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import pandas as pd
from sklearn.metrics.pairwise import cosine_similarity
from sklearn.feature_extraction.text import TfidfVectorizer

# Load the dataset (Assuming you have 'Customers.csv' and 'Transactions.csv')
customers_df = pd.read_csv('Customers.csv')
transactions_df = pd.read_csv('Transactions.csv')

# Merge customer and transaction data
merged_df = pd.merge(customers_df, transactions_df, on='CustomerID', how='left')

# Feature Engineering
# 1. Customer Features
merged_df['Region'] = merged_df['Region'].fillna('Unknown')
merged_df['CustomerProfile'] = merged_df['Region'] + ' ' + merged_df['CustomerName'].str.lower()

# 2. Product Features
merged_df['ProductFeatures'] = merged_df['ProductName'] + ' ' + merged_df['ProductCategory']

# Create a dictionary to store lookalike customers
lookalike_customers = {}

# TF-IDF Vectorization
vectorizer = TfidfVectorizer(stop_words='english')

# Iterate through the first 20 customers
for i, cust_id in enumerate(customers_df['CustomerID'].head(20)):
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    # Get customer profile and product features
    customer_profile = merged_df[merged_df['CustomerID'] == cust_id]['CustomerProfile'].values[0]
    customer_products = ' '.join(merged_df[merged_df['CustomerID'] == cust_id]['ProductFeatures'].dropna().tolist())

    # Create a combined feature vector
    customer_features = customer_profile + ' ' + customer_products

    # Create a TF-IDF matrix
    tfidf_matrix = vectorizer.fit_transform([customer_features] + merged_df['CustomerProfile'].tolist())

    # Calculate cosine similarity
    cosine_similarities = cosine_similarity(tfidf_matrix[0:1], tfidf_matrix[1:])[0]

    # Get top 3 most similar customers
    top_indices = cosine_similarities.argsort()[-3:][::-1]
    top_customers = merged_df['CustomerID'].iloc[top_indices].tolist()
    top_scores = cosine_similarities[top_indices]

    # Store lookalike customers and scores
    lookalike_customers[cust_id] = list(zip(top_customers, top_scores))

# Save lookalike customers to CSV
lookalike_df = pd.DataFrame.from_dict(lookalike_customers, orient='index', columns=['Lookalike Customers', 'Similarity Scores'])
lookalike_df.to_csv('Lookalike.csv')

print("Lookalike Model Generated and Saved to Lookalike.csv")
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