```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
```

Load the data

```
data = pd.read_csv('/content/mcdonalds.csv')
```

```
data
```

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	heal
0	No	Yes	No	Yes	No	Yes	Yes	No	Yes	
1	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	
2	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	
3	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	
4	No	Yes	No	Yes	Yes	Yes	Yes	No	No	
...	...	...	...	...	...	...	...	...	...	
1448	No	Yes	No	Yes	Yes	No	No	No	Yes	
1449	Yes	Yes	No	Yes	No	No	Yes	Yes	No	
1450	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	

Next steps: Generate code with `data` | View recommended plots | New interactive sheet

```
data.head()
```

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy
0	No	Yes	No	Yes	No	Yes	Yes	No	Yes	No
1	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
2	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

Next steps: Generate code with data | View recommended plots | New interactive sheet

```
data.tail()
```

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	heal
1448	No	Yes	No	Yes	Yes	No	No	No	Yes	
1449	Yes	Yes	No	Yes	No	No	Yes	Yes	No	
1450	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1453 entries, 0 to 1452
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   yummy           1453 non-null   object
 1   convenient      1453 non-null   object
 2   spicy           1453 non-null   object
 3   fattening       1453 non-null   object
 4   greasy          1453 non-null   object
 5   fast            1453 non-null   object
 6   cheap           1453 non-null   object
 7   tasty           1453 non-null   object
 8   expensive       1453 non-null   object
 9   healthy         1453 non-null   object
 10  disgusting      1453 non-null   object
 11  Like            1453 non-null   object
 12  Age             1453 non-null   int64 
 13  VisitFrequency  1453 non-null   object
 14  Gender          1453 non-null   object
dtypes: int64(1), object(14)
memory usage: 170.4+ KB
```

```
data.describe()
```

	Age
count	1453.000000
mean	44.604955
std	14.221178
min	18.000000
25%	33.000000
50%	45.000000
75%	57.000000
max	71.000000

```
data.columns
```

```
Index(['yummy', 'convenient', 'spicy', 'fattening', 'greasy', 'fast', 'cheap',
       'tasty', 'expensive', 'healthy', 'disgusting', 'Like', 'Age',
       'VisitFrequency', 'Gender'],
      dtype='object')
```

```
data.shape
```

```
(1453, 15)
```

```
data.isnull()
```

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	hea
0	False	False	False	False	False	False	False	False	False	F
1	False	False	False	False	False	False	False	False	False	F
2	False	False	False	False	False	False	False	False	False	F
3	False	False	False	False	False	False	False	False	False	F
4	False	False	False	False	False	False	False	False	False	F
...	...	...	...	...	...	...	...	...	...	
1448	False	False	False	False	False	False	False	False	False	F
1449	False	False	False	False	False	False	False	False	False	F
1450	False	False	False	False	False	False	False	False	False	F
1451	False	False	False	False	False	False	False	False	False	F
1452	False	False	False	False	False	False	False	False	False	F

1453 rows × 15 columns

```
data.isnull().sum()
```

	0
yummy	0
convenient	0
spicy	0
fattening	0
greasy	0
fast	0
cheap	0
tasty	0
expensive	0
healthy	0
disgusting	0
Like	0
Age	0
VisitFrequency	0
Gender	0

dtype: int64

```
data.replace({'Yes': 1, 'No': 0}, inplace=True)
```

```
data.dropna(subset=['VisitFrequency', 'Like'], inplace=True)
```

```
data
```

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	heal
0	0	1	0	1	0	1	1	0	1	
1	1	1	0	1	1	1	1	1	1	
2	0	1	1	1	1	1	0	1	1	
3	1	1	0	1	1	1	1	1	0	
4	0	1	0	1	1	1	1	0	0	
...	...	...	...	...	...	...	...	...	...	
1448	0	1	0	1	1	0	0	0	1	
1449	1	1	0	1	0	0	1	1	0	
1450	1	1	0	1	0	1	0	1	1	

Next steps: Generate code with data | View recommended plots | New interactive sheet

Mapping VisitFrequency to numeric values

```
visit_freq_mapping = {
    'More than once a week': 5,
    'Once a week': 4,
    'Once a month': 3,
    'Every three months': 2,
    'Once a year': 1,
    'Never': 0
}
data['VisitFrequency'] = data['VisitFrequency'].map(visit_freq_mapping)
```

```
data['Like'] = pd.to_numeric(data['Like'], errors='coerce')
```

Encode categorical variables

```
le = LabelEncoder()
for col in ['yummy', 'convenient', 'spicy', 'fattening', 'greasy', 'fast', 'cheap', 'tast
    data[col] = le.fit_transform(data[col])
```

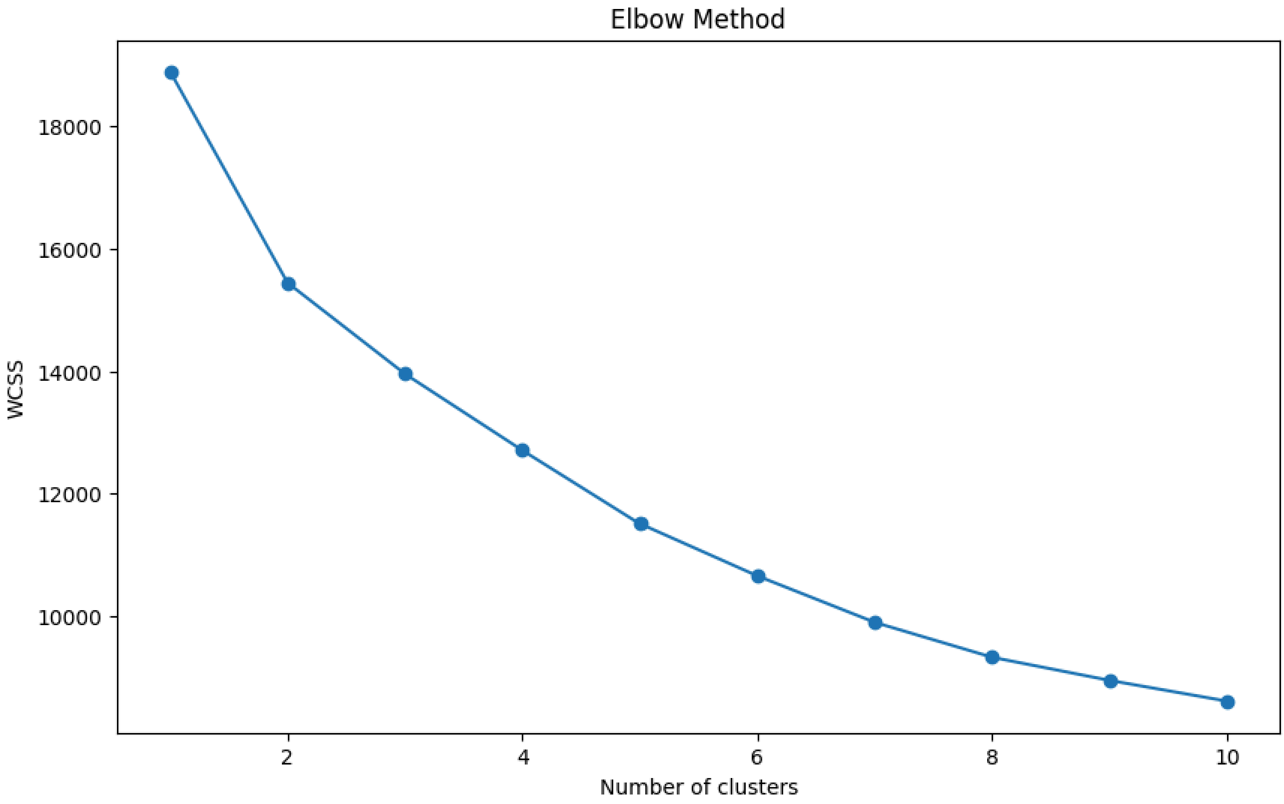
```
from sklearn.impute import SimpleImputer
imputer = SimpleImputer(strategy='mean')
data_imputed = imputer.fit_transform(data[['yummy', 'convenient', 'spicy', 'fattening', '
```

