In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler, StandardScaler
```

In [25]:

```
df = pd.read_csv("TechElectro_Customer_Data.csv")
```

In [26]:

```
df.head()
```

Out[26]:

	CustomaleerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	PreferredCategory
0	1001	58	male	Divorced	73598	53	Appliances
1	1002	32	male	Married	31717	87	Appliances
2	1003	55	Female	Divorced	26952	29	Appliances
3	1004	32	male	Married	38031	87	Electronics
4	1005	32	Female	Married	43231	18	Appliances

In [27]:

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

Out[27]:

```
CustomaleerID         0
Age                   0
Gender                0
MaritalStatus         0
AnnualIncome (USD)    0
TotalPurchases        0
PreferredCategory     0
dtype: int64
```

In [28]:

```
numerical_cols = ['Age', 'AnnualIncome (USD)', 'TotalPurchases']
minmax_scaler = MinMaxScaler()
standard_scaler = StandardScaler()

df[numerical_cols] = minmax_scaler.fit_transform(df[numerical_cols])
```

In [29]:

```
df.head()
```

Out[29]:

	CustomaleerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	PreferredCategory
0	1001	0.851064	male	Divorced	0.745837	0.525641	Appliances
1	1002	0.297872	male	Married	0.096459	0.961538	Appliances
2	1003	0.787234	Female	Divorced	0.022576	0.217949	Appliances
3	1004	0.297872	male	Married	0.194359	0.961538	Electronics
4	1005	0.297872	Female	Married	0.274987	0.076923	Appliances

Encoding Categorical Variables:

In [32]:

```
categorical_col = 'PreferredCategory'
df_encoded = pd.get_dummies(df, columns=[categorical_col], drop_first=True)
```

In [33]:

```
df_encoded.head()
```

Out[33]:

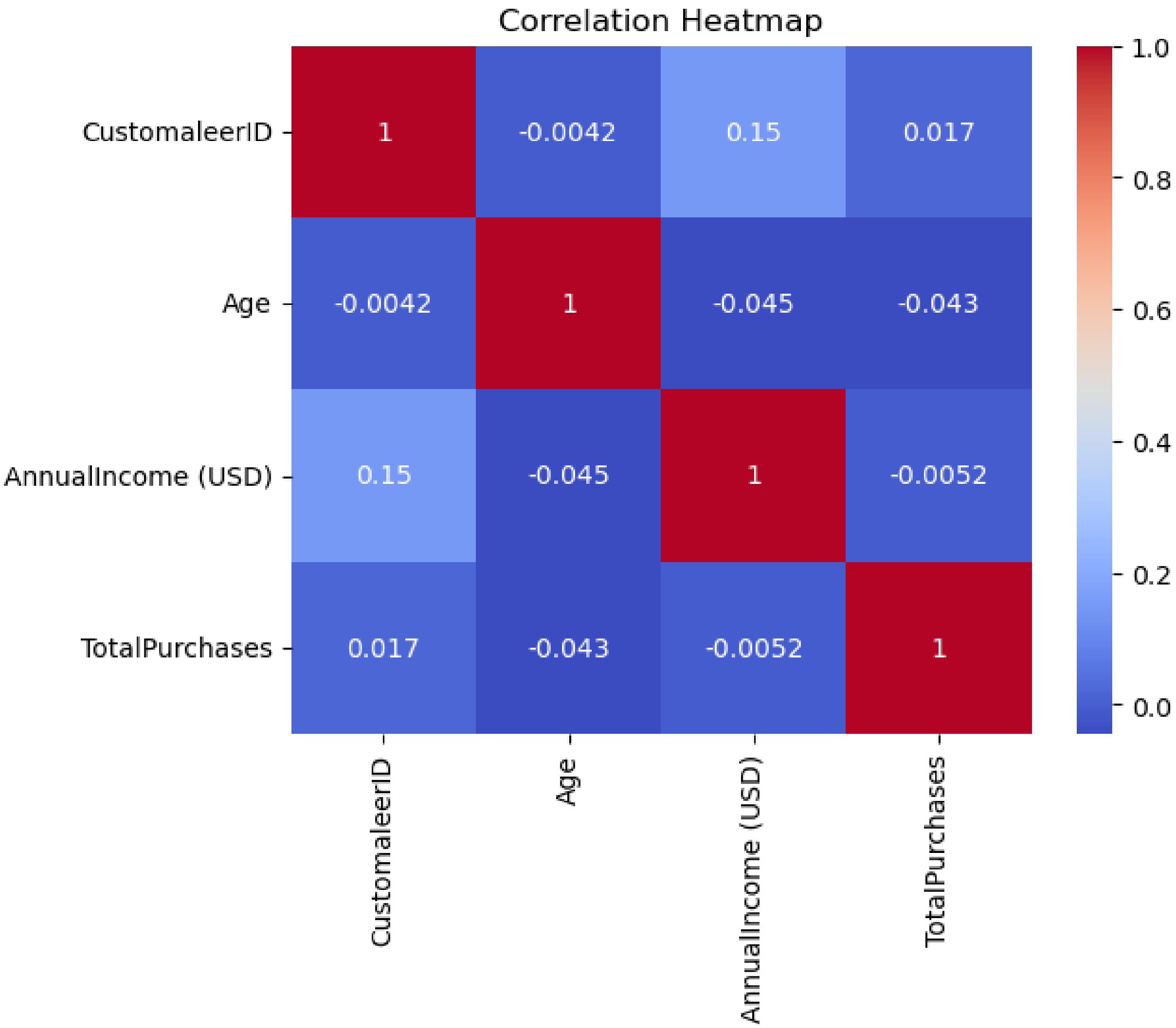
	CustomaleerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	PreferredCategory_
0	1001	0.851064	male	Divorced	0.745837	0.525641	
1	1002	0.297872	male	Married	0.096459	0.961538	
2	1003	0.787234	Female	Divorced	0.022576	0.217949	
3	1004	0.297872	male	Married	0.194359	0.961538	
4	1005	0.297872	Female	Married	0.274987	0.076923	

Correlation heatmap

In [34]:

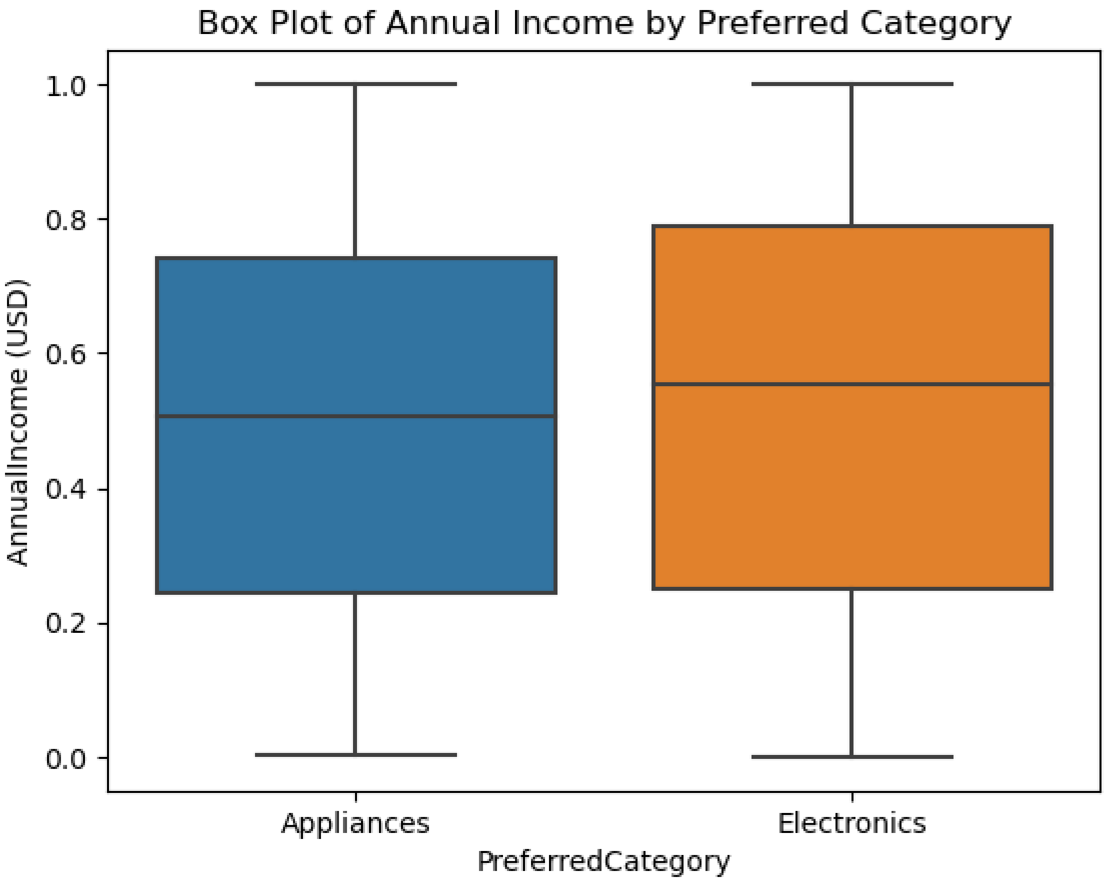
```
correlation_matrix = df.corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

```
C:\Users\Qurrat\AppData\Local\Temp\ipykernel_14748\2298098936.py:1: FutureWarning: The default val
ue of numeric_only in DataFrame.corr is deprecated. In a future version, it will default to False. Select only
valid columns or specify the value of numeric_only to silence this warning.
  correlation_matrix = df.corr()
```



