```
import pandas as pd
import numpy as np
from sklearn.preprocessing import LabelEncoder
from sklearn.neighbors import NearestNeighbors
from sklearn.feature_extraction.text import CountVectorizer
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import mean_squared_error, r2_score
```

```
import kagglehub

path = kagglehub.dataset_download("amanmehra23/travel-recommendation-dataset")

print("Path to dataset files:", path)
```

```
Path to dataset files: /kaggle/input/travel-recommendation-dataset
```

```
destinations_df = pd.read_csv(f"{path}/Expanded_Destinations.csv")
reviews_df = pd.read_csv(f"{path}/Final_Updated_Expanded_Reviews.csv")
userhistory_df = pd.read_csv(f"{path}/Final_Updated_Expanded_UserHistory.csv")
users_df = pd.read_csv(f"{path}/Final_Updated_Expanded_Users.csv")
```

```
destinations_df.head()
```

	DestinationID	Name	State	Type	Popularity	BestTimeToVisit
0	1	Taj Mahal	Uttar Pradesh	Historical	8.691906	Nov-Feb
1	2	Goa Beaches	Goa	Beach	8.605032	Nov-Mar
2	3	Jaipur City	Rajasthan	City	9.225372	Oct-Mar
3	4	Kerala Backwaters	Kerala	Nature	7.977386	Sep-Mar
4	5	Leh Ladakh	Jammu and Kashmir	Adventure	8.399822	Apr-Jun

```
reviews_df.head()
```

	ReviewID	DestinationID	UserID	Rating	ReviewText
0	1	178	327	2	Incredible monument!
1	2	411	783	1	Loved the beaches!
2	3	927	12	2	A historical wonder
3	4	358	959	3	Incredible monument!
4	5	989	353	2	Loved the beaches!

```
userhistory_df.head()
```

	HistoryID	UserID	DestinationID	VisitDate	ExperienceRating
0	1	525	760	2024-01-01	3
1	2	184	532	2024-02-15	5
2	3	897	786	2024-03-20	2
3	4	470	660	2024-01-01	1
4	5	989	389	2024-02-15	4

```
users_df.head()
```

	UserID	Name	Email	Preferences	Gender	NumberOfAdults	NumberOfChildren
0	1	Kavya	kavya@example.com	Beaches, Historical	Female	1	0
1	2	Rohan	rohan@example.com	Nature, Adventure	Male	2	2
2	3	Kavya	kavya@example.com	City, Historical	Female	2	0
3	4	Anika	anika@example.com	Beaches, Historical	Female	1	0
4	5	Tanvi	tanvi@example.com	Nature, Adventure	Female	2	2

```
total_users = len(users_df)
print(f"Total number of users: {total_users}")

total_destinations = len(destinations_df)
print(f"Total number of destinations: {total_destinations}")

destination_types = destinations_df['Type'].unique()
print(f"Destination types: {destination_types}")

states = destinations_df['State'].unique()
print(f"States: {states}")
```

```
Total number of users: 999
Total number of destinations: 1000
Destination types: ['Historical' 'Beach' 'City' 'Nature' 'Adventure']
States: ['Uttar Pradesh' 'Goa' 'Rajasthan' 'Kerala' 'Jammu and Kashmir']
```

```
def dataset_info(df, name):
    print(f"\n {name} Dataset:")
    print(df.info())
    print(df.describe())
    print("Missing values:", df.isnull().sum())
    print("Duplicates:", df.duplicated().sum())


dataset_info(destinations_df.head(), "Destinations")
```

```
 Destinations Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 6 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   DestinationID    5 non-null      int64  
 1   Name             5 non-null      object 
 2   State            5 non-null      object 
 3   Type             5 non-null      object 
 4   Popularity       5 non-null      float64
 5   BestTimeToVisit  5 non-null      object 
dtypes: float64(1), int64(1), object(4)
memory usage: 372.0+ bytes
None
       DestinationID  Popularity
count       5.000000    5.000000
mean        3.000000    8.579904
std         1.581139    0.454220
min         1.000000    7.977386
25%         2.000000    8.399822
50%         3.000000    8.605032
75%         4.000000    8.691906
max         5.000000    9.225372
Missing values: DestinationID      0
Name               0
State              0
Type               0
Popularity         0
BestTimeToVisit    0
dtype: int64
Duplicates: 0
```

```
dataset_info(users_df.head(), "Users")
```

```
 Users Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 7 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   UserID            5 non-null      int64 
 1   Name              5 non-null      object
 2   Email             5 non-null      object
 3   Preferences       5 non-null      object
 4   Gender            5 non-null      object
 5   NumberOfAdults    5 non-null      int64 
 6   NumberOfChildren  5 non-null      int64 
dtypes: int64(3), object(4)
memory usage: 412.0+ bytes
None
         UserID  NumberOfAdults  NumberOfChildren
count  5.000000        5.000000          5.000000
mean   3.000000        1.600000          0.800000
std    1.581139        0.547723          1.095445
min    1.000000        1.000000          0.000000
25%    2.000000        1.000000          0.000000
50%    3.000000        2.000000          0.000000
75%    4.000000        2.000000          2.000000
max    5.000000        2.000000          2.000000
Missing values: UserID              0
Name                0
Email               0
Preferences         0
Gender              0
NumberOfAdults      0
NumberOfChildren    0
dtype: int64
Duplicates: 0
```

```
dataset_info(reviews_df.head(), "Reviews")
```