```
scaler = StandardScaler()
data_scaled = scaler.fit_transform(data_imputed)
```

```
wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, random_state=0)
    kmeans.fit(data_scaled)
    wcss.append(kmeans.inertia_)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
```

```
plt.figure(figsize=(10, 6))
plt.plot(range(1, 11), wcss, marker='o')
plt.title('Elbow Method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```

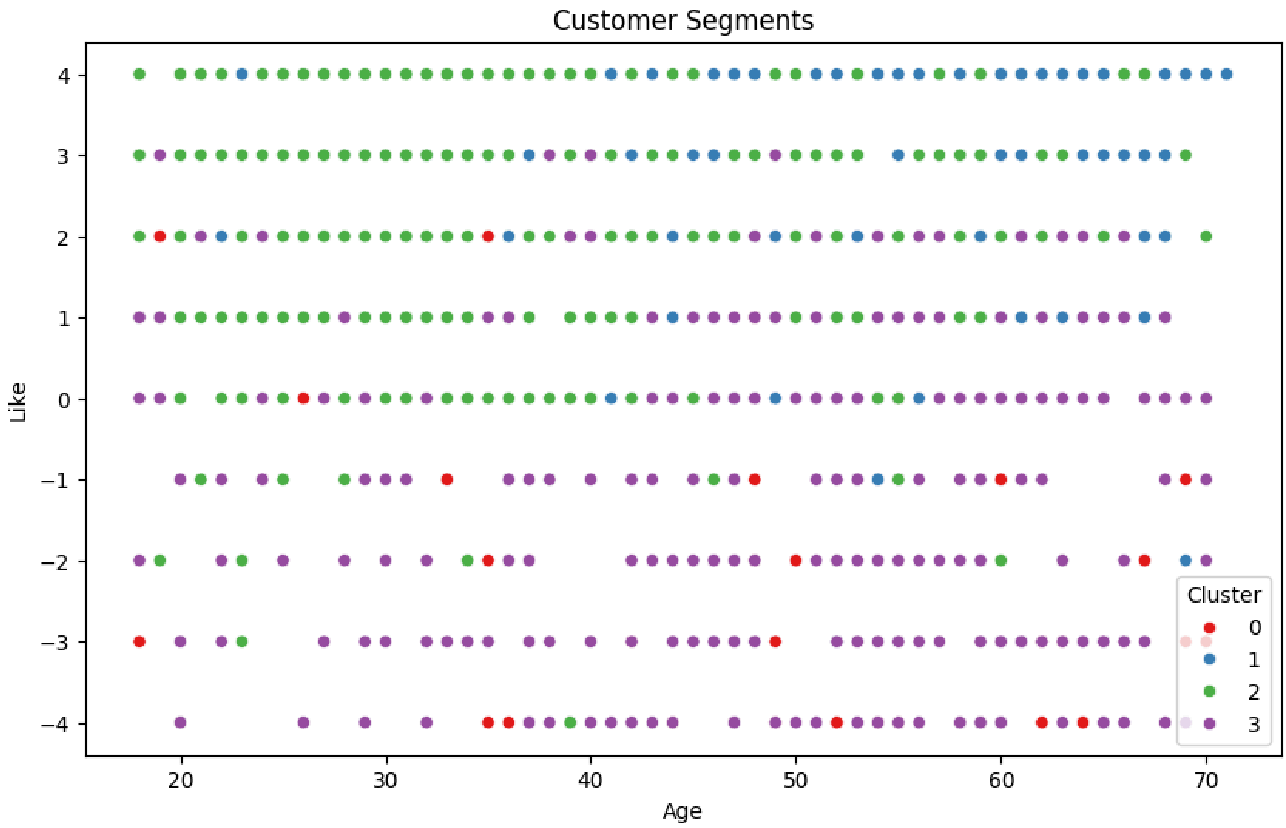



```
optimal_clusters = 4
kmeans = KMeans(n_clusters=optimal_clusters, random_state=0)
data['Cluster'] = kmeans.fit_predict(data_scaled)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarnir
  super()._check_params_vs_input(X, default_n_init=10)
```

```
cluster_centers = pd.DataFrame(scaler.inverse_transform(kmeans.cluster_centers_), columns
```

```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='Age', y='Like', hue='Cluster', data=data, palette='Set1')
plt.title('Customer Segments')
plt.show()
```




```
print("Cluster Centers:")
print(cluster_centers)
```

```
Cluster Centers:
      yummy    convenient     spicy  fattening    greasy      fast     cheap  \
0  0.074380 -1.332268e-15  0.074380   0.859504  0.735537  0.636364  0.338843
1  0.840336  9.705882e-01  0.130252   0.352941  0.046218  0.928571  0.739496
2  0.941272  9.902121e-01  0.076672   0.991843  0.575856  0.938010  0.619902
3  0.035343  1.000000e+00  0.101871   0.964657  0.648649  0.904366  0.567568

      tasty  expensive   healthy  disgusting      Like        Age
0  0.123967   0.644628  0.057851     0.77686 -0.223298  48.504132
1  0.920168   0.189076  0.789916     0.02521  2.066450  49.407563
2  0.957586   0.355628  0.106036     0.08646  2.076979  38.181077
3  0.239085   0.372141  0.060291     0.41580 -0.550745  49.434511
```

```
print("\nCluster Analysis:")
print(data.groupby('Cluster').mean())
```

