In [1]:
```
import matplotlib.pyplot as plt
plt.style.use('seaborn')
```

In [2]:
```
import pandas as pd
PRIMARY = 'Category Name'
SECONDARY = 'Order Region'

df = pd.read_csv(
    'DataCoSupplyChainDataset.csv',
    usecols = [PRIMARY, SECONDARY],
    encoding = 'unicode_escape'
).apply(lambda col: col.str.strip())
df.head()
```

Out[2]:

| | Category Name | Order Region |
|---|---|---|
| **0** | Sporting Goods | Southeast Asia |
| **1** | Sporting Goods | South Asia |
| **2** | Sporting Goods | South Asia |
| **3** | Sporting Goods | Oceania |
| **4** | Sporting Goods | Oceania |

# Check & remove null + duplicate values

In [3]:
```
df.isnull().sum().sort_values(ascending=False)
```

Out[3]:
```
Category Name    0
Order Region     0
dtype: int64
```

In [4]:
```
df.drop_duplicates(inplace=True)
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 691 entries, 0 to 162002
Data columns (total 2 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   Category Name  691 non-null    object
 1   Order Region   691 non-null    object
dtypes: object(2)
memory usage: 16.2+ KB
```

# Convert DataFrame to Graphs

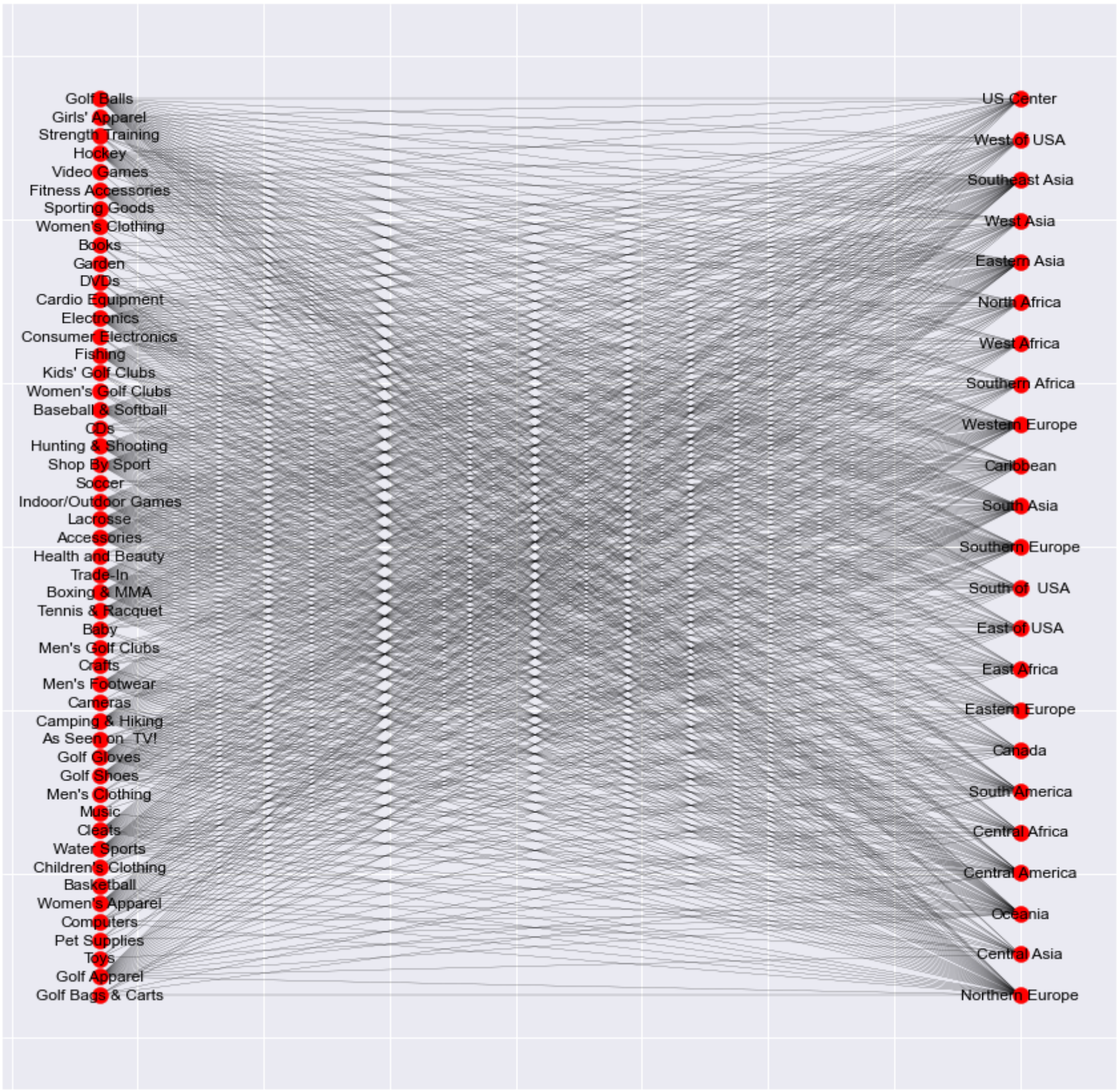
In [5]:
```
primary_col, secondary_col = df[PRIMARY], df[SECONDARY]
print(f'Number of {PRIMARY}:', primary_col.nunique())
print(f'Number of {SECONDARY}:', secondary_col.nunique())
print('Number of edges:', len(df))
```

```
Number of Category Name: 50
Number of Order Region: 23
Number of edges: 691
```

## 1. Bipartite Graph

In [6]:
```
import networkx as nx
from networkx.algorithms import bipartite

B = nx.Graph()
for index, row in df.iterrows():
    B.add_edge(row[PRIMARY], row[SECONDARY], weight=1)

B.add_nodes_from(primary_col, bipartite=0)
B.add_nodes_from(secondary_col, bipartite=1)
```

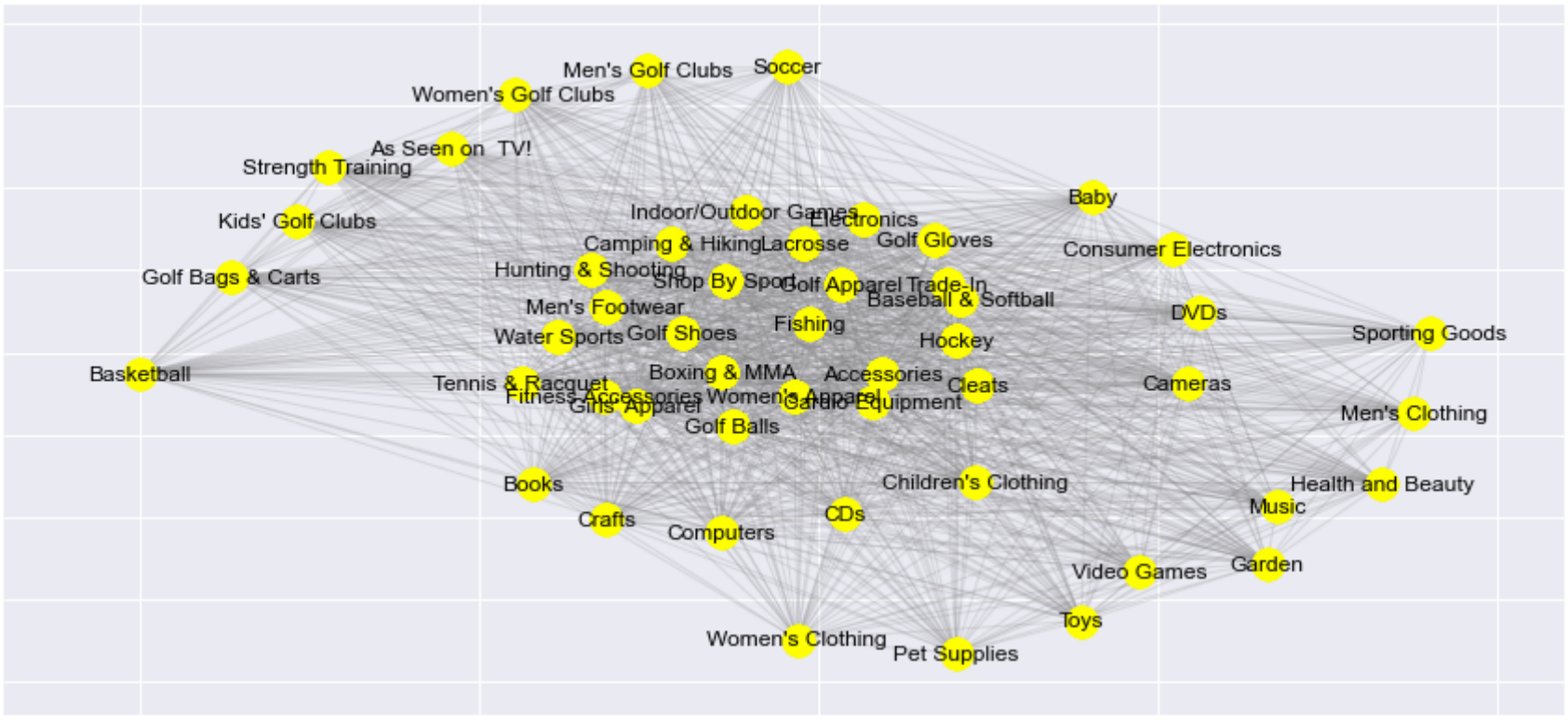
In [7]:
```
import matplotlib.pyplot as plt
plt.figure(figsize=(15, 15))
pos = nx.drawing.layout.bipartite_layout(B, primary_col)
nx.draw_networkx(B, pos=pos, node_size=150, width=0.2, node_color='red')
```