Box plot for annual income by preferred category

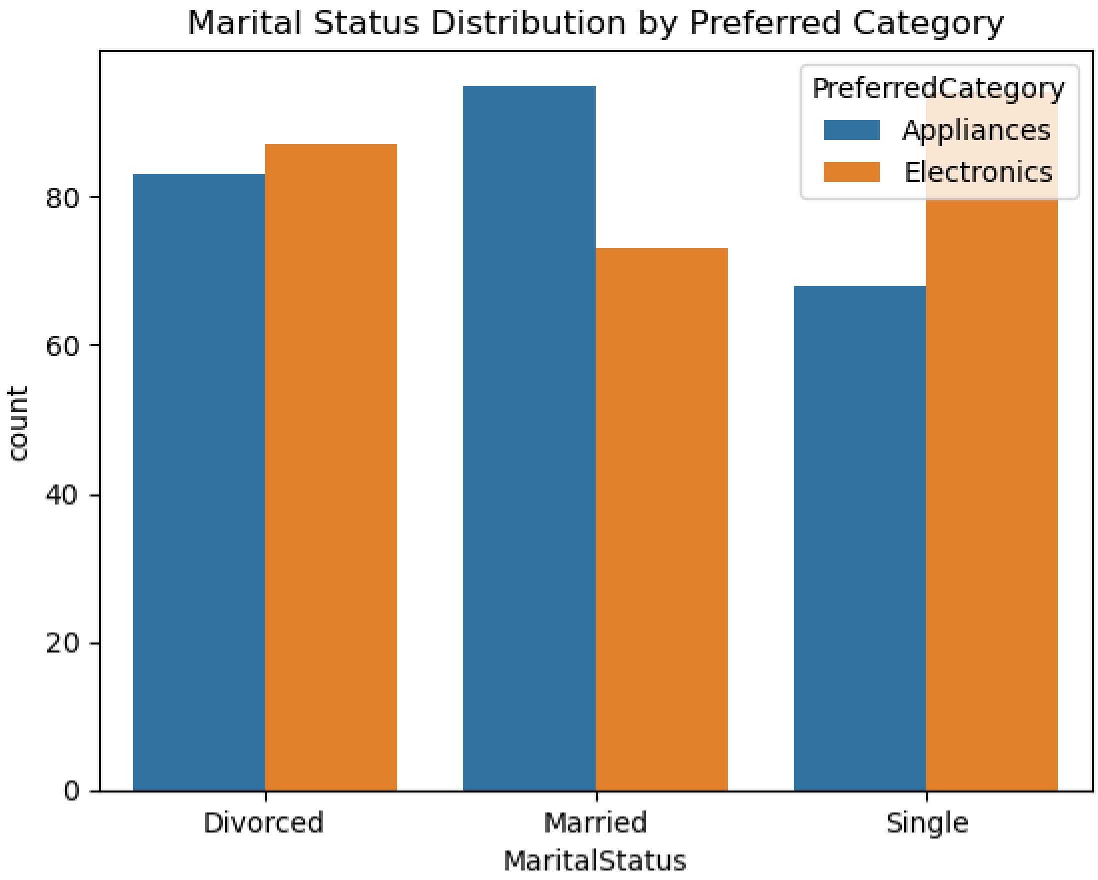
In [35]:
```
sns.boxplot(data=df, x='PreferredCategory', y='AnnualIncome (USD)')
plt.title('Box Plot of Annual Income by Preferred Category')
plt.show()
```