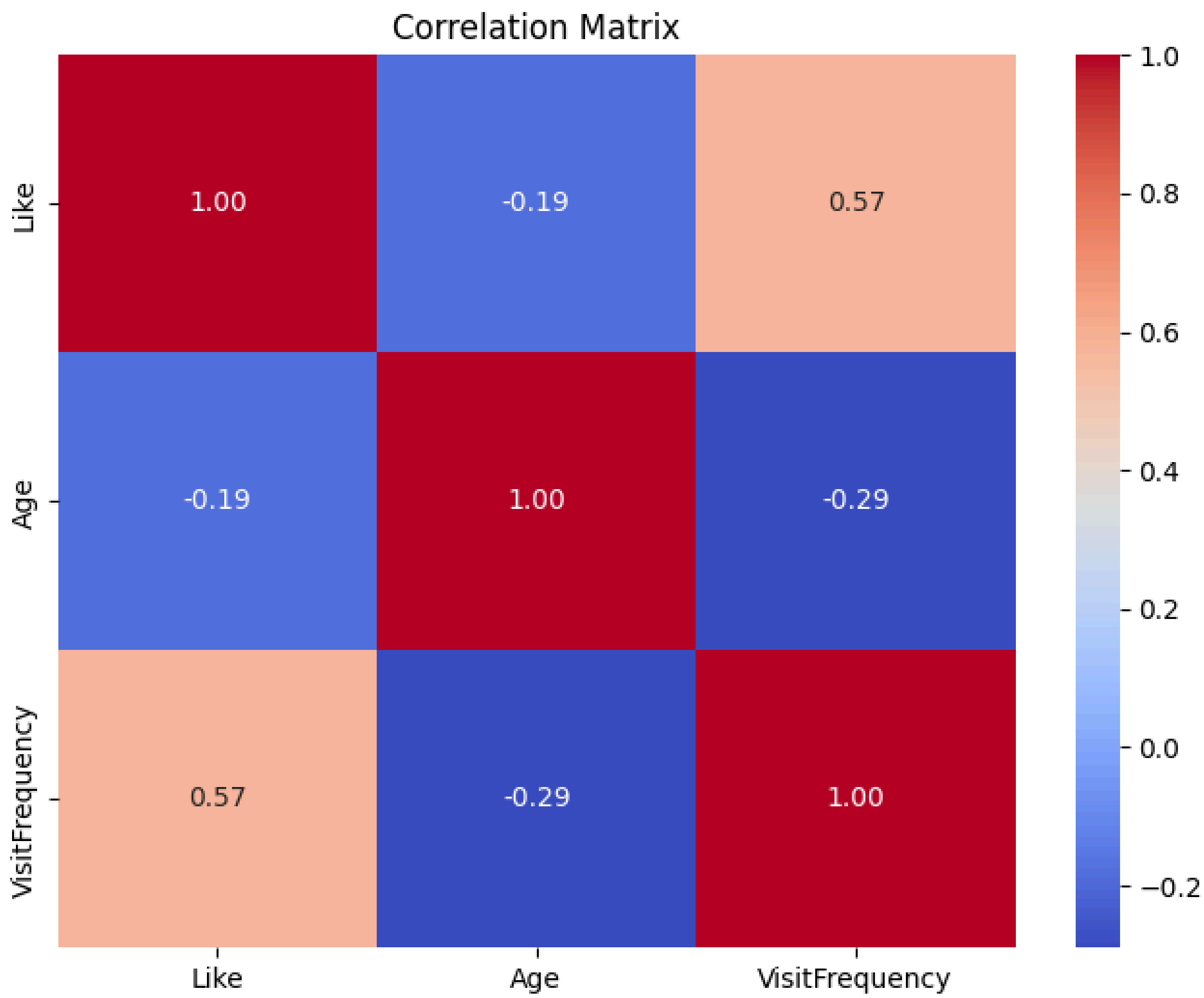
```
Cluster Analysis:
            yummy  convenient     spicy  fattening    greasy      fast  \
Cluster
0        0.074380    0.000000  0.074380   0.859504  0.735537  0.636364
1        0.840336    0.970588  0.130252   0.352941  0.046218  0.928571
```

```
2        0.941272    0.990212  0.076672   0.991843  0.575856  0.938010
3        0.035343    1.000000  0.101871   0.964657  0.648649  0.904366

            cheap     tasty  expensive   healthy  disgusting      Like  \
Cluster
0        0.338843  0.123967   0.644628  0.057851     0.77686 -1.980000
1        0.739496  0.920168   0.189076  0.789916     0.02521  2.413408
2        0.619902  0.957586   0.355628  0.106036     0.08646  2.250474
3        0.567568  0.239085   0.372141  0.060291     0.41580 -0.858209

               Age  VisitFrequency    Gender
Cluster
0        48.504132        0.942149  0.545455
1        49.407563        2.987395  0.432773
2        38.181077        2.941272  0.432300
3        49.434511        1.735967  0.480249
```

```
pca = PCA(n_components=2)
data_pca = pca.fit_transform(data_scaled)
data['PCA1'] = data_pca[:, 0]
data['PCA2'] = data_pca[:, 1]
```

```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='PCA1', y='PCA2', hue='Cluster', data=data, palette='Set1')
plt.title('Customer Segments (PCA)')
plt.show()
```


```
corr_matrix = data[['Like', 'Age', 'VisitFrequency']].corr()
plt.figure(figsize=(8, 6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', fmt='.2f')
plt.title('Correlation Matrix')
plt.show()
```




```
print(data[['Like', 'Age']].describe())
print("\nGender distribution:\n", data['Gender'].value_counts())
print("\nVisit Frequency distribution:\n", data['VisitFrequency'].value_counts())
```

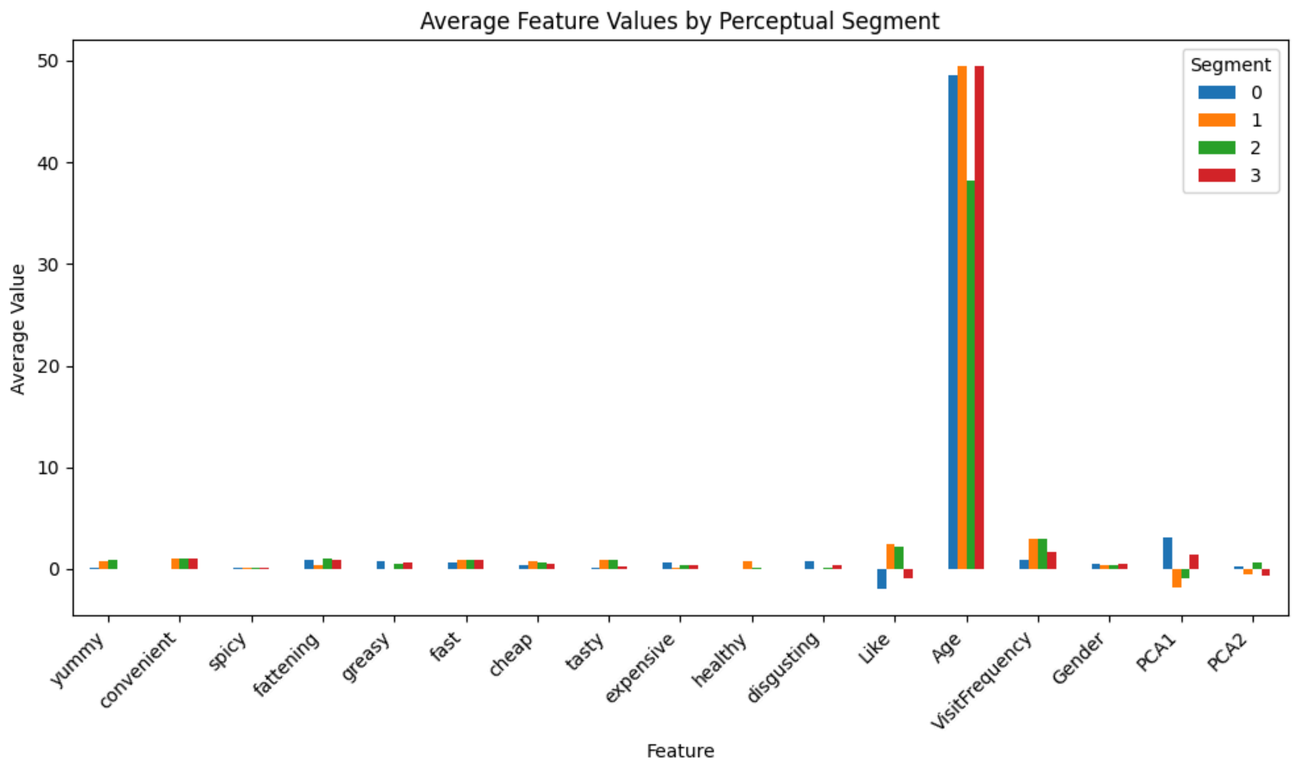
```
              Like          Age
count  1158.000000  1453.000000
mean      1.013817    44.604955
std       2.355189    14.221178
min      -4.000000    18.000000
25%       0.000000    33.000000
50%       1.000000    45.000000
75%       3.000000    57.000000
max       4.000000    71.000000

Gender distribution:
 Gender
0    788
1    665
Name: count, dtype: int64

Visit Frequency distribution:
 VisitFrequency
3    439
2    342
1    252
4    235
0    131
```

```
5     54
Name: count, dtype: int64
```