## 2. Weighted Projected Graph

In [8]:
```
G = bipartite.weighted_projected_graph(B, primary_col)
node_labels = dict(zip(primary_col, primary_col))
```

In [9]:
```
plt.figure(figsize=(15, 7))
pos = nx.spring_layout(G)
nx.draw_networkx_nodes(G, pos, nodelist=primary_col, node_color='yellow')
nx.draw_networkx_edges(G, pos, edge_color='grey', alpha=0.2)
nx.draw_networkx_labels(G, pos, labels=node_labels)
plt.show()
```



# Community Detection

In [10]:
```
df_groupby_category = df.groupby([SECONDARY])[PRIMARY].apply(lambda x: sorted(set(x)))
df_groupby_category = df_groupby_category.reset_index()
# print(df_groupby_category.iloc[14][1])
df_groupby_category.head()
```

Out[10]:

| | Order Region | Category Name |
|---|---|---|
| **0** | Canada | [Accessories, Baseball & Softball, Boxing & MM... |
| **1** | Caribbean | [Accessories, As Seen on TV!, Baseball & Soft... |
| **2** | Central Africa | [Accessories, Baseball & Softball, Boxing & MM... |
| **3** | Central America | [Accessories, As Seen on TV!, Baseball & Soft... |
| **4** | Central Asia | [Accessories, Boxing & MMA, Camping & Hiking, ... |

In [11]:
```
def get_cluster_common_values(cluster):
    commons = []
    for index, row in df_groupby_category.iterrows():
        if set(cluster).issubset(row[PRIMARY]):
            commons.append(row[SECONDARY])
    return commons
```

In [12]:
```
def print_communities(node_groups):
    print('Number of communities:', len(node_groups))
    for index, cluster in enumerate(node_groups):
        cluster = sorted(cluster)
        common_values = sorted(get_cluster_common_values(cluster))

        print(f'\nCluster {index}:')
        print(f"- {len(cluster)} Nodes: {', '.join(cluster)}")
        print(f"- {len(common_values)} Common values: {', '.join(common_values)}")
```

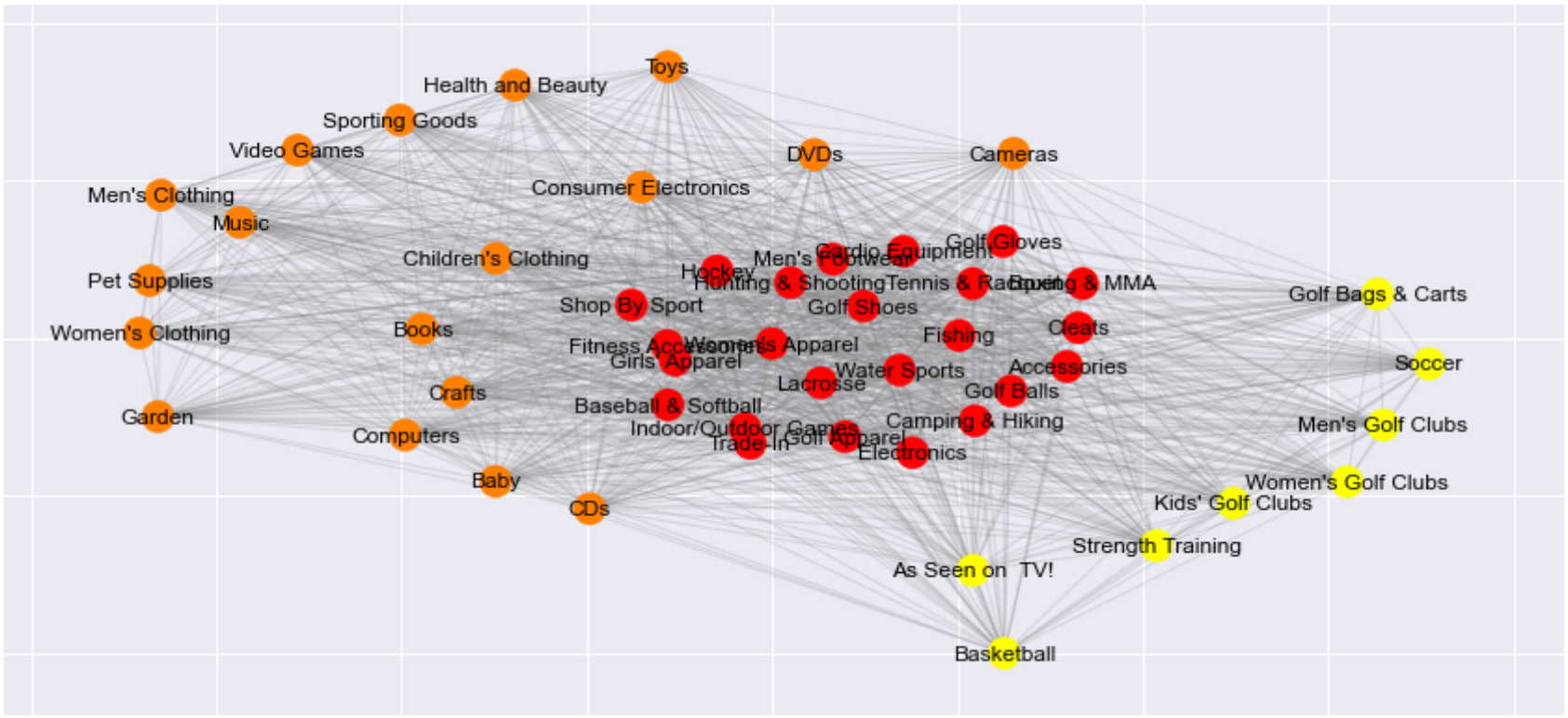
In [13]:
```
import matplotlib.cm as cm
def plot_communities(nodes, labels):
    cmap = cm.get_cmap('autumn', max(labels) + 1)
    pos = nx.spring_layout(G)

    plt.figure(figsize=(15, 7))
    nx.draw_networkx_nodes(G, pos, nodes, cmap=cmap, node_color=labels)
    nx.draw_networkx_edges(G, pos, edge_color='grey', alpha=0.2)
    nx.draw_networkx_labels(G, pos)
    plt.show()
```

## 1. Louvain Algorithm

In [14]:
```
import community.community_louvain as community_louvain
partition = community_louvain.best_partition(G)
louvain_node_groups = [[] for _ in set(partition.values())]

for node, cluster in sorted(partition.items()):
    louvain_node_groups[cluster].append(node)
```

