearestNeighbors

# Load datasets (ensure the file paths are correct)
customers = pd.read_csv("Customers.csv")
products = pd.read_csv("Products.csv")
transactions = pd.read_csv("Transactions.csv")

# Merge datasets
merged_data = transactions.merge(products, on="ProductID", how="left").merge(customers, on="CustomerID",
how="left")

# Calculate Price if it does not exist
if 'Price' not in merged_data.columns:
    merged_data['Price'] = merged_data['TotalValue'] / merged_data['Quantity']

# Feature engineering: Aggregate features for each customer
customer_features = merged_data.groupby('CustomerID').agg({
    'TotalValue': 'sum',      # Total transaction value
    'Quantity': 'sum',        # Total quantity purchased
    'Price': 'mean'           # Average price paid
}).reset_index()

# Normalize the data (scaling features for the lookalike model)
scaler = StandardScaler()
features_scaled = scaler.fit_transform(customer_features.iloc[:, 1:])

# Build Nearest Neighbors model
nn_model = NearestNeighbors(n_neighbors=4, metric='euclidean')
nn_model.fit(features_scaled)

# Finding lookalikes for the first 20 customers
lookalike_results = {}
for idx, customer in enumerate(customer_features['CustomerID'][:20]):
    distances, indices = nn_model.kneighbors([features_scaled[idx]])
    lookalike_results[customer] = [(customer_features['CustomerID'][i], distances[0][j])
                                    for j, i in enumerate(indices[0][1:])]

# Convert results into a DataFrame
lookalike_df = pd.DataFrame(
    [(key, look[0], look[1]) for key, looks in lookalike_results.items() for look in looks],
    columns=['CustomerID', 'LookalikeID', 'SimilarityScore']
)

# Save results to a CSV file
lookalike_df.to_csv("FirstName_LastName_Lookalike.csv", index=False)

# Display the first few rows of the lookalike results
print(lookalike_df.head())

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| | CustomerID | LookalikeID | SimilarityScore |
|---|------------|-------------|-----------------|
| 0 | C0001 | C0070 | 0.000000 |
| 1 | C0001 | C0137 | 0.129332 |
| 2 | C0001 | C0191 | 0.220628 |
| 3 | C0002 | C0029 | 0.000000 |
| 4 | C0002 | C0157 | 0.044942 |