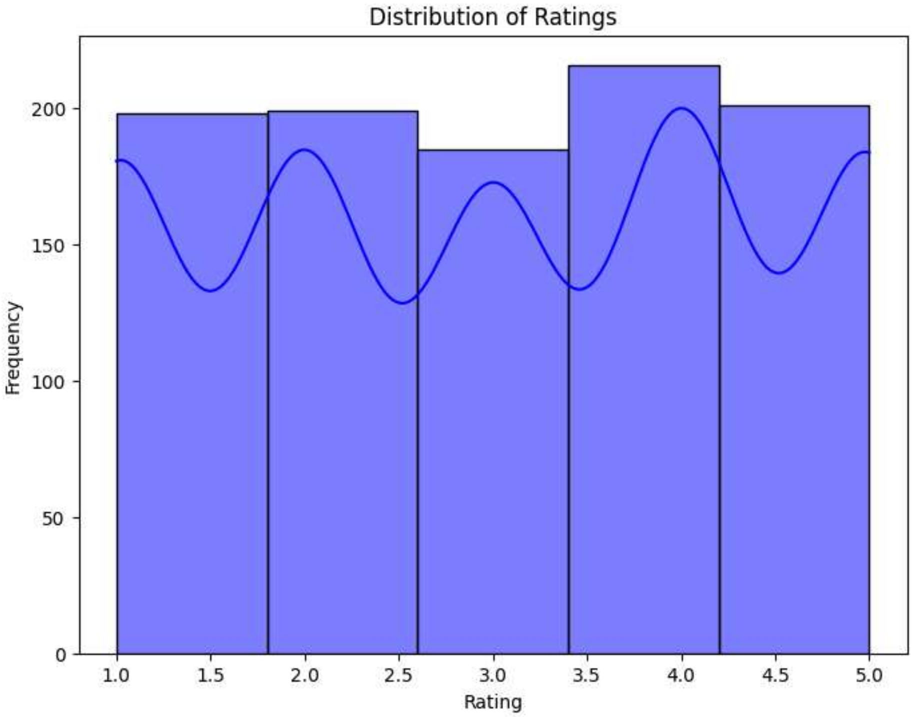
```
 Reviews Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 5 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   ReviewID       5 non-null      int64 
 1   DestinationID  5 non-null      int64 
 2   UserID         5 non-null      int64 
 3   Rating         5 non-null      int64 
 4   ReviewText     5 non-null      object
dtypes: int64(4), object(1)
memory usage: 332.0+ bytes
None
       ReviewID  DestinationID      UserID    Rating
count  5.000000       5.000000    5.000000  5.000000
mean   3.000000     572.600000  486.800000  2.000000
std    1.581139     362.927403  380.651021  0.707107
min    1.000000     178.000000   12.000000  1.000000
25%    2.000000     358.000000  327.000000  2.000000
50%    3.000000     411.000000  353.000000  2.000000
75%    4.000000     927.000000  783.000000  2.000000
max    5.000000     989.000000  959.000000  3.000000
Missing values: ReviewID         0
DestinationID    0
UserID           0
Rating           0
ReviewText       0
dtype: int64
Duplicates: 0
```

```
dataset_info(userhistory_df.head(), "User History")
```

```
 User History Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 5 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   HistoryID         5 non-null      int64 
 1   UserID            5 non-null      int64 
 2   DestinationID     5 non-null      int64 
 3   VisitDate         5 non-null      object
 4   ExperienceRating  5 non-null      int64 
dtypes: int64(4), object(1)
memory usage: 332.0+ bytes
None
```

```
       HistoryID     UserID  DestinationID  ExperienceRating
count   5.000000    5.00000       5.000000          5.000000
mean    3.000000  613.00000     625.400000          3.000000
std     1.581139  329.49431     165.616424          1.581139
min     1.000000  184.00000     389.000000          1.000000
25%     2.000000  470.00000     532.000000          2.000000
50%     3.000000  525.00000     660.000000          3.000000
75%     4.000000  897.00000     760.000000          4.000000
max     5.000000  989.00000     786.000000          5.000000
Missing values: HistoryID           0
UserID              0
DestinationID       0
VisitDate           0
ExperienceRating    0
dtype: int64
Duplicates: 0
```

```
# Check distribution of ratings
plt.figure(figsize=(8, 6))
sns.histplot(reviews_df['Rating'], bins=5, kde=True, color='blue')
plt.title('Distribution of Ratings')
plt.xlabel('Rating')
plt.ylabel('Frequency')
plt.show()
```



```
# Merge datasets

reviews_destinations = pd.merge(reviews_df, destinations_df, on='DestinationID', how='inner')

reviews_destinations_userhistory = pd.merge(reviews_destinations, userhistory_df, on='UserID', how='inner')

df = pd.merge(reviews_destinations_userhistory, users_df, on='UserID', how='inner')

df
```