In [15]:
```
print_communities(louvain_node_groups)
plot_communities(partition.keys(), list(partition.values()))
```

```
Number of communities: 3

Cluster 0:
- 24 Nodes: Accessories, Baseball & Softball, Boxing & MMA, Camping & Hiking, Cardio Equipment, Cleats, Electronics, Fishing, Fitn
ess Accessories, Girls' Apparel, Golf Apparel, Golf Balls, Golf Gloves, Golf Shoes, Hockey, Hunting & Shooting, Indoor/Outdoor Gam
es, Lacrosse, Men's Footwear, Shop By Sport, Tennis & Racquet, Trade-In, Water Sports, Women's Apparel
- 22 Common values: Canada, Caribbean, Central Africa, Central America, East Africa, East of USA, Eastern Asia, Eastern Europe, No
rth Africa, Northern Europe, Oceania, South America, South Asia, South of  USA, Southeast Asia, Southern Africa, Southern Europe,
US Center, West Africa, West Asia, West of USA, Western Europe

Cluster 1:
- 18 Nodes: Baby, Books, CDs, Cameras, Children's Clothing, Computers, Consumer Electronics, Crafts, DVDs, Garden, Health and Beau
ty, Men's Clothing, Music, Pet Supplies, Sporting Goods, Toys, Video Games, Women's Clothing
- 3 Common values: Oceania, South Asia, Southeast Asia

Cluster 2:
- 8 Nodes: As Seen on  TV!, Basketball, Golf Bags & Carts, Kids' Golf Clubs, Men's Golf Clubs, Soccer, Strength Training, Women's
Golf Clubs
- 3 Common values: Northern Europe, Southern Europe, Western Europe
```



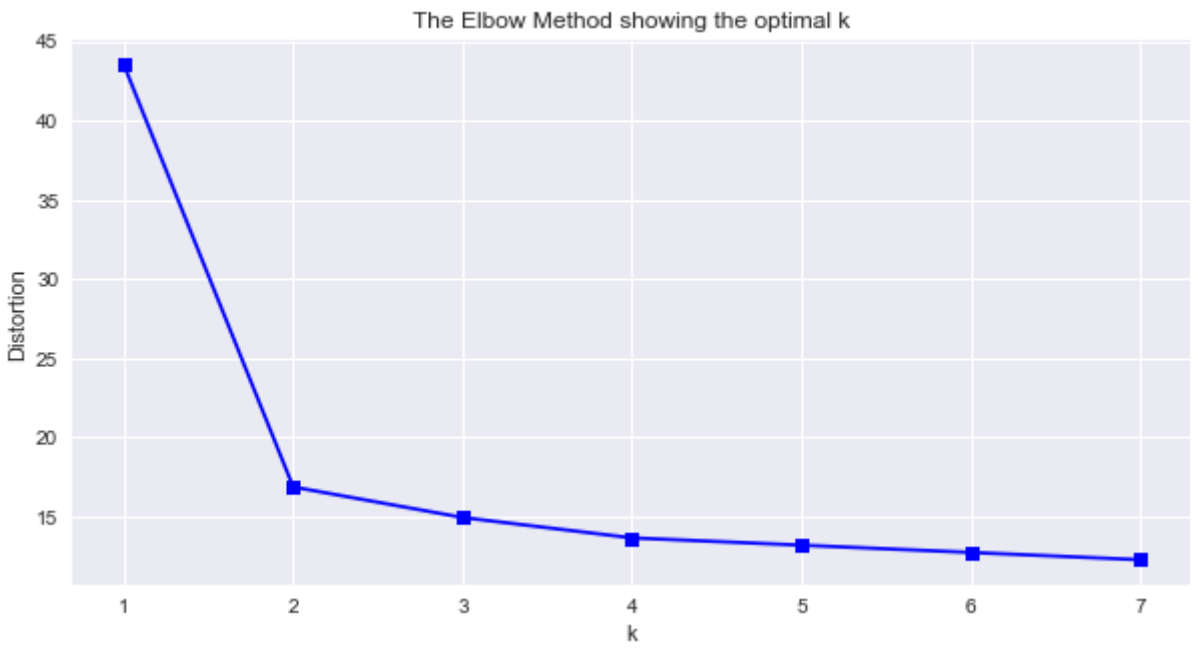

## 2. K-Means Algorithm

In [16]:
```
from sklearn.cluster import KMeans
from scipy.spatial.distance import cdist
adj_matrix = nx.to_numpy_array(G)
adj_matrix
```

Out[16]:
```
array([[ 0.,  4.,  4., ...,  4.,  4.,  4.],
       [ 4.,  0., 23., ...,  4., 23., 23.],
       [ 4., 23.,  0., ...,  4., 23., 23.],
       ...,
       [ 4.,  4.,  4., ...,  0.,  4.,  4.],
       [ 4., 23., 23., ...,  4.,  0., 23.],
       [ 4., 23., 23., ...,  4., 23.,  0.]])
```

In [17]:
```
import numpy as np
distortions = []
K = range(1, 8)

for k in K:
    kmean_model = KMeans(n_clusters=k)
    kmean_model.fit(adj_matrix)
    dist = sum(np.min(cdist(adj_matrix, kmean_model.cluster_centers_, 'euclidean'), axis=1))
    distortions.append(dist / adj_matrix.shape[0])
```

In [18]:
```
plt.figure(figsize=(10, 5))
plt.plot(K, distortions, 'bs-')
plt.xlabel('k')
plt.ylabel('Distortion')
plt.title('The Elbow Method showing the optimal k')
plt.show()
```

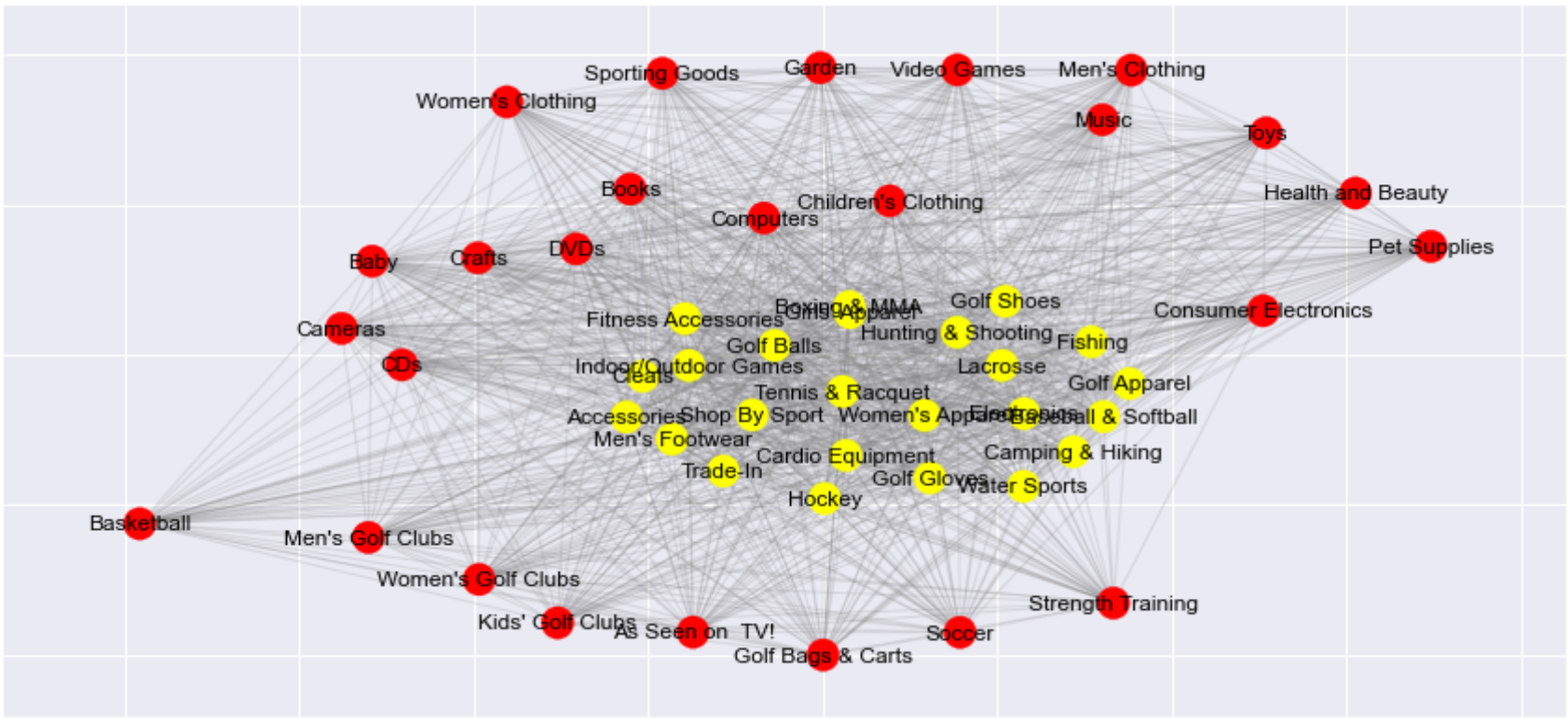



In [19]:
```
kmeans = KMeans(n_clusters=2)
kmeans.fit(adj_matrix)

kmeans_node_groups = [[] for _ in range(kmeans.n_clusters)]
for node, cluster in zip(G.nodes(), kmeans.labels_):
    kmeans_node_groups[cluster].append(node)
```