Bar plot for marital status distribution

In [36]:

```
sns.countplot(data=df, x='MaritalStatus', hue='PreferredCategory')
plt.title('Marital Status Distribution by Preferred Category')
plt.show()
```



In [ ]:

In [48]:

```
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
columns_for_clustering = ['Age', 'AnnualIncome (USD)', 'TotalPurchases', 'PreferredCategory_Electronics']
scaler = StandardScaler()
```

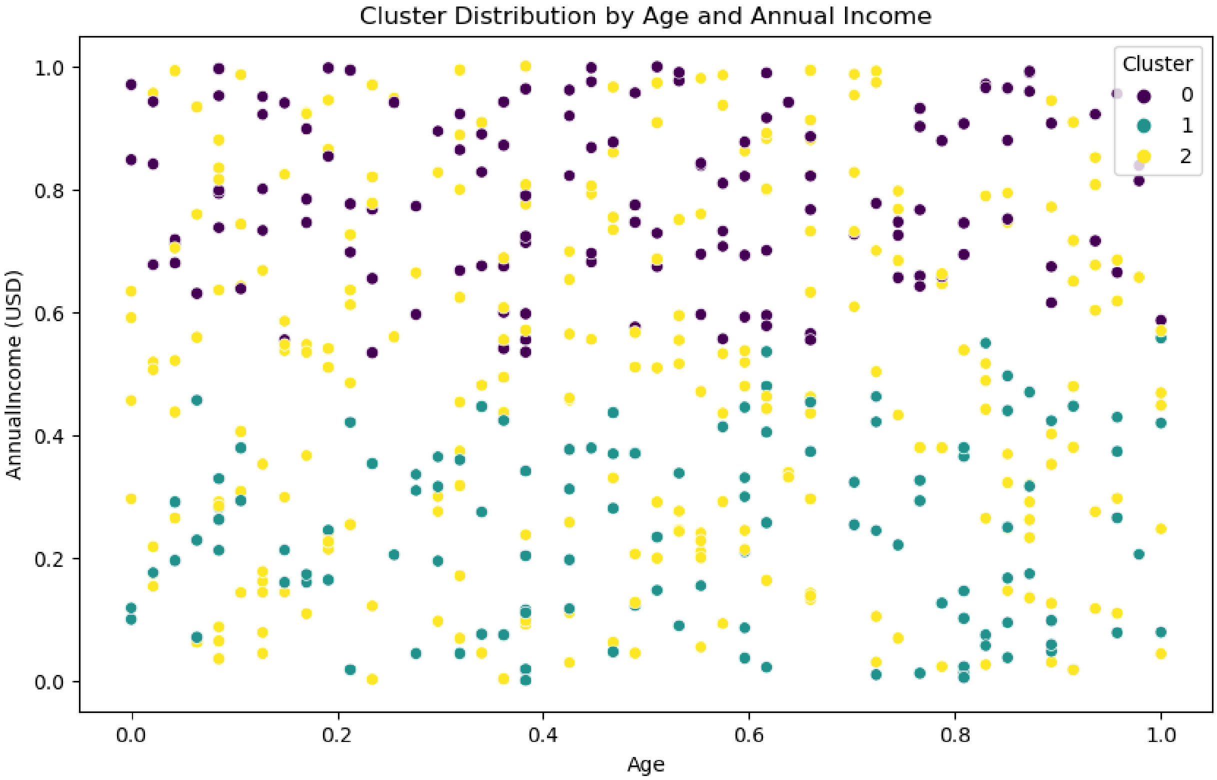
In [49]:

```
df_scaled = scaler.fit_transform(df_encoded[columns_for_clustering])
k = 3
kmeans = KMeans(n_clusters=k, random_state=42)
df_encoded['Cluster'] = kmeans.fit_predict(df_scaled)
cluster_sizes = df_encoded['Cluster'].value_counts()
print("Cluster Sizes:", cluster_sizes)
```

```
C:\anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value of `n_i
nit` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  warnings.warn(
C:\anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it
by setting the environment variable OMP_NUM_THREADS=2.
  warnings.warn(
Cluster Sizes: 2    246
0    131
1    123
Name: Cluster, dtype: int64
```

In [50]:

```
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df_encoded, x='Age', y='AnnualIncome (USD)', hue='Cluster', palette='viridis')
plt.title('Cluster Distribution by Age and Annual Income')
plt.show()
```



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