	ReviewID	DestinationID_x	UserID	Rating	ReviewText	Name_x	State	Type	Popularity	BestTimeToVisit	HistoryID	Desti
0	1	178	327	2	Incredible monument!	Jaipur City	Rajasthan	City	8.544352	Oct-Mar	79	
1	2	411	783	1	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	8.284127	Nov-Feb	834	
2	4	358	959	3	Incredible monument!	Jaipur City	Rajasthan	City	7.738761	Oct-Mar	998	
3	5	989	353	2	Loved the beaches!	Kerala Backwaters	Kerala	Nature	8.208088	Sep-Mar	202	
4	6	473	408	4	A historical wonder	Jaipur City	Rajasthan	City	8.138558	Oct-Mar	331	
...	...	...	...	...	...	...	...	...	...	...	...	
988	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	138	
989	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	643	
990	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	454	
991	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	556	
992	997	823	858	5	Incredible monument!	Jaipur City	Rajasthan	City	8.501225	Oct-Mar	423	

993 rows × 20 columns

```
df.shape
```

```
(993, 20)
```

```
df.to_csv("merge.csv", index=False)
```

```
df.duplicated().sum()
```

```
np.int64(0)
```

```
df.isnull().sum()
```

	0
ReviewID	0
DestinationID_x	0
UserID	0
Rating	0
ReviewText	0
Name_x	0
State	0
Type	0
Popularity	0
BestTimeToVisit	0
HistoryID	0
DestinationID_y	0
VisitDate	0
ExperienceRating	0
Name_y	0
Email	0
Preferences	0
Gender	0
NumberOfAdults	0
NumberOfChildren	0