In [20]:
```
print_communities(kmeans_node_groups)
```

```
plot_communities(G.nodes(), kmeans.labels_)
```

```
Number of communities: 2

Cluster 0:
- 26 Nodes: As Seen on  TV!, Baby, Basketball, Books, CDs, Cameras, Children's Clothing, Computers, Consumer Electronics, Crafts,
DVDs, Garden, Golf Bags & Carts, Health and Beauty, Kids' Golf Clubs, Men's Clothing, Men's Golf Clubs, Music, Pet Supplies, Socce
r, Sporting Goods, Strength Training, Toys, Video Games, Women's Clothing, Women's Golf Clubs
- 0 Common values:

Cluster 1:
- 24 Nodes: Accessories, Baseball & Softball, Boxing & MMA, Camping & Hiking, Cardio Equipment, Cleats, Electronics, Fishing, Fitn
ess Accessories, Girls' Apparel, Golf Apparel, Golf Balls, Golf Gloves, Golf Shoes, Hockey, Hunting & Shooting, Indoor/Outdoor Gam
es, Lacrosse, Men's Footwear, Shop By Sport, Tennis & Racquet, Trade-In, Water Sports, Women's Apparel
- 22 Common values: Canada, Caribbean, Central Africa, Central America, East Africa, East of USA, Eastern Asia, Eastern Europe, No
rth Africa, Northern Europe, Oceania, South America, South Asia, South of  USA, Southeast Asia, Southern Africa, Southern Europe,
US Center, West Africa, West Asia, West of USA, Western Europe
```

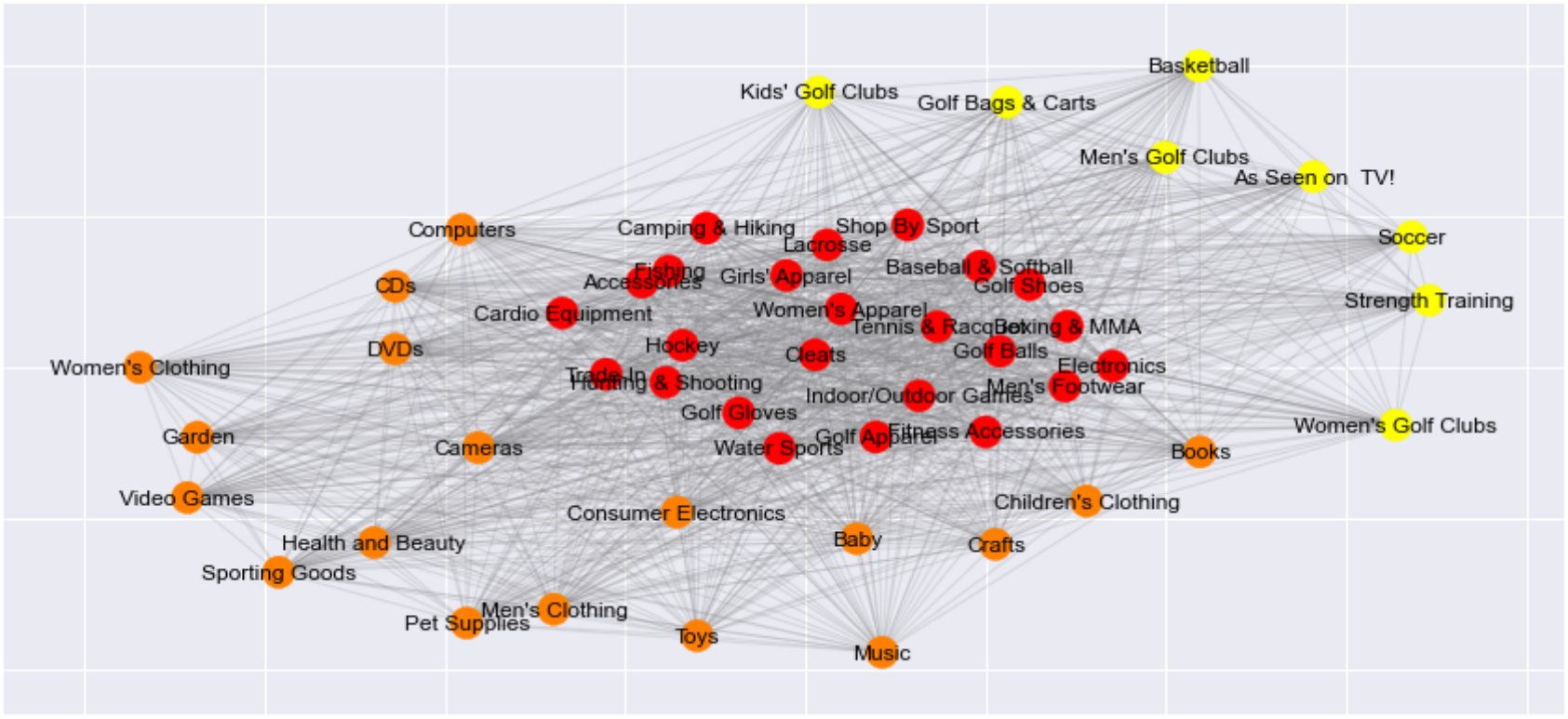



## 3. Gaussian Mixture Model

In [42]:
```
from sklearn.mixture import GaussianMixture
n_clusters = 3
gmm = GaussianMixture(n_components=n_clusters)
gmm.fit(adj_matrix)

labels = gmm.predict(adj_matrix)
gmm_node_groups = [[] for _ in range(n_clusters)]
for node, cluster in zip(G.nodes(), labels):
    gmm_node_groups[cluster].append(node)
```

In [43]:
```
print_communities(gmm_node_groups)
plot_communities(G.nodes(), labels)
```

```
Number of communities: 3
Cluster 0:
- 24 Nodes: Accessories, Baseball & Softball, Boxing & MMA, Camping & Hiking, Cardio Equipment, Cleats, Electronics, Fishing, Fitn
ess Accessories, Girls' Apparel, Golf Apparel, Golf Balls, Golf Gloves, Golf Shoes, Hockey, Hunting & Shooting, Indoor/Outdoor Gam
es, Lacrosse, Men's Footwear, Shop By Sport, Tennis & Racquet, Trade-In, Water Sports, Women's Apparel
- 22 Common values: Canada, Caribbean, Central Africa, Central America, East Africa, East of USA, Eastern Asia, Eastern Europe, No
rth Africa, Northern Europe, Oceania, South America, South Asia, South of  USA, Southeast Asia, Southern Africa, Southern Europe,
US Center, West Africa, West Asia, West of USA, Western Europe

Cluster 1:
- 18 Nodes: Baby, Books, CDs, Cameras, Children's Clothing, Computers, Consumer Electronics, Crafts, DVDs, Garden, Health and Beau
ty, Men's Clothing, Music, Pet Supplies, Sporting Goods, Toys, Video Games, Women's Clothing
- 3 Common values: Oceania, South Asia, Southeast Asia

Cluster 2:
- 8 Nodes: As Seen on  TV!, Basketball, Golf Bags & Carts, Kids' Golf Clubs, Men's Golf Clubs, Soccer, Strength Training, Women's
Golf Clubs
- 3 Common values: Northern Europe, Southern Europe, Western Europe
```