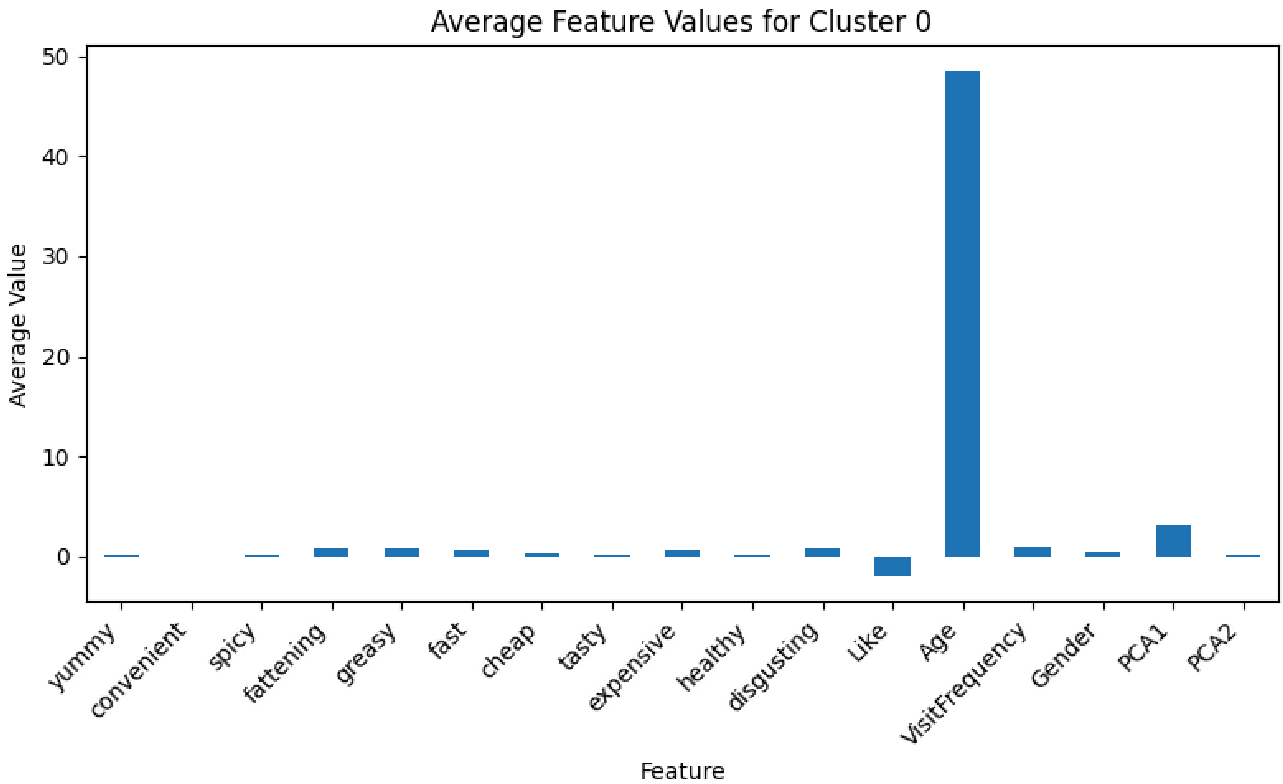
```
numeric_columns = data.select_dtypes(include=['number']).columns
segment_means = data[numeric_columns].groupby('Cluster').mean()
print("\nSegment Means:\n", segment_means)
```

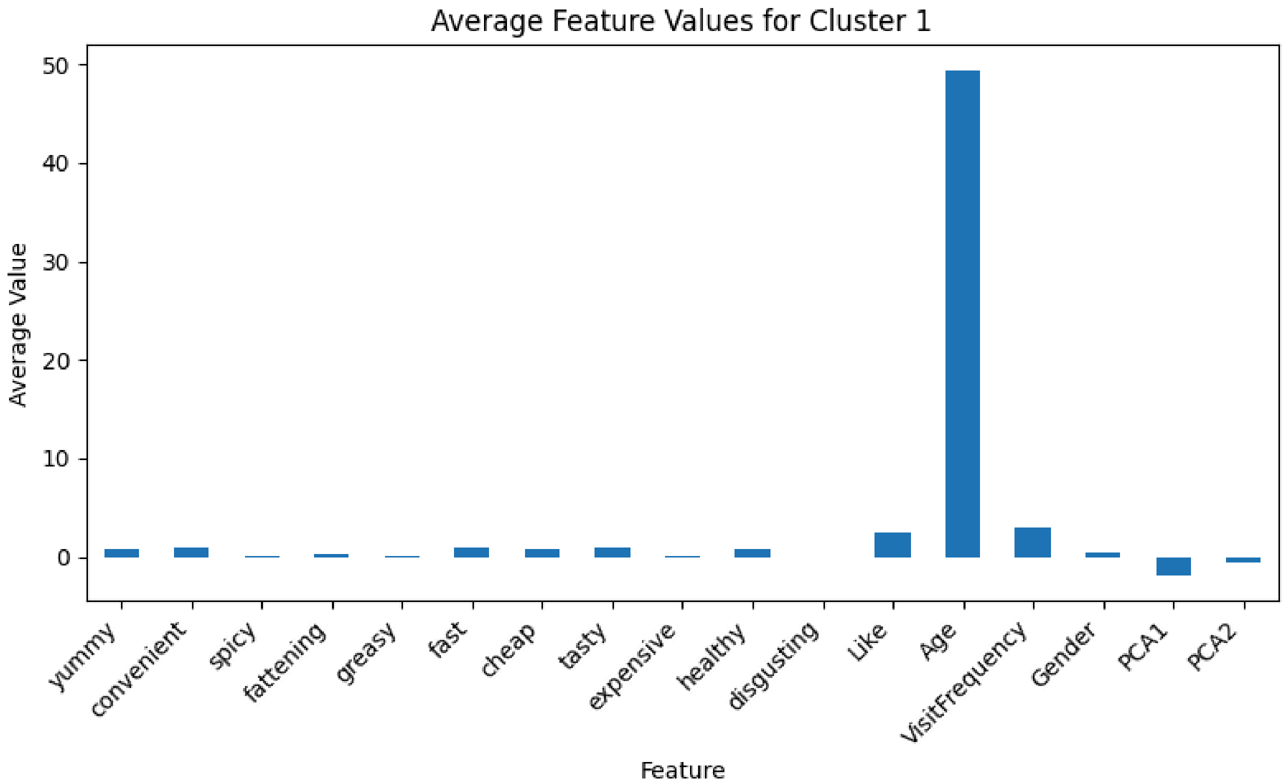
```
Segment Means:
             yummy  convenient     spicy  fattening    greasy      fast  \
Cluster
0        0.074380    0.000000  0.074380   0.859504  0.735537  0.636364
1        0.840336    0.970588  0.130252   0.352941  0.046218  0.928571
2        0.941272    0.990212  0.076672   0.991843  0.575856  0.938010
3        0.035343    1.000000  0.101871   0.964657  0.648649  0.904366

            cheap     tasty  expensive   healthy  disgusting      Like  \
Cluster
0        0.338843  0.123967   0.644628  0.057851     0.77686 -1.980000
1        0.739496  0.920168   0.189076  0.789916     0.02521  2.413408
2        0.619902  0.957586   0.355628  0.106036     0.08646  2.250474
3        0.567568  0.239085   0.372141  0.060291     0.41580 -0.858209

               Age  VisitFrequency    Gender      PCA1      PCA2
Cluster
0        48.504132        0.942149  0.545455  3.045976  0.202149
1        49.407563        2.987395  0.432773 -1.870572 -0.480294
2        38.181077        2.941272  0.432300 -0.961170  0.685318
3        49.434511        1.735967  0.480249  1.384262 -0.686590
```