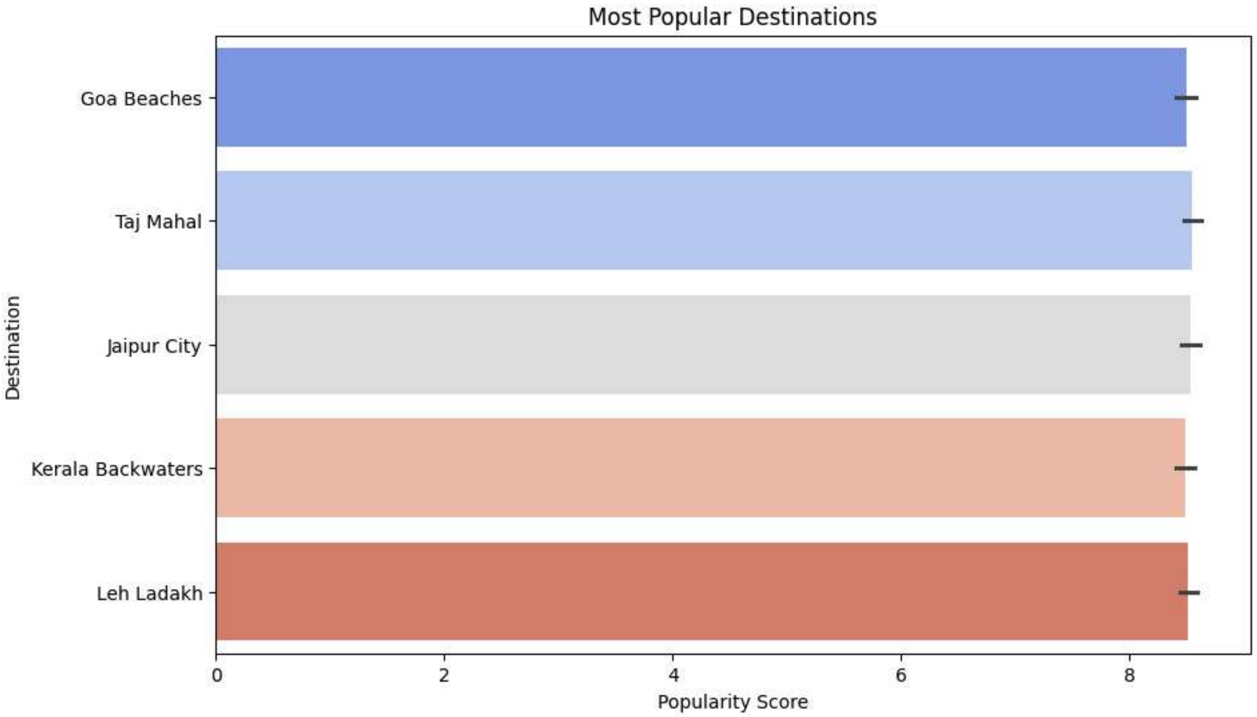
dtype: int64

```
plt.figure(figsize=(10, 6))
sns.barplot(y='Name', x='Popularity', data=destinations_df.sort_values(by='Popularity', ascending=True), palette='coolwarm')
plt.title('Most Popular Destinations')
plt.xlabel('Popularity Score')
plt.ylabel('Destination')
plt.show()
```

```
/tmp/ipython-input-214-1003702628.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `y` variable to `hue` and set `legend

  sns.barplot(y='Name', x='Popularity', data=destinations_df.sort_values(by='Popularity', ascending=True), palette='coolwarm')
```



```
destinations_df['Type'].value_counts()
```

Type	count
Historical	200
Beach	200
City	200
Nature	200
Adventure	200

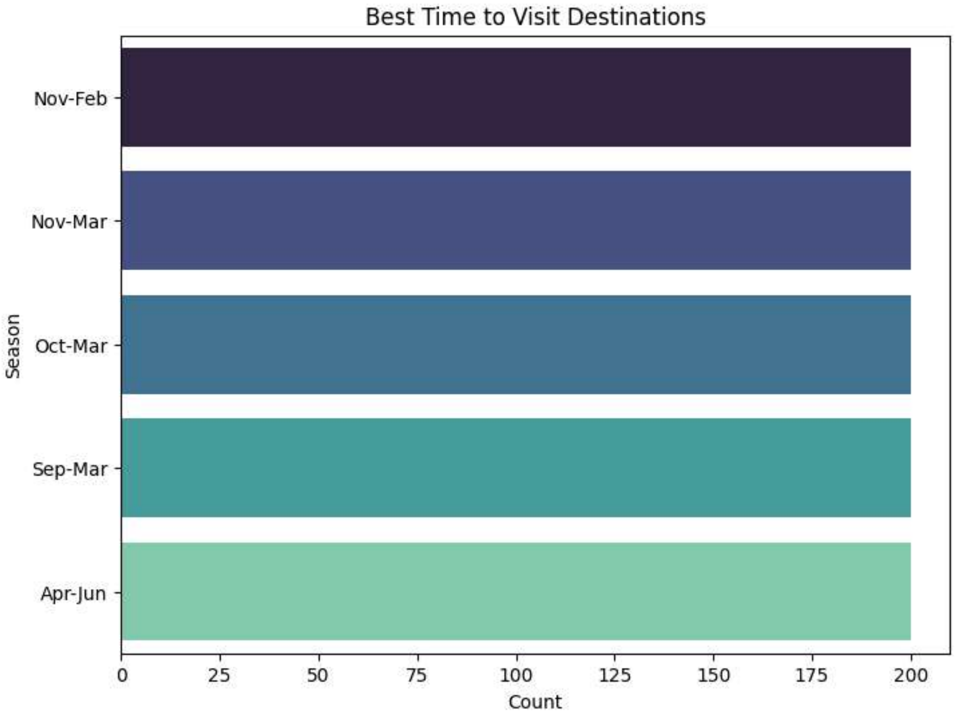
dtype: int64

```
plt.figure(figsize=(8, 6))
sns.countplot(y='BestTimeToVisit', data=destinations_df, order=destinations_df['BestTimeToVisit'].value_counts().index, palette='mako')
plt.title('Best Time to Visit Destinations')
plt.xlabel('Count')
plt.ylabel('Season')
plt.show()
```