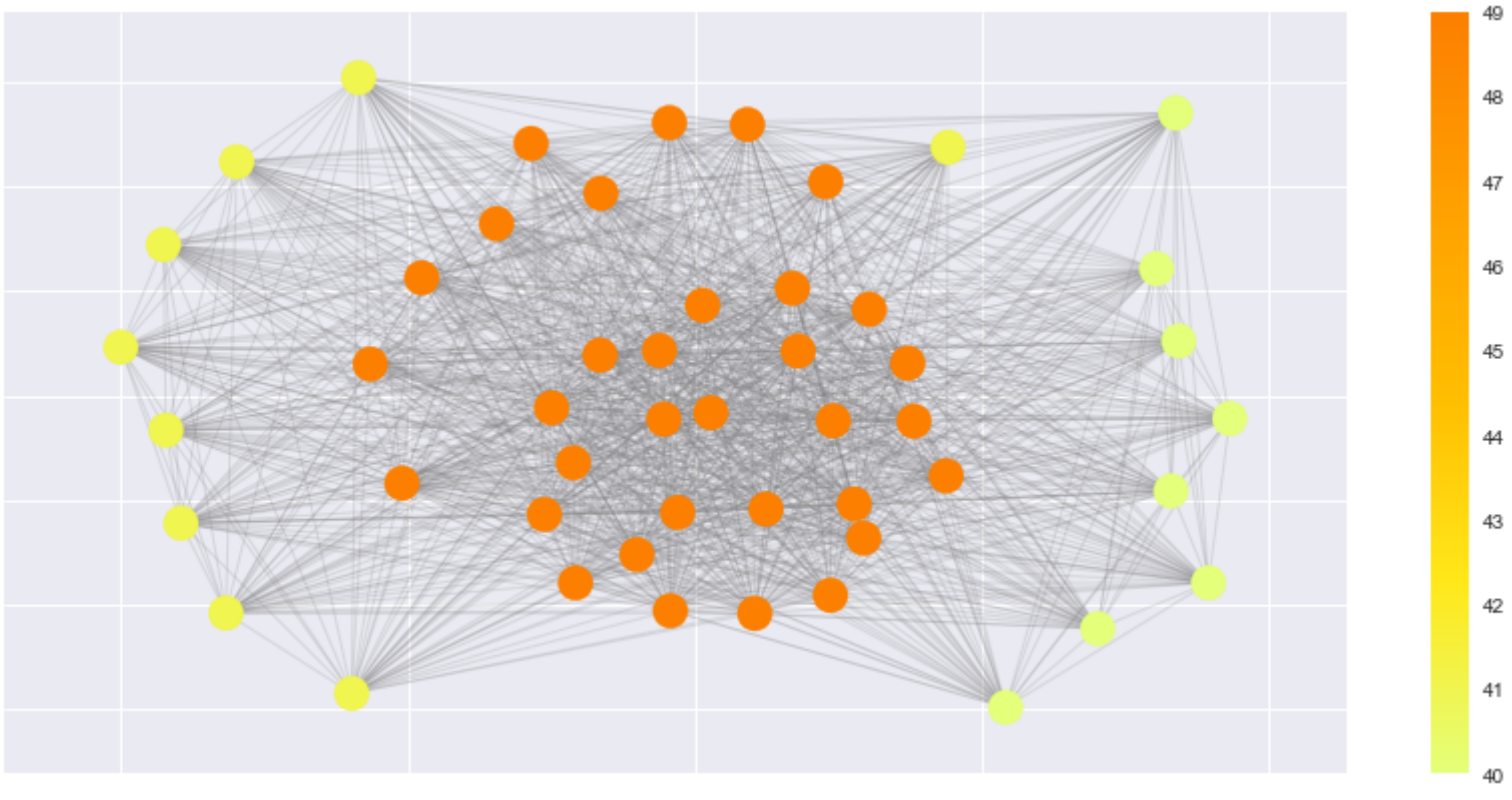

# Network Centrality

In [44]:
```
def print_centrality(centrality, name):
    result = pd.DataFrame(centrality.items(), columns=['Category Name', name])
    result.sort_values(name, ascending=False, inplace=True)
    print(result.to_records(index=False).tolist())
    return result
```

In [45]:
```
def plot_centrality(centrality):
    plt.figure(figsize=(15, 7))
    node_color = [centrality[i] for i in centrality.keys()]

    cmap = plt.cm.ScalarMappable(
        cmap = 'Wistia',
        norm = plt.Normalize(vmin=min(node_color), vmax=max(node_color))
    )
    cmap.set_array([])
    plt.colorbar(cmap)

    pos = nx.spring_layout(G)
    nx.draw_networkx_nodes(G, pos, node_color=node_color, cmap='Wistia')
    nx.draw_networkx_edges(G, pos, edge_color='grey', alpha=0.2)
    plt.show()
```

## Degree Centrality

In [46]:
```
degree = dict(nx.degree(G))
plot_centrality(degree)
print_centrality(degree, 'Degree Centrality').head()
```




```
[('Indoor/Outdoor Games', 49), ('Golf Balls', 49), ('Golf Shoes', 49), ('Crafts', 49), ('Golf Gloves', 49), ('Tennis & Racquet', 4
9), ('Fitness Accessories', 49), ('Cleats', 49), ("Children's Clothing", 49), ('Golf Apparel', 49), ('Lacrosse', 49), ('Baby', 4
9), ('Fishing', 49), ('Books', 49), ('DVDs', 49), ('CDs', 49), ('Accessories', 49), ("Girls' Apparel", 49), ('Hockey', 49), ('Shop
By Sport', 49), ('Computers', 49), ('Cameras', 49), ('Consumer Electronics', 49), ('Camping & Hiking', 49), ("Men's Footwear", 4
9), ('Baseball & Softball', 49), ('Hunting & Shooting', 49), ('Water Sports', 49), ('Trade-In', 49), ('Cardio Equipment', 49), ('B
oxing & MMA', 49), ('Electronics', 49), ("Women's Apparel", 49), ('Music', 41), ('Health and Beauty', 41), ('Toys', 41), ('Video G
```

```
ames', 41), ('Sporting Goods', 41), ('Pet Supplies', 41), ('Garden', 41), ("Men's Clothing", 41), ("Women's Clothing", 41), ('Stre
ngth Training', 40), ('Golf Bags & Carts', 40), ('Soccer', 40), ("Women's Golf Clubs", 40), ("Men's Golf Clubs", 40), ('Basketbal
l', 40), ("Kids' Golf Clubs", 40), ('As Seen on  TV!', 40)]
```

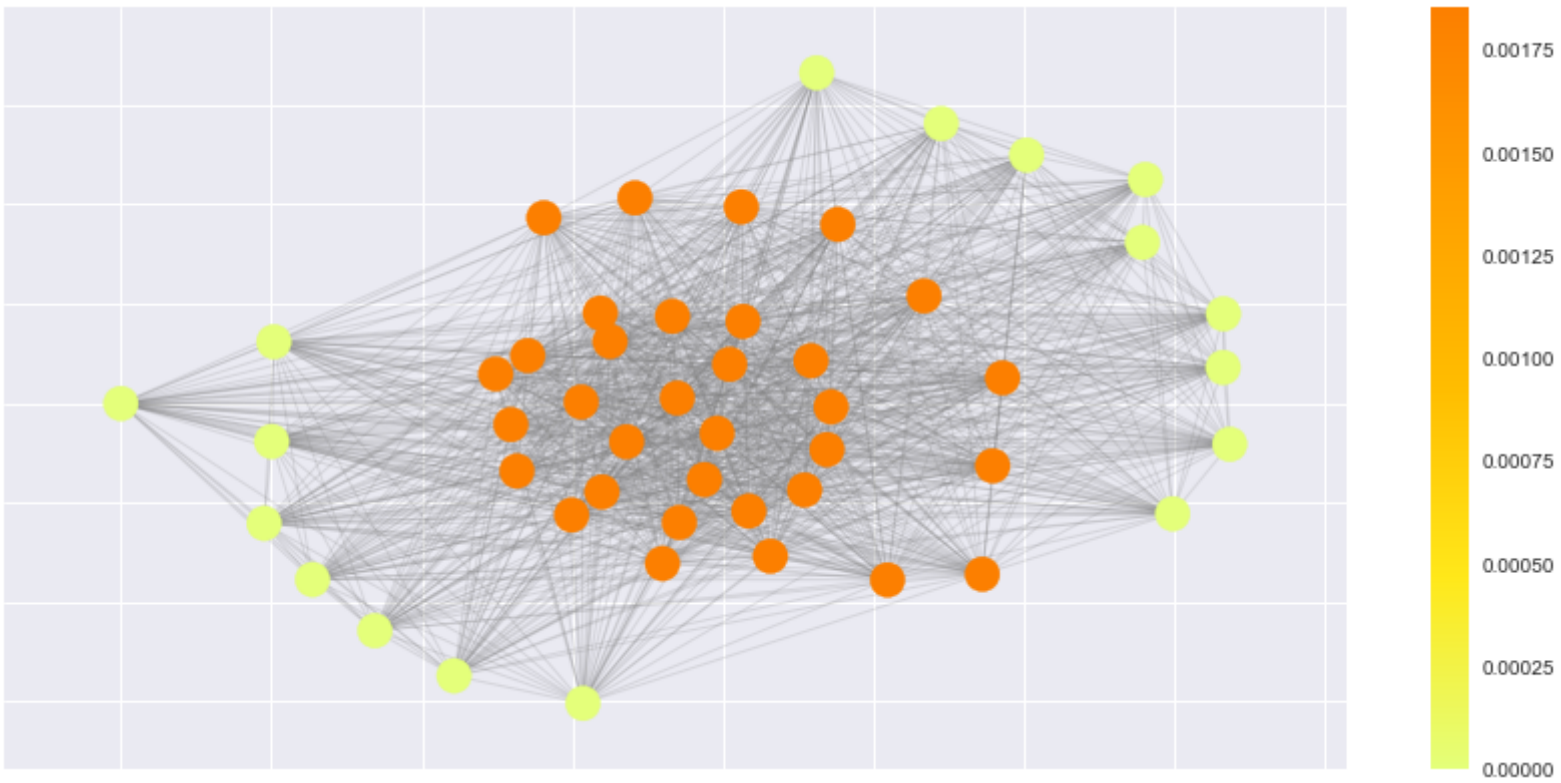
Out[46]:

| | Category Name | Degree Centrality |
|---|---|---|
| **49** | Indoor/Outdoor Games | 49 |
| **26** | Golf Balls | 49 |
| **43** | Golf Shoes | 49 |
| **21** | Crafts | 49 |
| **41** | Golf Gloves | 49 |

## Betweenness Centrality

In [47]:

```
betweenness = nx.betweenness_centrality(G)
plot_centrality(betweenness)
print_centrality(betweenness, 'Betweenness Centrality').head()
```




```
[('Indoor/Outdoor Games', 0.0018552875695732828), ("Girls' Apparel", 0.0018552875695732828), ('Golf Apparel', 0.001855287569573282
8), ('Tennis & Racquet', 0.0018552875695732828), ('Fitness Accessories', 0.0018552875695732828), ('Cleats', 0.001855287569573282
8), ('Golf Balls', 0.0018552875695732828), ('Golf Shoes', 0.0018552875695732828), ("Children's Clothing", 0.0018552875695732828),
('Lacrosse', 0.0018552875695732828), ('Baby', 0.0018552875695732828), ('Fishing', 0.0018552875695732828), ('Books', 0.001855287569
5732828), ('DVDs', 0.0018552875695732828), ('CDs', 0.0018552875695732828), ('Hockey', 0.0018552875695732828), ('Golf Gloves', 0.00
18552875695732828), ('Crafts', 0.0018552875695732828), ('Accessories', 0.0018552875695732828), ('Hunting & Shooting', 0.0018552875
695732828), ('Electronics', 0.0018552875695732828), ('Shop By Sport', 0.0018552875695732828), ("Women's Apparel", 0.00185528756957
32828), ('Computers', 0.0018552875695732828), ('Cameras', 0.0018552875695732828), ('Consumer Electronics', 0.0018552875695732828),
('Camping & Hiking', 0.0018552875695732828), ("Men's Footwear", 0.0018552875695732828), ('Baseball & Softball', 0.0018552875695732
828), ('Water Sports', 0.0018552875695732828), ('Trade-In', 0.0018552875695732828), ('Cardio Equipment', 0.0018552875695732828),
('Boxing & MMA', 0.0018552875695732828), ('Golf Bags & Carts', 0.0), ('Music', 0.0), ("Women's Golf Clubs", 0.0), ('Toys', 0.0),
("Men's Golf Clubs", 0.0), ('Video Games', 0.0), ('Sporting Goods', 0.0), ('Health and Beauty', 0.0), ('Pet Supplies', 0.0), ('Gar
den', 0.0), ('Strength Training', 0.0), ("Men's Clothing", 0.0), ("Women's Clothing", 0.0), ('Soccer', 0.0), ('Basketball', 0.0),
("Kids' Golf Clubs", 0.0), ('As Seen on  TV!', 0.0)]
```

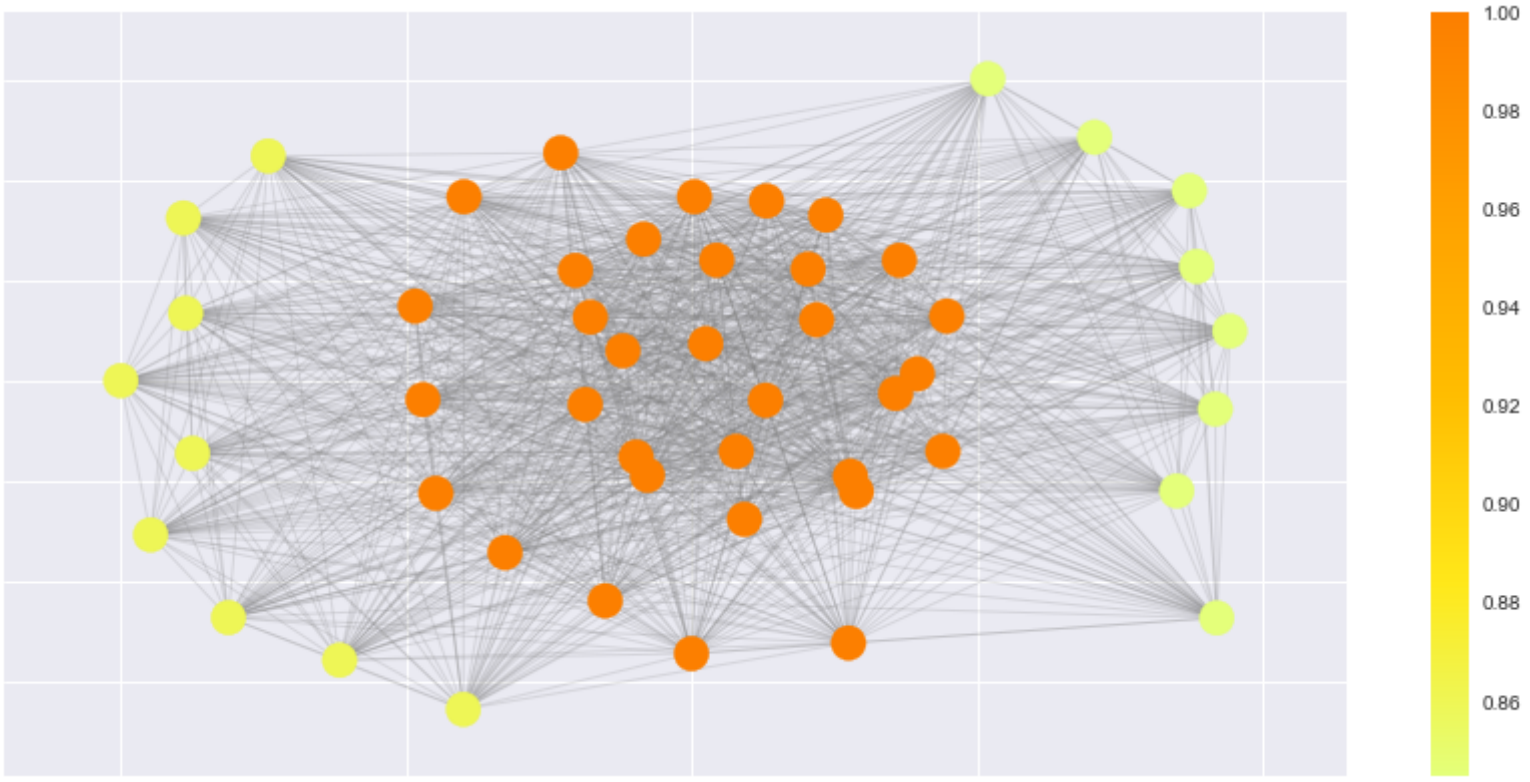
Out[47]:

| | Category Name | Betweenness Centrality |
|---|---|---|
| **49** | Indoor/Outdoor Games | 0.001855 |
| **18** | Girls' Apparel | 0.001855 |
| **44** | Golf Apparel | 0.001855 |
| **23** | Tennis & Racquet | 0.001855 |
| **24** | Fitness Accessories | 0.001855 |