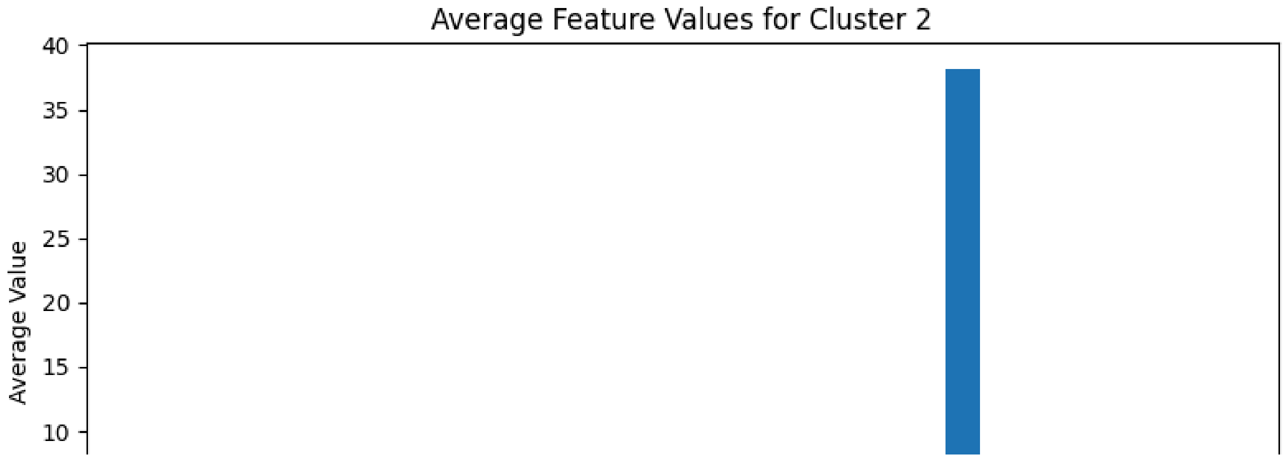
```
segment_means_t = segment_means.transpose()
segment_means_t.plot(kind='bar', figsize=(10, 6))
plt.title('Average Feature Values by Perceptual Segment')
plt.ylabel('Average Value')
plt.xlabel('Feature')
plt.xticks(rotation=45, ha='right')
plt.legend(title='Segment')
plt.tight_layout()
plt.show()
```

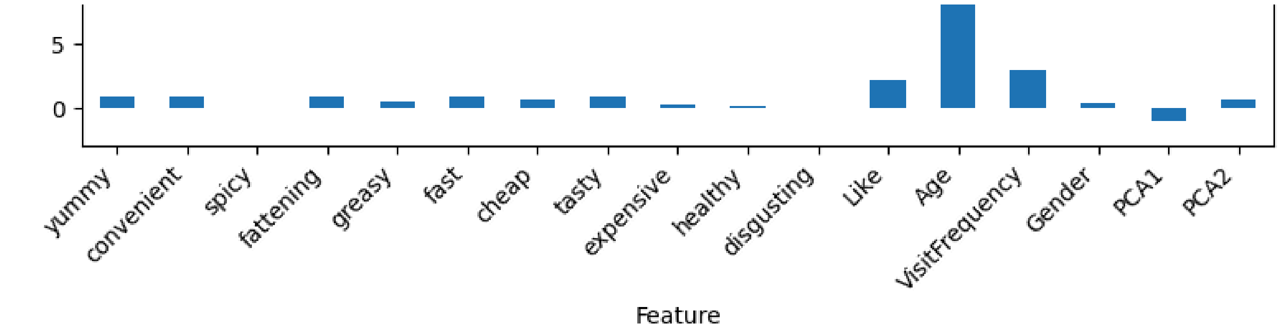


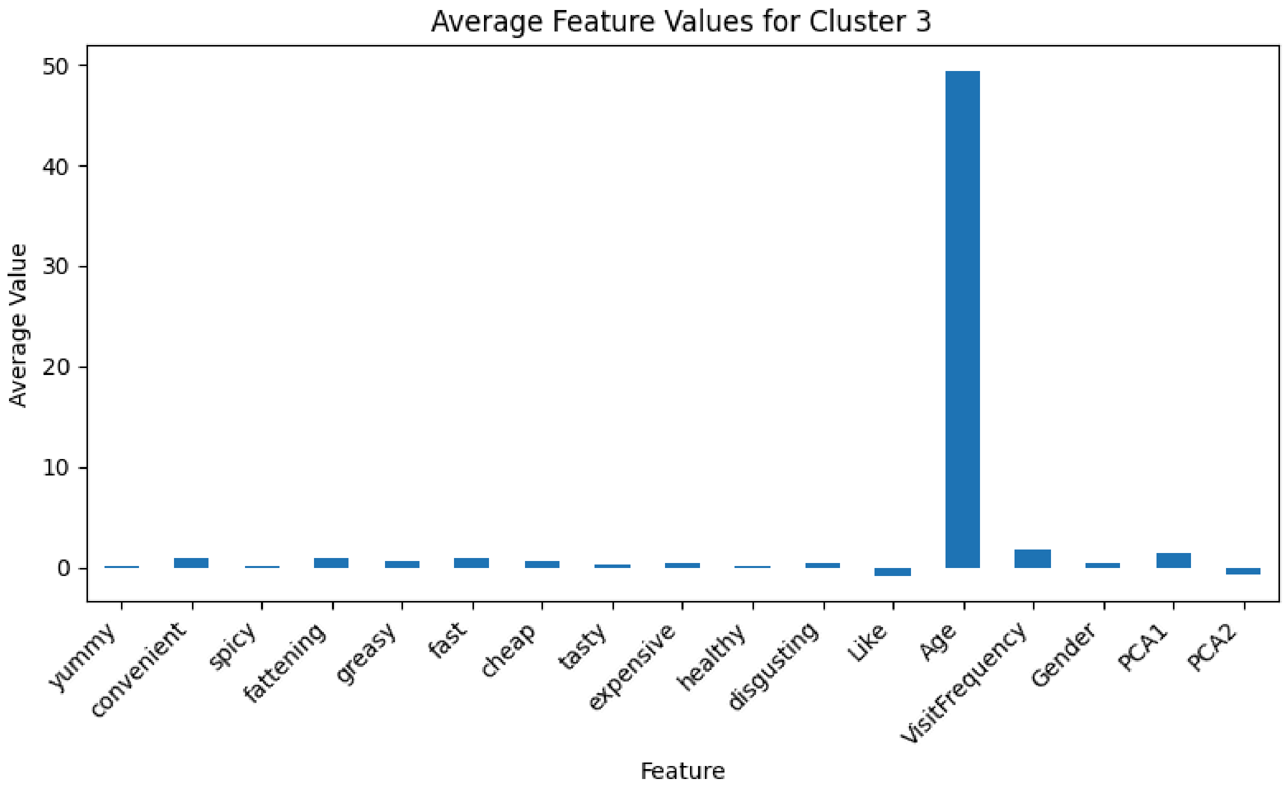

```
for cluster in segment_means.index:
    cluster_data = segment_means.loc[cluster]
    # A bar chart for the current cluster
    plt.figure()
    cluster_data.plot(kind='bar', figsize=(8, 5))
    plt.title(f'Average Feature Values for Cluster {cluster}')
    plt.ylabel('Average Value')
    plt.xlabel('Feature')
    plt.xticks(rotation=45, ha='right')
    plt.tight_layout()
    plt.show()
```


Average Feature Values for Cluster 0
Average Value
Feature
yummy
convenient
spicy
fattening
greasy
fast
cheap
tasty
expensive
healthy
disgusting
Like
Age
VisitFrequency
Gender
PCA1
PCA2


Average Feature Values for Cluster 1
Average Value
Feature
yummy
convenient
spicy
fattening
greasy
fast
cheap
tasty
expensive
healthy
disgusting
Like
Age
VisitFrequency
Gender
PCA1
PCA2

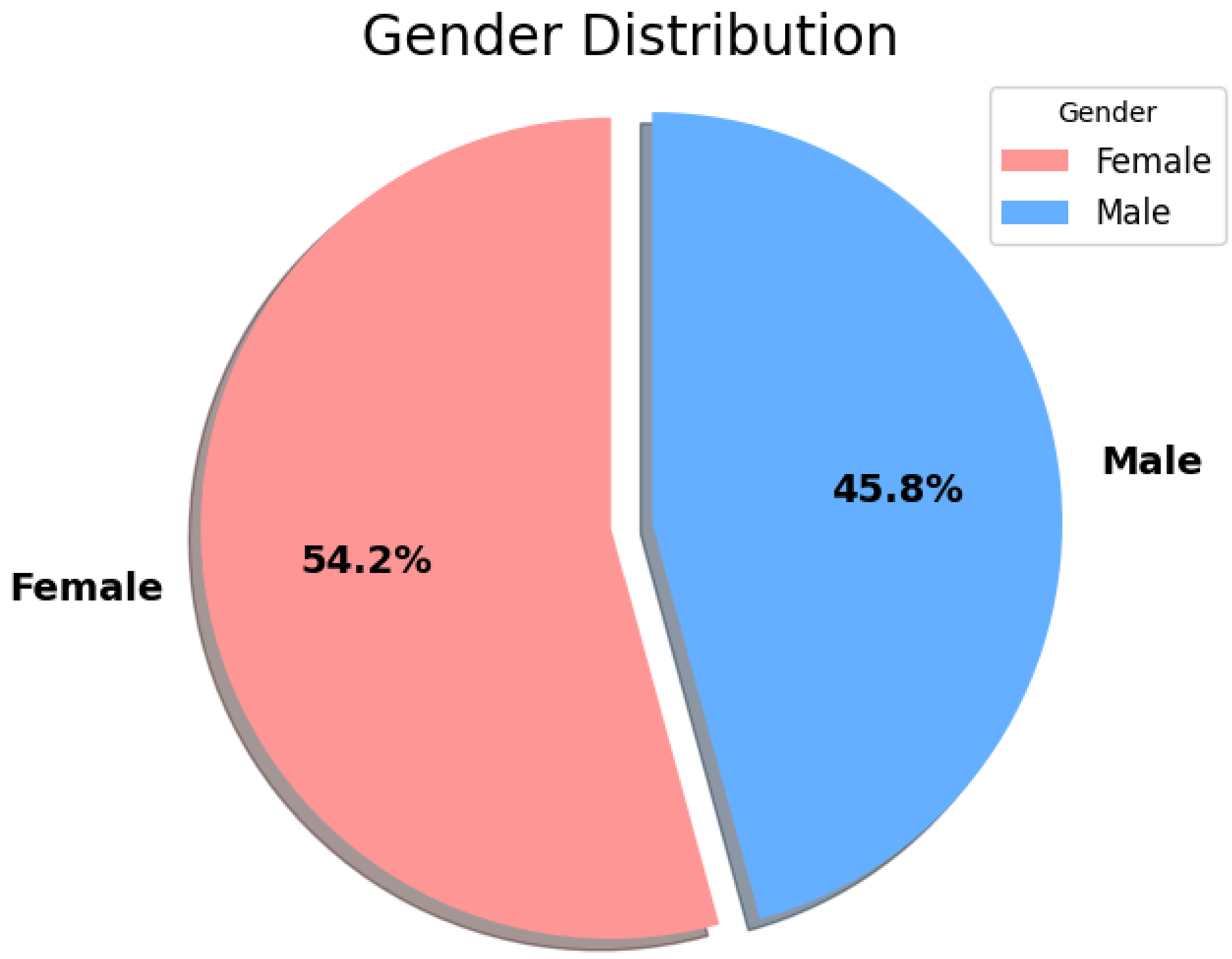

Average Feature Values for Cluster 2
Average Value





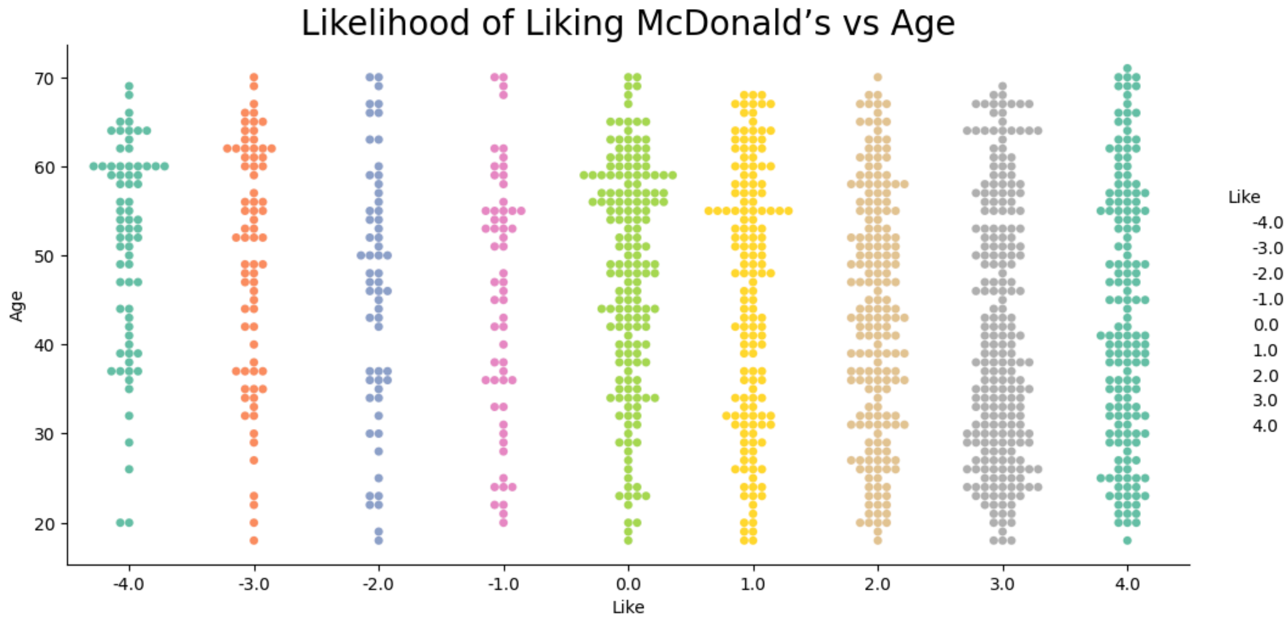

```
labels = ['Female', 'Male']
size = data['Gender'].value_counts()
colors = ['#ff9999','#66b3ff']
explode = [0, 0.1]
```

```
plt.figure(figsize=(8, 6))
plt.pie(size, colors=colors, explode=explode, labels=labels,
        shadow=True, autopct='%1.1f%%', startangle=90,
        textprops={'fontsize': 14, 'weight': 'bold'})
plt.title('Gender Distribution', fontsize=20)
plt.axis('equal')
plt.legend(title='Gender', loc='upper right', fontsize=12)
plt.show()
```



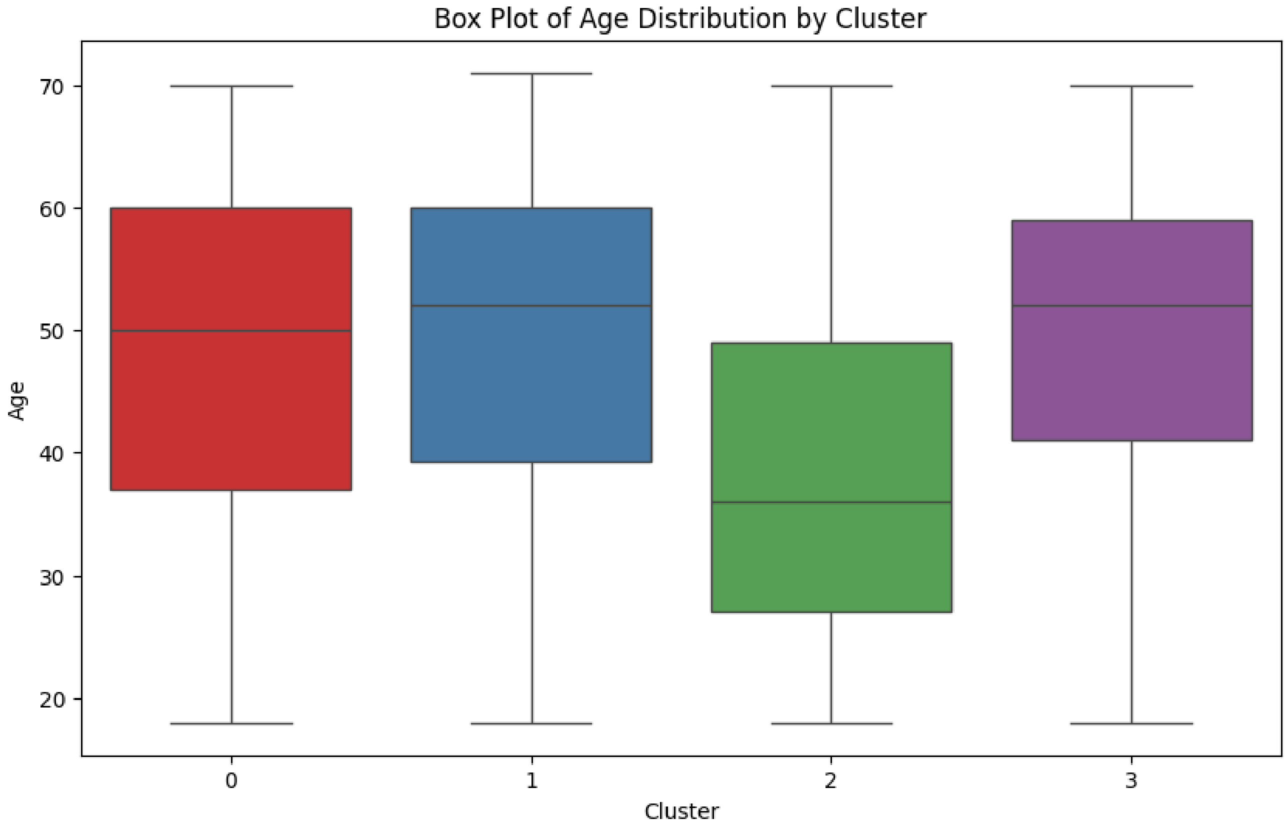

```
sns.catplot(data=data, x="Like", y="Age", orient="v", height=5, aspect=2, palette="Set2",
plt.title('Likelihood of Liking McDonald’s vs Age', fontsize=20)
plt.xlabel('Like')
plt.ylabel('Age')
plt.show()
```

```
<ipython-input-43-2536c07e6668>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.

  sns.catplot(data=data, x="Like", y="Age", orient="v", height=5, aspect=2, palette="
```




```
plt.figure(figsize=(10, 6))
sns.boxplot(x='Cluster', y='Age', data=data, palette='Set1')
plt.title('Box Plot of Age Distribution by Cluster')
plt.xlabel('Cluster')
plt.ylabel('Age')
plt.show()
```

```
<ipython-input-44-144ae284e3e5>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.

  sns.boxplot(x='Cluster', y='Age', data=data, palette='Set1')
```



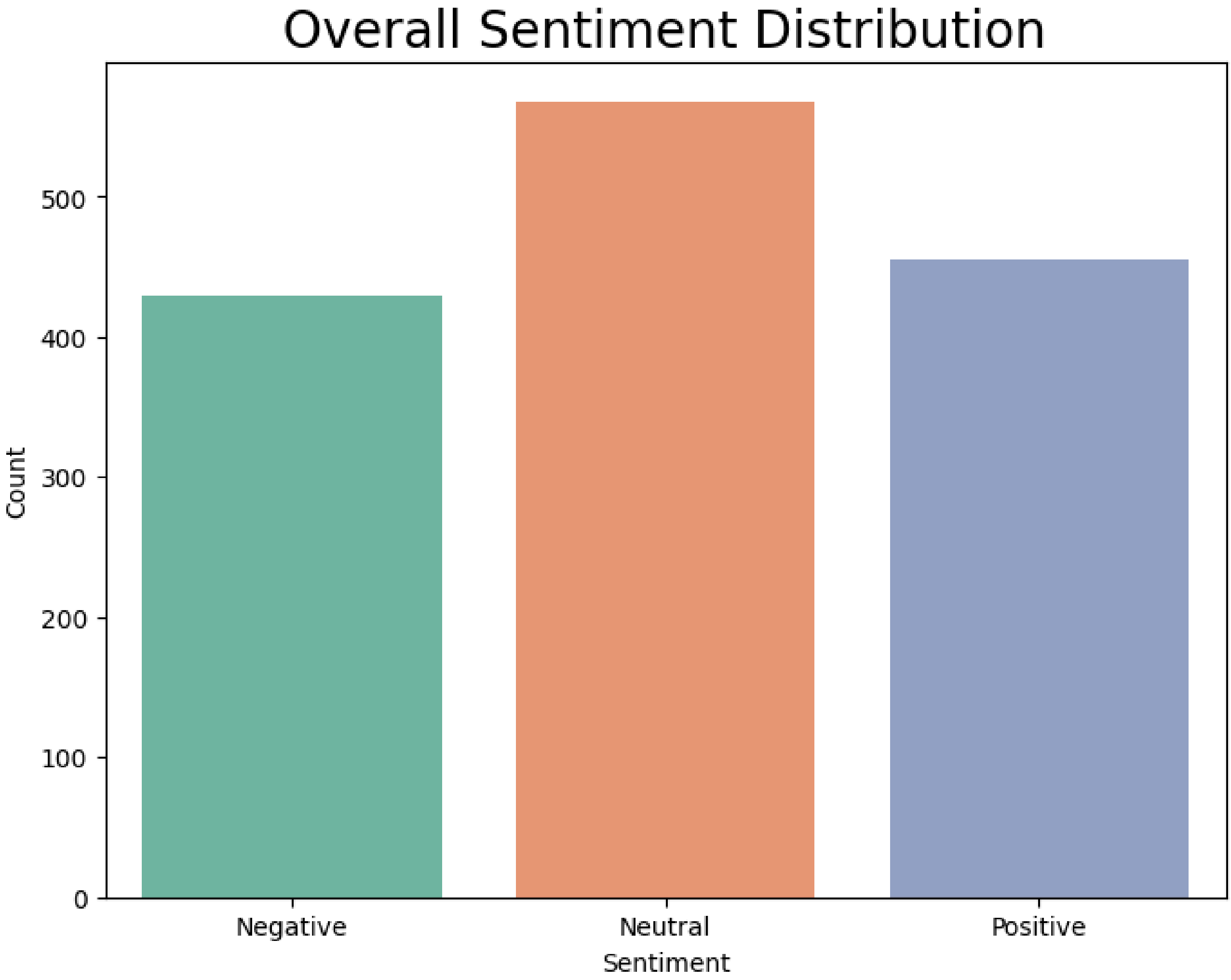
Categorize sentiment based on the "Like" column

```
def categorize_sentiment(like_score):
    if like_score <= 0:
        return 'Negative'
    elif 1 <= like_score <= 3:
        return 'Neutral'
    else:
        return 'Positive'

data['Sentiment'] = data['Like'].apply(categorize_sentiment)
```

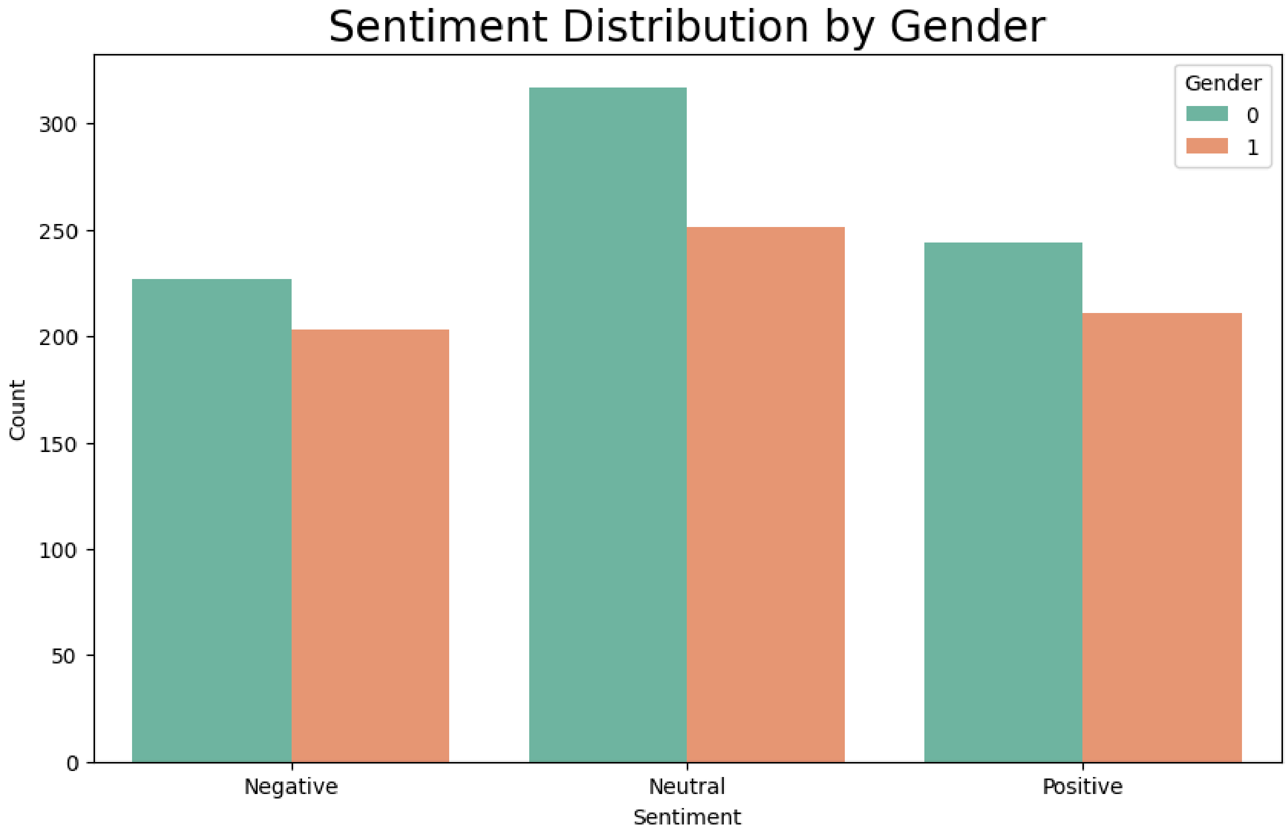
Overall sentiment distribution

```
plt.figure(figsize=(8, 6))
sns.countplot(x='Sentiment', data=data, palette='Set2')
plt.title('Overall Sentiment Distribution', fontsize=20)
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.show()
```

```
<ipython-input-47-9eed0a076eab>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.

  sns.countplot(x='Sentiment', data=data, palette='Set2')
```

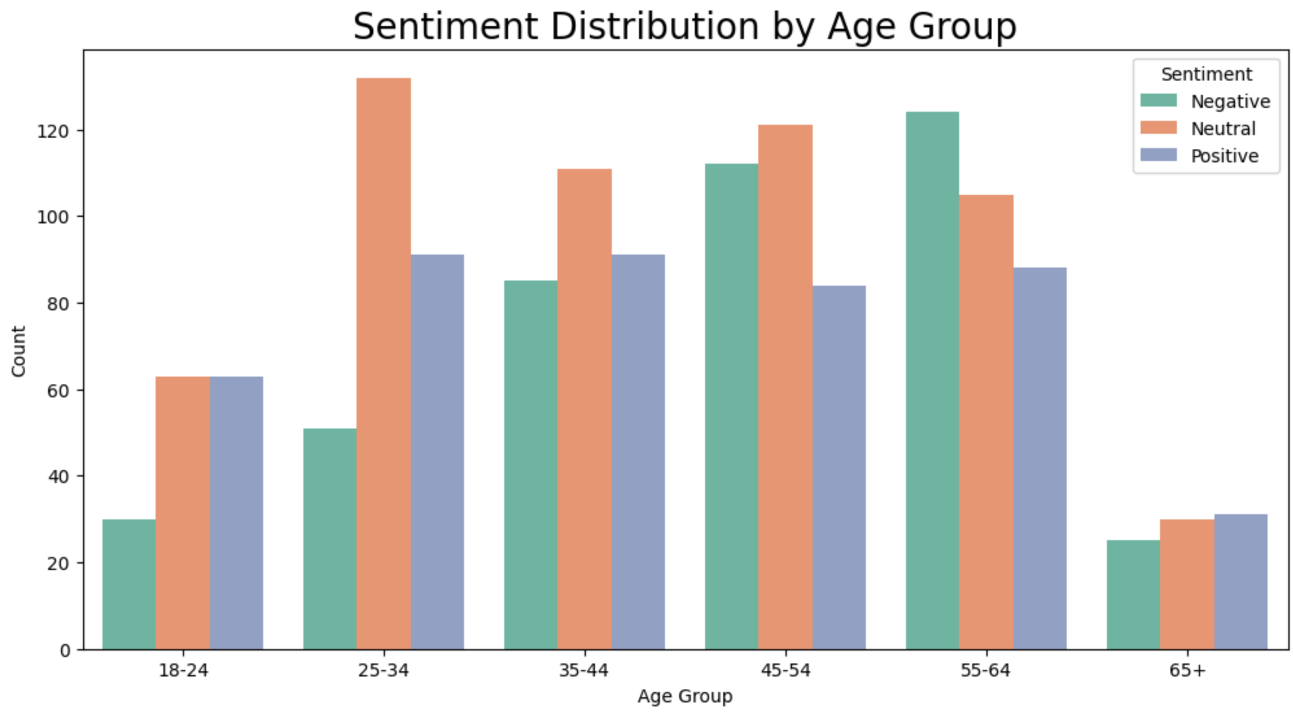



```
plt.figure(figsize=(10, 6))
sns.countplot(x='Sentiment', hue='Gender', data=data, palette='Set2')
plt.title('Sentiment Distribution by Gender', fontsize=20)
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.legend(title='Gender')
plt.show()
```




```
age_bins = [18, 25, 35, 45, 55, 65, 75]
age_labels = ['18-24', '25-34', '35-44', '45-54', '55-64', '65+']
data['AgeGroup'] = pd.cut(data['Age'], bins=age_bins, labels=age_labels)
```

```
plt.figure(figsize=(12, 6))
sns.countplot(x='AgeGroup', hue='Sentiment', data=data, palette='Set2')
plt.title('Sentiment Distribution by Age Group', fontsize=20)
plt.xlabel('Age Group')
plt.ylabel('Count')
plt.legend(title='Sentiment')
plt.show()
```




```
plt.figure(figsize=(12, 6))
sns.countplot(x='VisitFrequency', hue='Sentiment', data=data, palette='Set2')
plt.title('Sentiment Distribution by Visit Frequency', fontsize=20)
plt.xlabel('Visit Frequency')
plt.ylabel('Count')
plt.legend(title='Sentiment')
plt.show()
```