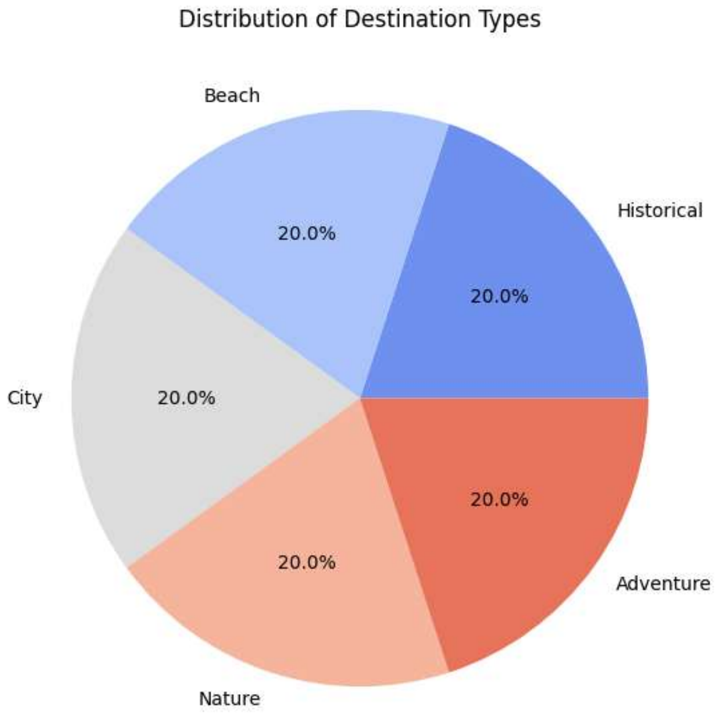
```
/tmp/ipython-input-216-924054954.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `y` variable to `hue` and set `legend

  sns.countplot(y='BestTimeToVisit', data=destinations_df, order=destinations_df['BestTimeToVisit'].value_counts().index, palette='mako'
```

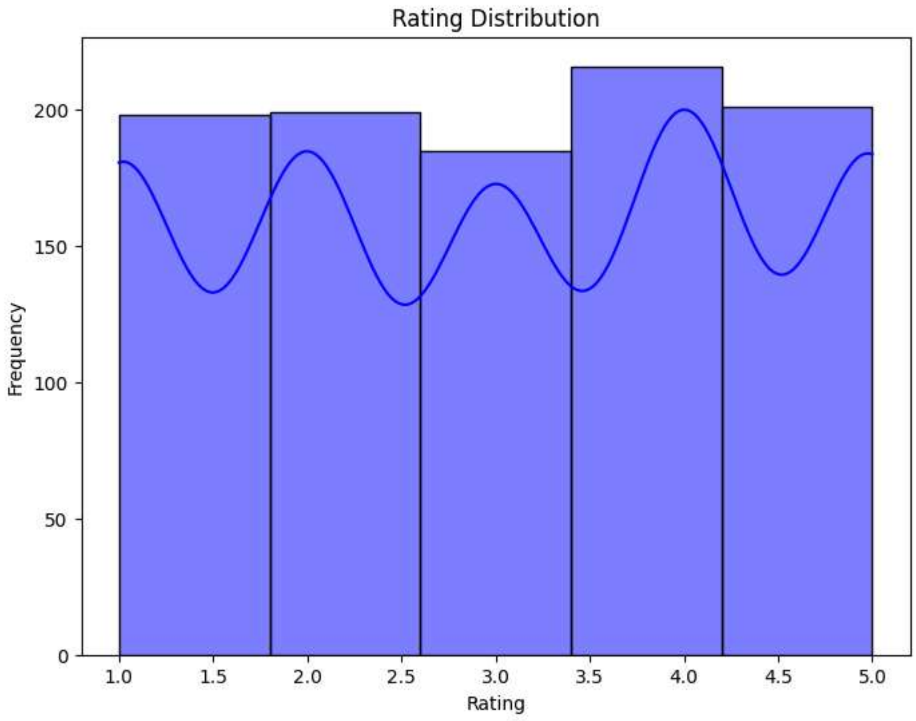


```
plt.figure(figsize=(7, 7))
destinations_df['Type'].value_counts().plot(kind='pie', autopct='%1.1f%%', colors=sns.color_palette('coolwarm', n_colors=len(destinations_df
plt.title('Distribution of Destination Types')
plt.ylabel('')  # Hides the y-axis label
plt.show()
```



```
plt.figure(figsize=(8, 6))
sns.histplot(reviews_df['Rating'], bins=5, kde=True, color='blue')
```

```
plt.title('Rating Distribution')
plt.xlabel('Rating')
plt.ylabel('Frequency')
plt.show()
```



```
df
```

	ReviewID	DestinationID_x	UserID	Rating	ReviewText	Name_x	State	Type	Popularity	BestTimeToVisit	HistoryID	Desti
0	1	178	327	2	Incredible monument!	Jaipur City	Rajasthan	City	8.544352	Oct-Mar	79	
1	2	411	783	1	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	8.284127	Nov-Feb	834	
2	4	358	959	3	Incredible monument!	Jaipur City	Rajasthan	City	7.738761	Oct-Mar	998	
3	5	989	353	2	Loved the beaches!	Kerala Backwaters	Kerala	Nature	8.208088	Sep-Mar	202	
4	6	473	408	4	A historical wonder	Jaipur City	Rajasthan	City	8.138558	Oct-Mar	331	
...	...	...	...	...	...	...	...	...	...	...	...	
988	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	138	
989	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	643	
990	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	454	
991	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	556	
992	997	823	858	5	Incredible monument!	Jaipur City	Rajasthan	City	8.501225	Oct-Mar	423	

993 rows × 20 columns

```
df['features'] = df['Type'] + ' ' + df['State'] + ' ' + df['BestTimeToVisit'] + " " + df['Preferences']
df
```

	ReviewID	DestinationID_x	UserID	Rating	ReviewText	Name_x	State	Type	Popularity	BestTimeToVisit	...	Destinatio
0	1	178	327	2	Incredible monument!	Jaipur City	Rajasthan	City	8.544352	Oct-Mar	...	
1	2	411	783	1	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	8.284127	Nov-Feb	...	
2	4	358	959	3	Incredible monument!	Jaipur City	Rajasthan	City	7.738761	Oct-Mar	...	
3	5	989	353	2	Loved the beaches!	Kerala Backwaters	Kerala	Nature	8.208088	Sep-Mar	...	
4	6	473	408	4	A historical wonder	Jaipur City	Rajasthan	City	8.138558	Oct-Mar	...	
...	...	...	...	...	...	...	...	...	...	...	...	
988	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	...	
989	991	701	850	3	Incredible monument!	Taj Mahal	Uttar Pradesh	Historical	8.814029	Nov-Feb	...	
990	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	...	
991	995	231	346	5	Loved the beaches!	Taj Mahal	Uttar Pradesh	Historical	7.788256	Nov-Feb	...	
992	997	823	858	5	Incredible monument!	Jaipur City	Rajasthan	City	8.501225	Oct-Mar	...	

993 rows × 21 columns

```
vectorizer = CountVectorizer(stop_words='english')
destination_features = vectorizer.fit_transform(df['features'])
```

```
destination_features.toarray()
```

```
array([[0, 0, 0, ..., 1, 0, 0],
       [0, 0, 0, ..., 0, 0, 1],
       [1, 0, 0, ..., 1, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 1],
          [0, 0, 0, ..., 0, 0, 1],
          [0, 0, 0, ..., 1, 0, 0]])
```

```
# Fit KNN model on destination feature matrix
knn_model = NearestNeighbors(n_neighbors=6, metric='cosine')  # 5 neighbors + 1 self
knn_model.fit(destination_features)
```

```
▾            NearestNeighbors               ⓘ ?
NearestNeighbors(metric='cosine', n_neighbors=6)
```

```
destination_features = vectorizer.fit_transform(df['features'])
```

```
df['features']
```

	features
0	City Rajasthan Oct-Mar City, Historical
1	Historical Uttar Pradesh Nov-Feb City, Historical
2	City Rajasthan Oct-Mar Nature, Adventure
3	Nature Kerala Sep-Mar Nature, Adventure
4	City Rajasthan Oct-Mar City, Historical
...	...
988	Historical Uttar Pradesh Nov-Feb Beaches, Hist...
989	Historical Uttar Pradesh Nov-Feb Beaches, Hist...
990	Historical Uttar Pradesh Nov-Feb Beaches, Hist...
991	Historical Uttar Pradesh Nov-Feb Beaches, Hist...
992	City Rajasthan Oct-Mar City, Historical

993 rows × 1 columns

dtype: object

```
def recommend_destinations_knn(destination_index, df, knn_model, features_matrix):
    """
    Recommends destinations based on content-based filtering using KNN.

    Args:
    - destination_index: Index of the destination in the df and features_matrix for which recommendations are to be made.
    - df: DataFrame containing destination details and features.
    - knn_model: Trained NearestNeighbors model.
    - features_matrix: Feature matrix used to train the KNN model.

    Returns:
    - DataFrame with recommended destinations and their details.
    """
    distances, indices = knn_model.kneighbors(features_matrix[destination_index], n_neighbors=6)

    recommended = []
    for idx in indices.flatten()[1:]:  # Skip the first (itself)
        recommended.append({
            'DestinationID': df.iloc[idx]['DestinationID_x'], # Use DestinationID_x
            'Name': df.iloc[idx]['Name_x'], # Use Name_x or Name_y depending on which name is desired
            'State': df.iloc[idx]['State'],
            'Type': df.iloc[idx]['Type'],
            'Popularity': df.iloc[idx]['Popularity']
        })

    # Remove duplicate DestinationIDs if any (can happen due to merging) and keep the first occurrence
    recommended_df = pd.DataFrame(recommended).drop_duplicates(subset=['DestinationID']).reset_index(drop=True)

    return recommended_df
```

```
# Example: Recommend places similar to the destination at index 0 in the df
recommendations_knn = recommend_destinations_knn(0, df, knn_model, destination_features)
```

```
print(recommendations_knn)
```

```
   DestinationID         Name      State  Type  Popularity
0            823  Jaipur City  Rajasthan  City    8.501225
1            373  Jaipur City  Rajasthan  City    9.276957
2            398  Jaipur City  Rajasthan  City    8.332950
3            183  Jaipur City  Rajasthan  City    8.872499
4            118  Jaipur City  Rajasthan  City    7.698986
```

```
user_item_matrix = userhistory_df.pivot(index='UserID', columns='DestinationID', values='ExperienceRating')
user_item_matrix = user_item_matrix.fillna(0)
user_item_matrix
```

DestinationID	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**...**	**987**	**988**	**990**	**991**	**993**	**994**	**996**	**997**	**998**	**1000**
UserID																					
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

642 rows × 638 columns

```
user_item_matrix = userhistory_df.pivot(index='UserID', columns='DestinationID', values='ExperienceRating')
user_item_matrix = user_item_matrix.fillna(0)
```

```
# Fit KNN model
knn_user = NearestNeighbors(metric='cosine', algorithm='brute', n_neighbors=6)
knn_user.fit(user_item_matrix)
```

```
▾                 NearestNeighbors                 ⓘ ?
NearestNeighbors(algorithm='brute', metric='cosine', n_neighbors=6)
```

```
def collaborative_recommend_knn(user_id, user_item_matrix, destinations_df, knn_model, num_recommendations=5):
    if user_id not in user_item_matrix.index:
        print("User not found.")
        return []

    user_idx = user_item_matrix.index.get_loc(user_id)
    distances, indices = knn_model.kneighbors(user_item_matrix.iloc[[user_idx]], n_neighbors=6)

    similar_users = user_item_matrix.iloc[indices.flatten()[1:]]
    mean_ratings = similar_users.mean().sort_values(ascending=False)

    already_rated = user_item_matrix.loc[user_id]
    already_rated = already_rated[already_rated > 0].index

    recommendations = mean_ratings.drop(index=already_rated, errors='ignore').head(num_recommendations)
    return destinations_df[destinations_df['DestinationID'].isin(recommendations.index)][['DestinationID', 'Name', 'Type', 'State']]
```

```
user_id = 200001  # Replace with a real UserID from your data
knn_recommendations = collaborative_recommend_knn(user_id, user_item_matrix, destinations_df, knn_user)

print("Recommended destinations for user:", user_id)
print(knn_recommendations)
```

```
User not found.
Recommended destinations for user: 200001
[]
```

```
# No need to create a copy, we will encode directly on df
# data=df.copy()
```

```
# Predicting popularity
features = ['Name_x', 'State', 'Type', 'BestTimeToVisit', 'Preferences', 'Gender', 'NumberOfAdults', 'NumberOfChildren']
target = 'Popularity'

# Use df directly
X = df[features]
y = df[target]
```

```
# Use df directly
df[features]
```

	Name_x	State	Type	BestTimeToVisit	Preferences	Gender	NumberOfAdults	NumberOfChildren
0	Jaipur City	Rajasthan	City	Oct-Mar	City, Historical	Female	1	1
1	Taj Mahal	Uttar Pradesh	Historical	Nov-Feb	City, Historical	Male	1	1
2	Jaipur City	Rajasthan	City	Oct-Mar	Nature, Adventure	Male	1	1
3	Kerala Backwaters	Kerala	Nature	Sep-Mar	Nature, Adventure	Female	2	0
4	Jaipur City	Rajasthan	City	Oct-Mar	City, Historical	Male	2	0
...	...	...	...	...	...	...	...	...
988	Taj Mahal	Uttar Pradesh	Historical	Nov-Feb	Beaches, Historical	Male	2	0
989	Taj Mahal	Uttar Pradesh	Historical	Nov-Feb	Beaches, Historical	Male	2	0
990	Taj Mahal	Uttar Pradesh	Historical	Nov-Feb	Beaches, Historical	Male	2	2
991	Taj Mahal	Uttar Pradesh	Historical	Nov-Feb	Beaches, Historical	Male	2	2
992	Jaipur City	Rajasthan	City	Oct-Mar	City, Historical	Male	1	2

993 rows × 8 columns

```
for col in features:
      print(col)
```

```
Name_x
State
Type
BestTimeToVisit
Preferences
Gender
NumberOfAdults
NumberOfChildren
```

```
label_encoders = {}
for col in features:
    # Check if the column exists in df and if its dtype is object
    if col in df.columns and df[col].dtype == 'object':
        le = LabelEncoder()
        # Fit and transform directly on the df DataFrame
        df[col] = le.fit_transform(df[col].astype(str))
        label_encoders[col] = le
    # If the column is already numerical and is in features, keep it as is
    elif col not in df.columns:
        print(f"Warning: Feature '{col}' not found in df columns.")
```

```
# Use df directly
df[features]
```

	Name_x	State	Type	BestTimeToVisit	Preferences	Gender	NumberOfAdults	NumberOfChildren
0	1	3	2	3	1	0	1	1
1	4	4	3	1	1	1	1	1
2	1	3	2	3	2	1	1	1
3	2	2	4	4	2	0	2	0
4	1	3	2	3	1	1	2	0
...	...	...	...	...	...	...	...	...
988	4	4	3	1	0	1	2	0
989	4	4	3	1	0	1	2	0
990	4	4	3	1	0	1	2	2
991	4	4	3	1	0	1	2	2
992	1	3	2	3	1	1	1	2

993 rows × 8 columns

```
# Use df directly
X = df[features]
y = df[target]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)


#Train Model
model = RandomForestRegressor(random_state=42)
model.fit(X_train, y_train)

#Evaluation
y_pred = model.predict(X_test)
print(f"Mean Squared Error: {mean_squared_error(y_test, y_pred):.2f}")
print(f"R² Score: {r2_score(y_test, y_pred):.2f}")
```

```
Mean Squared Error: 0.30
R² Score: 0.07
```

```
def recommend_destinations(user_input, model, label_encoders, features, df):
    # Create a dictionary for the encoded input
    encoded_input = {}
    for feature in features:
        if feature in user_input:
            if feature in label_encoders:
                # Use the stored label encoder to transform the input value
                try:
                    encoded_input[feature] = label_encoders[feature].transform([str(user_input[feature])])[0
                except ValueError as e:
                    print(f"Error encoding feature '{feature}': {e}")
                    print(f"Input value was: '{user_input[feature]}'")
                    print(f"Known classes for this encoder: {label_encoders[feature].classes_}")
                    # Handle unseen labels - for now, we'll raise the error
                    raise e
            else:
                # If not a categorical feature that was encoded, use the input value directly
                 encoded_input[feature] = user_input[feature]
        else:
            # Handle cases where a feature in the 'features' list is not in the user_input
            # Depending on the model and feature, you might impute a default value or raise an error
            # For simplicity, let's assume all features in the list are expected in user_input
            print(f"Warning: Feature '{feature}' not provided in user input.")
            # As a placeholder, you might add a default value or handle this case based on your needs
            # For now, we'll assume the input is complete based on the 'features' list
            pass # Or set a default value, e.g., encoded_input[feature] = default_value


    # Convert to DataFrame
    # Ensure the order of columns in the input_df matches the order of features the model was trained on
    input_df = pd.DataFrame([encoded_input])[features]


    # Predict popularity
    predicted_popularity = model.predict(input_df)[0]
```