## Closeness Centrality

In [48]:

```
closeness = nx.closeness_centrality(G)
plot_centrality(closeness)
print_centrality(closeness, 'Closeness Centrality').head()
```




```
[('Indoor/Outdoor Games', 1.0), ('Golf Balls', 1.0), ('Golf Shoes', 1.0), ('Crafts', 1.0), ('Golf Gloves', 1.0), ('Tennis & Racque
t', 1.0), ('Fitness Accessories', 1.0), ('Cleats', 1.0), ("Children's Clothing", 1.0), ('Golf Apparel', 1.0), ('Lacrosse', 1.0),
('Baby', 1.0), ('Fishing', 1.0), ('Books', 1.0), ('DVDs', 1.0), ('CDs', 1.0), ('Accessories', 1.0), ("Girls' Apparel", 1.0), ('Hoc
key', 1.0), ('Shop By Sport', 1.0), ('Computers', 1.0), ('Cameras', 1.0), ('Consumer Electronics', 1.0), ('Camping & Hiking', 1.
0), ("Men's Footwear", 1.0), ('Baseball & Softball', 1.0), ('Hunting & Shooting', 1.0), ('Water Sports', 1.0), ('Trade-In', 1.0),
('Cardio Equipment', 1.0), ('Boxing & MMA', 1.0), ('Electronics', 1.0), ("Women's Apparel", 1.0), ('Music', 0.8596491228070176),
('Health and Beauty', 0.8596491228070176), ('Toys', 0.8596491228070176), ('Video Games', 0.8596491228070176), ('Sporting Goods',
0.8596491228070176), ('Pet Supplies', 0.8596491228070176), ('Garden', 0.8596491228070176), ("Men's Clothing", 0.8596491228070176),
("Women's Clothing", 0.8596491228070176), ('Strength Training', 0.8448275862068966), ('Golf Bags & Carts', 0.8448275862068966),
('Soccer', 0.8448275862068966), ("Women's Golf Clubs", 0.8448275862068966), ("Men's Golf Clubs", 0.8448275862068966), ('Basketbal
l', 0.8448275862068966), ("Kids' Golf Clubs", 0.8448275862068966), ('As Seen on  TV!', 0.8448275862068966)]
```

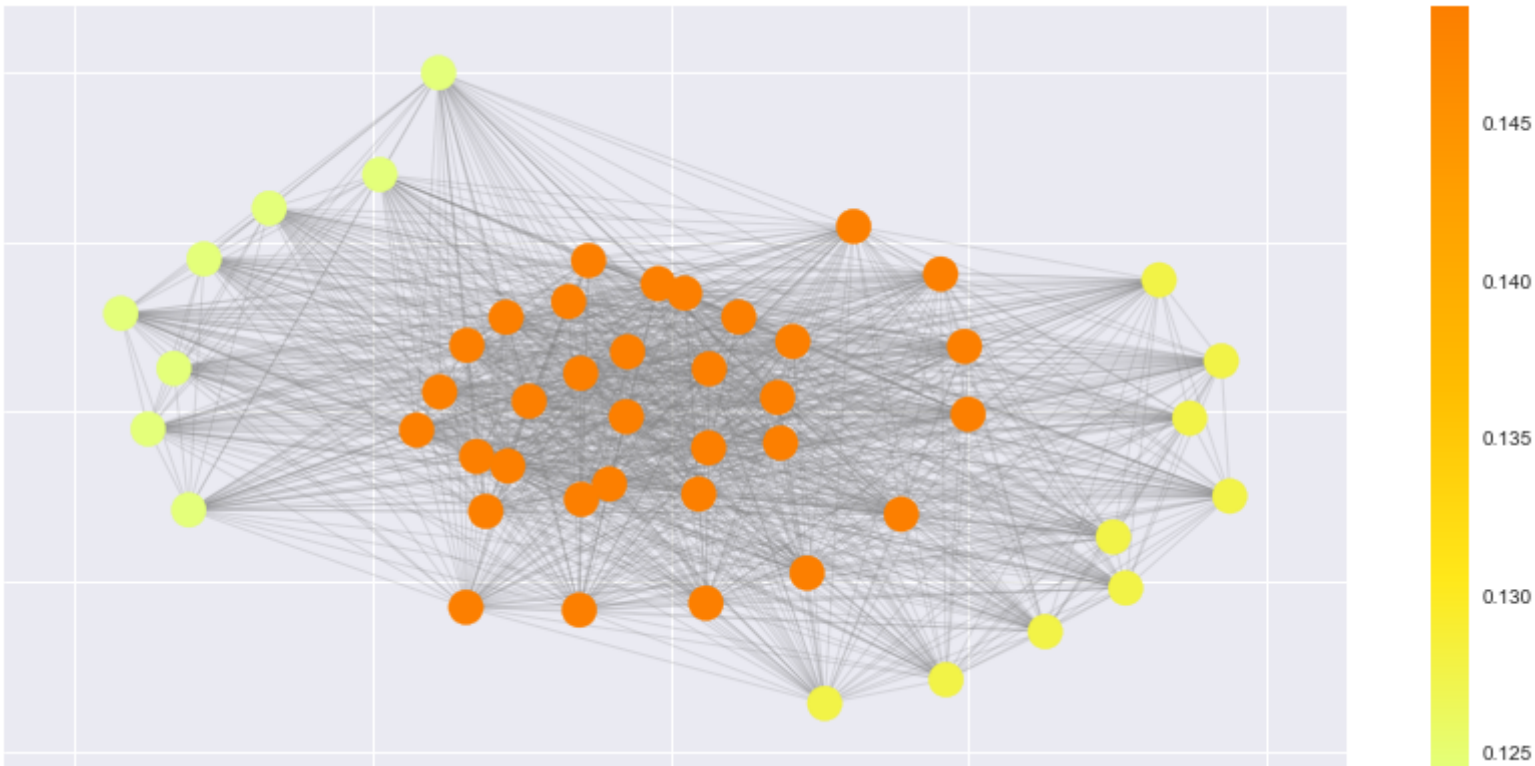
Out[48]:

| | Category Name | Closeness Centrality |
|---|---|---|
| **49** | Indoor/Outdoor Games | 1.0 |
| **26** | Golf Balls | 1.0 |
| **43** | Golf Shoes | 1.0 |
| **21** | Crafts | 1.0 |
| **41** | Golf Gloves | 1.0 |

## Eigenvector Centrality

In [49]:

```
eigenvector = nx.eigenvector_centrality(G)
plot_centrality(eigenvector)
print_centrality(eigenvector, 'Eigenvector Centrality').head()
```




```
[('Indoor/Outdoor Games', 0.14867064721396608), ("Children's Clothing", 0.14867064721396608), ('Crafts', 0.14867064721396608), ('G
olf Gloves', 0.14867064721396608), ('Tennis & Racquet', 0.14867064721396608), ('Fitness Accessories', 0.14867064721396608), ('Clea
ts', 0.14867064721396608), ('Golf Balls', 0.14867064721396608), ('Lacrosse', 0.14867064721396608), ("Girls' Apparel", 0.1486706472
1396608), ('Baby', 0.14867064721396608), ('Fishing', 0.14867064721396608), ('Books', 0.14867064721396608), ('DVDs', 0.148670647213
96608), ('CDs', 0.14867064721396608), ('Hockey', 0.14867064721396608), ('Golf Shoes', 0.14867064721396608), ('Accessories', 0.1486
7064721396608), ('Golf Apparel', 0.14867064721396608), ('Water Sports', 0.14867064721396608), ('Shop By Sport', 0.1486706472139660
8), ("Women's Apparel", 0.14867064721396608), ('Electronics', 0.14867064721396608), ('Boxing & MMA', 0.14867064721396608), ('Cardi
o Equipment', 0.14867064721396608), ('Trade-In', 0.14867064721396608), ('Hunting & Shooting', 0.14867064721396608), ('Baseball & S
oftball', 0.14867064721396608), ("Men's Footwear", 0.14867064721396608), ('Camping & Hiking', 0.14867064721396608), ('Consumer Ele
ctronics', 0.14867064721396608), ('Cameras', 0.14867064721396608), ('Computers', 0.14867064721396608), ('Video Games', 0.127679298
33125463), ('Music', 0.12767929833125463), ('Garden', 0.12767929833125463), ('Toys', 0.12767929833125463), ('Pet Supplies', 0.1276
7929833125463), ('Health and Beauty', 0.12767929833125463), ('Sporting Goods', 0.1276792983312546), ("Men's Clothing", 0.127679298
```

```
3312546), ("Women's Clothing", 0.1276792983312546), ('Strength Training', 0.12444087284685672), ('Golf Bags & Carts', 0.12444087284685672), ('Soccer', 0.12444087284685672), ("Women's Golf Clubs", 0.12444087284685672), ("Men's Golf Clubs", 0.12444087284685672), ('Basketball', 0.12444087284685672), ("Kids' Golf Clubs", 0.12444087284685672), ('As Seen on  TV!', 0.12444087284685672)]
```

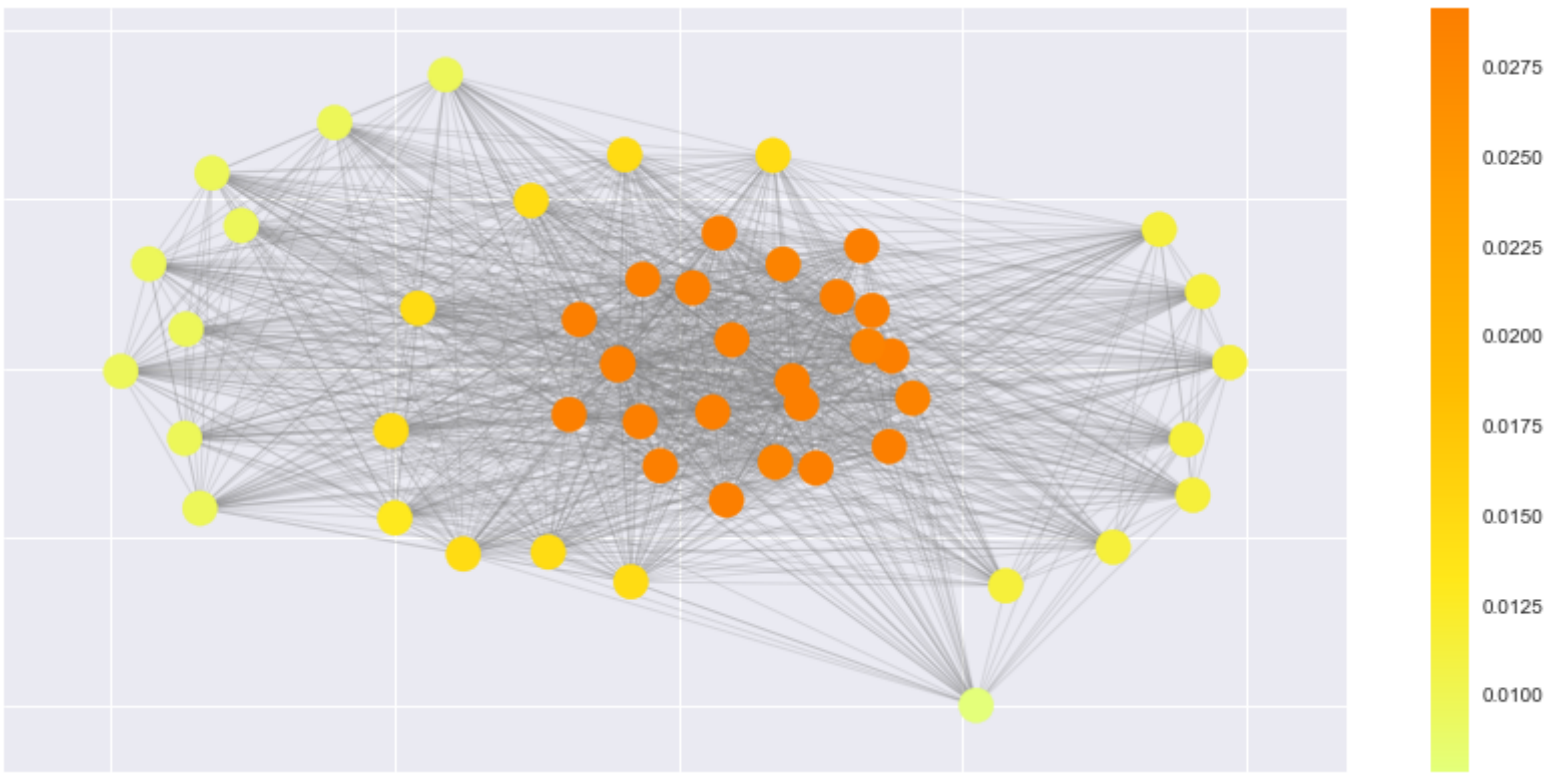
Out[49]:

| | Category Name | Eigenvector Centrality |
|---|---|---|
| **49** | Indoor/Outdoor Games | 0.148671 |
| **28** | Children's Clothing | 0.148671 |
| **21** | Crafts | 0.148671 |
| **41** | Golf Gloves | 0.148671 |
| **23** | Tennis & Racquet | 0.148671 |

# PageRank

In [50]:

```
pagerank = nx.pagerank(G)
plot_centrality(pagerank)
print_centrality(pagerank, 'PageRank').head()
```




```
[('Indoor/Outdoor Games', 0.02910004330793566), ("Men's Footwear", 0.02910004330793566), ('Fishing', 0.02910004330793566), ('Lacro
sse', 0.02910004330793566), ('Golf Balls', 0.02910004330793566), ('Cleats', 0.02910004330793566), ('Tennis & Racquet', 0.029100043
30793566), ('Golf Apparel', 0.02910004330793566), ('Accessories', 0.02910004330793566), ('Camping & Hiking', 0.02910004330793566),
("Girls' Apparel", 0.02910004330793566), ('Cardio Equipment', 0.02910004330793566), ('Water Sports', 0.02910004330793566), ('Shop
By Sport', 0.02910004330793566), ("Women's Apparel", 0.02910004330793566), ('Electronics', 0.02910004330793566), ('Boxing & MMA',
0.02910004330793566), ('Hunting & Shooting', 0.02910004330793566), ('Trade-In', 0.02910004330793566), ('Golf Gloves', 0.0291000433
0793566), ('Hockey', 0.028393028110741375), ('Golf Shoes', 0.028393028110741375), ('Fitness Accessories', 0.028393028110741375),
('Baseball & Softball', 0.028393028110741375), ('Crafts', 0.01460032971973412), ('Computers', 0.01460032971973412), ("Children's C
lothing", 0.01460032971973412), ('Baby', 0.01460032971973412), ('Consumer Electronics', 0.01460032971973412), ('Books', 0.01460032
971973412), ('DVDs', 0.01460032971973412), ('CDs', 0.01460032971973412), ('Cameras', 0.012939485390217484), ("Women's Golf Clubs",
0.01134315515704318), ("Men's Golf Clubs", 0.01134315515704318), ('Golf Bags & Carts', 0.01134315515704318), ('As Seen on  TV!',
0.01134315515704318), ('Strength Training', 0.01134315515704318), ('Soccer', 0.01134315515704318), ("Kids' Golf Clubs", 0.01134315
515704318), ('Pet Supplies', 0.009718050588254678), ('Health and Beauty', 0.009718050588254678), ('Music', 0.009718050588254678),
('Video Games', 0.009718050588254678), ('Garden', 0.009718050588254678), ("Men's Clothing", 0.009718050588254678), ("Women's Cloth
ing", 0.009718050588254678), ('Toys', 0.009718050588254678), ('Sporting Goods', 0.009718050588254678), ('Basketball', 0.0078203568
56636094)]
```

Out[50]:

| | Category Name | PageRank |
|---|---|---|
| **49** | Indoor/Outdoor Games | 0.0291 |
| **11** | Men's Footwear | 0.0291 |
| **31** | Fishing | 0.0291 |
| **29** | Lacrosse | 0.0291 |
| **26** | Golf Balls | 0.0291 |

In [ ]: