Importing Dataset:

```
import pandas as pd
!pip install dash
import numpy as np;np.random.seed(42)
import seaborn as sb
import matplotlib.pyplot as plt
!pip install plotly
import plotly
import dash
from dash import html,dcc
from dash.dependencies import Input,Output
import matplotlib.pyplot as plt
import plotly.express as px
import plotly.graph_objects as go
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
```

```
Collecting dash
  Downloading dash-2.11.1-py3-none-any.whl (10.4 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 10.4/10.4 MB 21.8 MB/s eta 0:00:00
Requirement already satisfied: Flask<2.3.0,>=1.0.4 in /usr/local/lib/python3.10/dist-packages (from dash) (2.2.5)
Collecting Werkzeug<2.3.0 (from dash)
  Downloading Werkzeug-2.2.3-py3-none-any.whl (233 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 233.6/233.6 kB 13.7 MB/s eta 0:00:00
Requirement already satisfied: plotly>=5.0.0 in /usr/local/lib/python3.10/dist-packages (from dash) (5.13.1)
Collecting dash-html-components==2.0.0 (from dash)
  Downloading dash_html_components-2.0.0-py3-none-any.whl (4.1 kB)
Collecting dash-core-components==2.0.0 (from dash)
  Downloading dash_core_components-2.0.0-py3-none-any.whl (3.8 kB)
Collecting dash-table==5.0.0 (from dash)
  Downloading dash_table-5.0.0-py3-none-any.whl (3.9 kB)
Requirement already satisfied: typing-extensions>=4.1.1 in /usr/local/lib/python3.10/dist-packages (from dash) (4.7.1)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from dash) (2.27.1)
Collecting retrying (from dash)
  Downloading retrying-1.3.4-py3-none-any.whl (11 kB)
Collecting ansi2html (from dash)
  Downloading ansi2html-1.8.0-py3-none-any.whl (16 kB)
Requirement already satisfied: nest-asyncio in /usr/local/lib/python3.10/dist-packages (from dash) (1.5.6)
Requirement already satisfied: Jinja2>=3.0 in /usr/local/lib/python3.10/dist-packages (from Flask<2.3.0,>=1.0.4->dash) (3.1.2)
Requirement already satisfied: itsdangerous>=2.0 in /usr/local/lib/python3.10/dist-packages (from Flask<2.3.0,>=1.0.4->dash) (2.1.2)
```

Generating Dataset:

```
customer_id = range(1001, 1501)
age = np.random.randint(18, 65, 500)
gender = np.random.choice(['Male', 'Female'], 500)
marital_status = np.random.choice(['Single', 'Married', 'Divorced'], 500)
annual_income = np.random.randint(30000, 100000, 500)
total_purchase = np.random.randint(5, 50,500)
preferred_category = np.random.choice(['Electronics', 'Appliances', 'Beauty', 'Fashion'], 500)
```

```
Successfully installed Werkzeug-2.2.3 ansi2html-1.8.0 dash-2.11.1 dash-core-components-2.0.0 dash-html-components-2.0.0 dash-table-5.0.0
```

```
file = pd.DataFrame({'CUSTOMER_ID': customer_id,'ANNUAL_INCOME (USD)': annual_income,'ANNUAL_INCOME (USD)': annual_income,
    'MARITAL_STATUS': marital_status,
    'TOTAL_PURCAHSE': total_purchase,
    'GENDER': gender,
    'PREFERRED_CATEGORY': preferred_category,
    'AGE': age
})
```

Saving Dataset:

```
file.to_csv('TechElectro_Customer_Data.csv', index=False)
```

Importing Dataset:

```
file=pd.read_csv("TechElectro_Customer_Data.csv")
file.head()
```

	CUSTOMER_ID	ANNUAL_INCOME (USD)	MARITAL_STATUS	TOTAL_PURCAHSE	GENDER	PREFERRED_CATEGORY	AGE
0	1001	86133	Single	32	Male	Electronics	56
1	1002	91268	Married	19	Male	Appliances	46
2	1003	68243	Divorced	10	Male	Beauty	32
3	1004	87384	Married	48	Male	Appliances	60
4	1005	61653	Divorced	24	Male	Fashion	25

EDA:

```
file.columns
```

```
Index(['CUSTOMER_ID', 'ANNUAL_INCOME (USD)', 'MARITAL_STATUS',
       'TOTAL_PURCAHSE', 'GENDER', 'PREFERRED_CATEGORY', 'AGE'],
      dtype='object')
```

```
file.isnull().sum()
```

```
CUSTOMER_ID           0
ANNUAL_INCOME (USD)   0
MARITAL_STATUS        0
TOTAL_PURCAHSE        0
GENDER                0
PREFERRED_CATEGORY    0
AGE                   0
dtype: int64
```

```
file.describe()
```

	CUSTOMER_ID	ANNUAL_INCOME (USD)	TOTAL_PURCAHSE	AGE
count	500.000000	500.000000	500.000000	500.000000
mean	1250.500000	65129.962000	26.260000	41.278000
std	144.481833	19309.946461	13.006103	13.389072
min	1001.000000	30060.000000	5.000000	18.000000
25%	1125.750000	50641.750000	15.000000	30.000000
50%	1250.500000	64088.500000	26.000000	42.000000
75%	1375.250000	81202.750000	38.000000	52.000000
max	1500.000000	99768.000000	49.000000	64.000000

```
file.shape
```

```
(500, 7)
```

```
pc_counts =file.PREFERRED_CATEGORY.value_counts()
pc_percentage = (pc_counts/ len(file)) * 100
print('Preferred Category Percentage\n',pc_percentage)
```

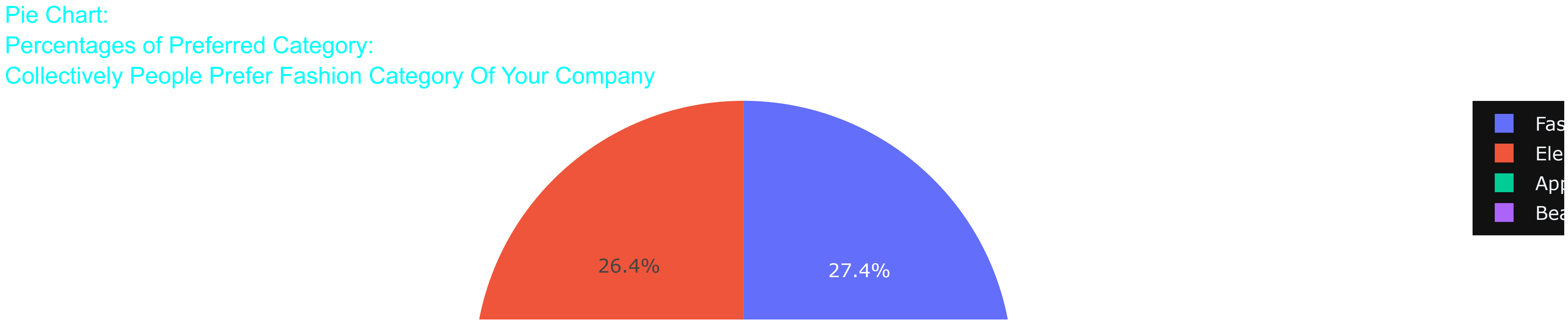
```
Preferred Category Percentage
 Fashion        27.4
Electronics    26.4
Appliances     24.2
Beauty         22.0
Name: PREFERRED_CATEGORY, dtype: float64
```

Data Visualization:

Preferred Category:

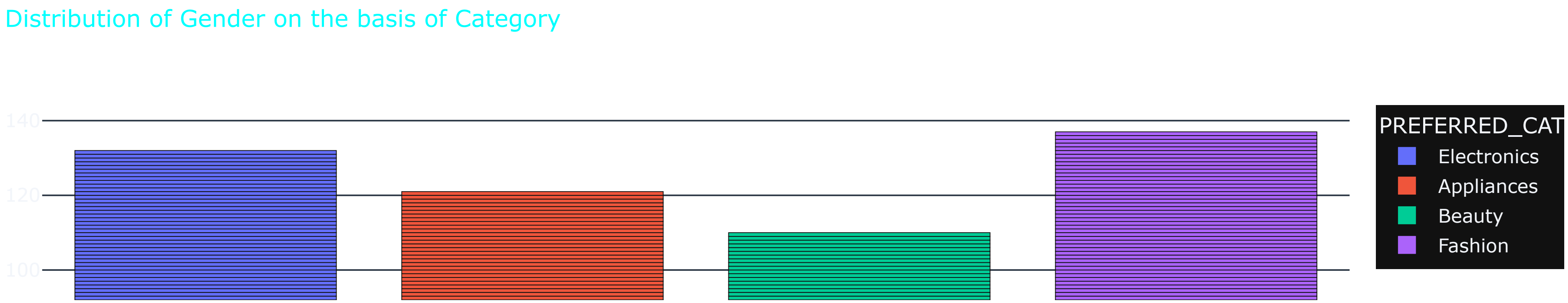
Pie Chart Of Percentages of Preferred Category:

```
fig_pie_for_percentage_of_pc = px.pie(data_frame=file, names='PREFERRED_CATEGORY', title='Pie Chart:<br>Percentages of Preferred Category:<br>C
fig_pie_for_percentage_of_pc.update_layout(title_font=dict(size=15,family="Arial",color='Cyan'))
fig_pie_for_percentage_of_pc.show()
```



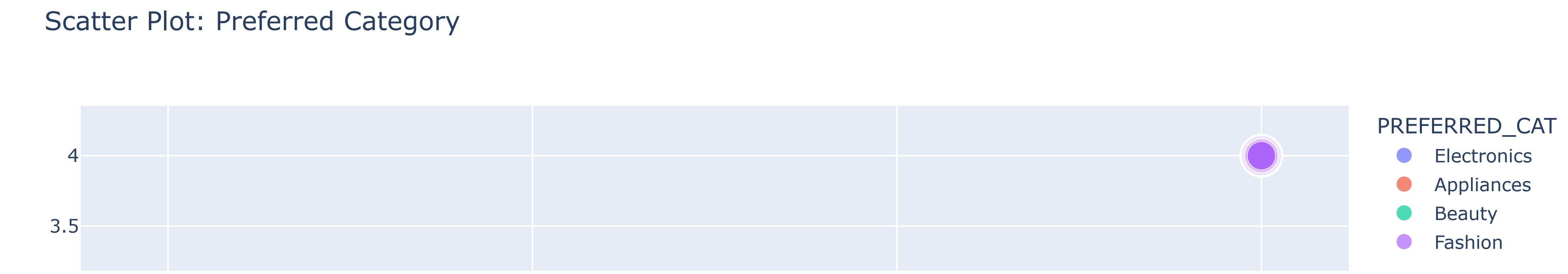
Histogram of Preferred Category:

```
hist_of_pc = px.bar(data_frame=file, x='PREFERRED_CATEGORY', color='PREFERRED_CATEGORY',
             template='plotly_dark',title='Distribution of Gender on the basis of Category',
             labels={'PREFERRED_CATEGORY': 'PREFERRED_CATEGORY', 'count': 'COUNT'})
hist_of_pc.update_layout(title_font=dict(size=15,color="Cyan"))
hist_of_pc.show()
```

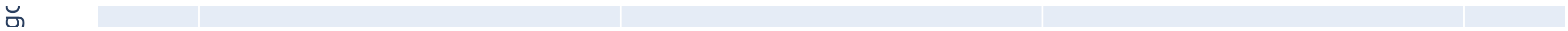


Scatter plot of Preferred Category:

```
category_codes = {'Electronics':1,'Appliances':2,'Beauty':3,'Fashion':4}
file['Category_Code'] = file['PREFERRED_CATEGORY'].map(category_codes)
fig_scatter_category = px.scatter(data_frame=file, x='PREFERRED_CATEGORY', y='Category_Code',color='PREFERRED_CATEGORY',size='AGE',title='Scatt
                                        'TOTAL_PURCHASE': 'Total Purchase'})
fig_scatter_category.show()
```

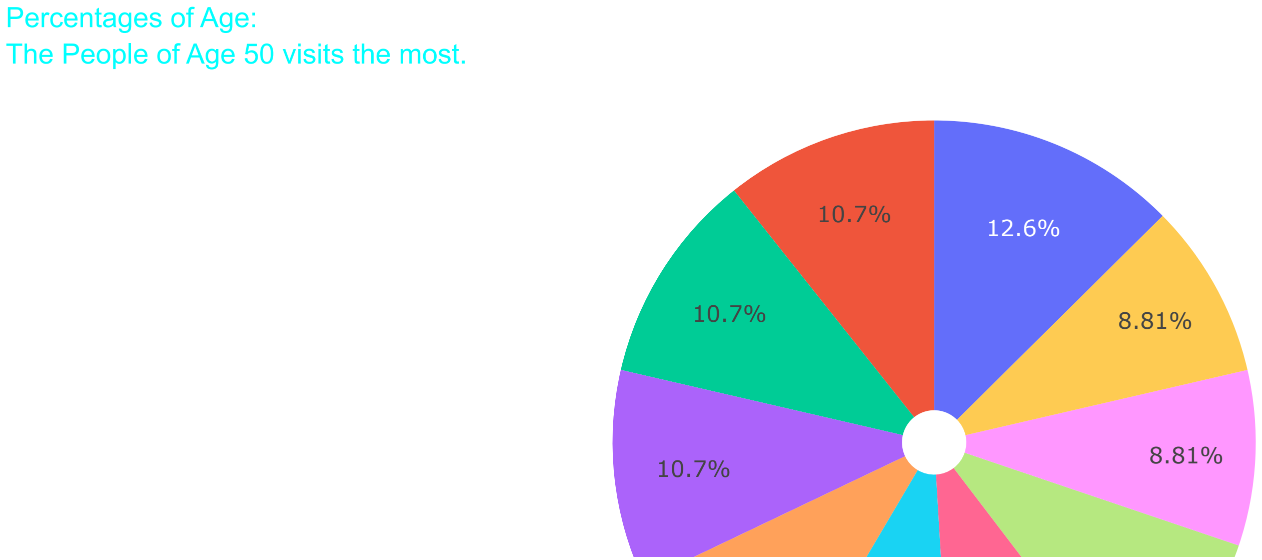


Percentages of Ages:



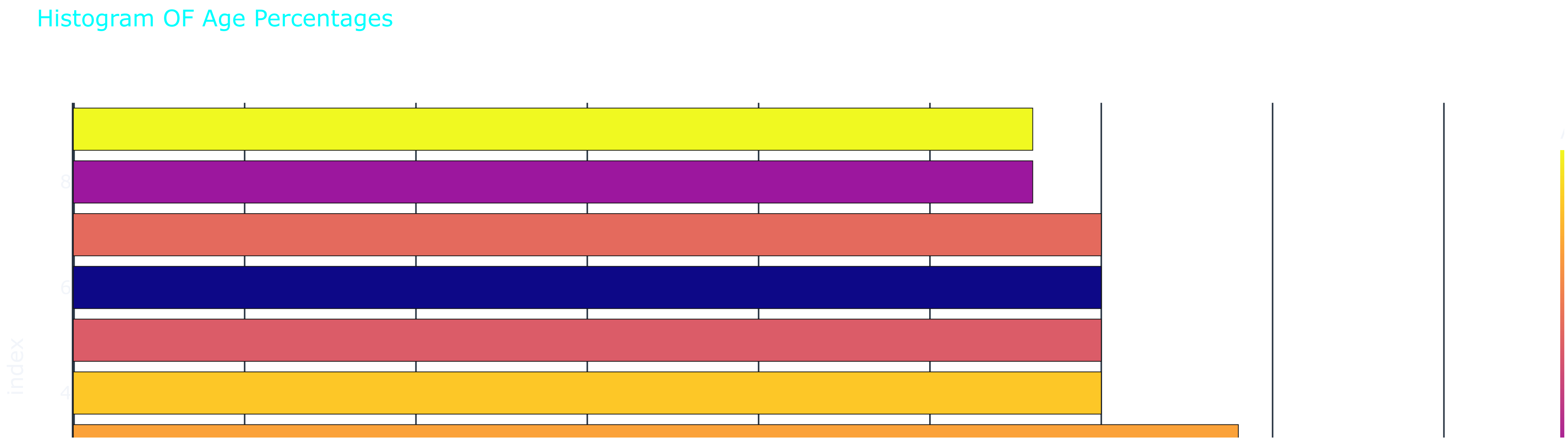
Pie Chart OF Age:

```
age_counts =file.AGE.value_counts().nlargest(10)
age_percentage = (age_counts/ len(file)) * 100
top_ten_age_percentage=age_percentage
data_frame_for_top_ten_ages=pd.DataFrame({'AGES':top_ten_age_percentage.index,"PERCENTAGES":top_ten_age_percentage.values})
fig_pie_for_percentage_of_age = px.pie(data_frame=data_frame_for_top_ten_ages, names='AGES',values='PERCENTAGES', title='Percentages of Age:<br
fig_pie_for_percentage_of_age.update_layout(title_font=dict(size=15,family="Arial",color='Cyan'))
fig_pie_for_percentage_of_age.show()
```



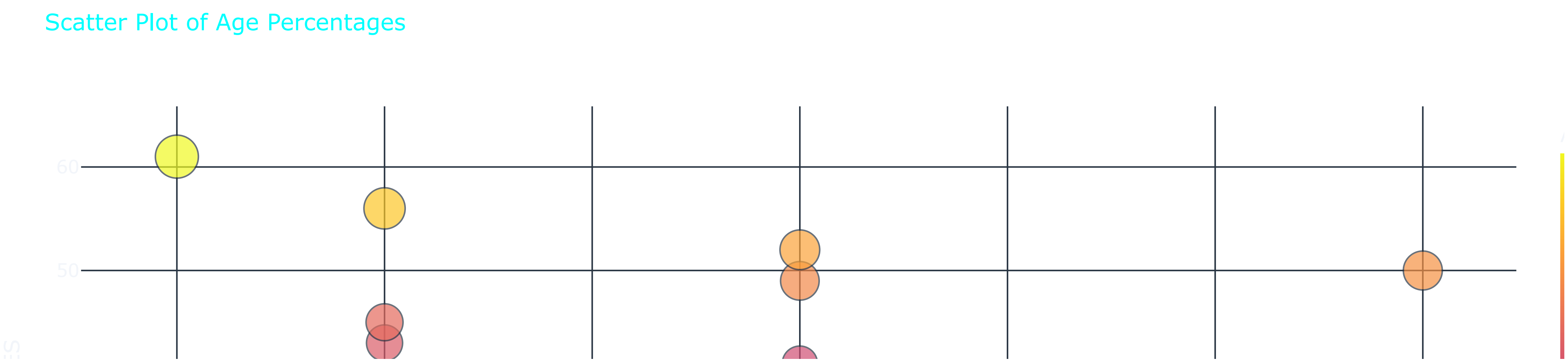
Histogram Of Age :

```
hist_of_age= px.bar(data_frame=data_frame_for_top_ten_ages, x='PERCENTAGES', color='AGES',
             template='plotly_dark',title='Histogram OF Age Percentages',
             labels={'GENDER': 'GENDER--->', 'PREFERRED_CATEGORY': 'PREFERRED_CATEGORY', 'count': 'COUNT--->'})
hist_of_age.update_layout(title_font=dict(size=15,color="Cyan"))
hist_of_age.show()
```



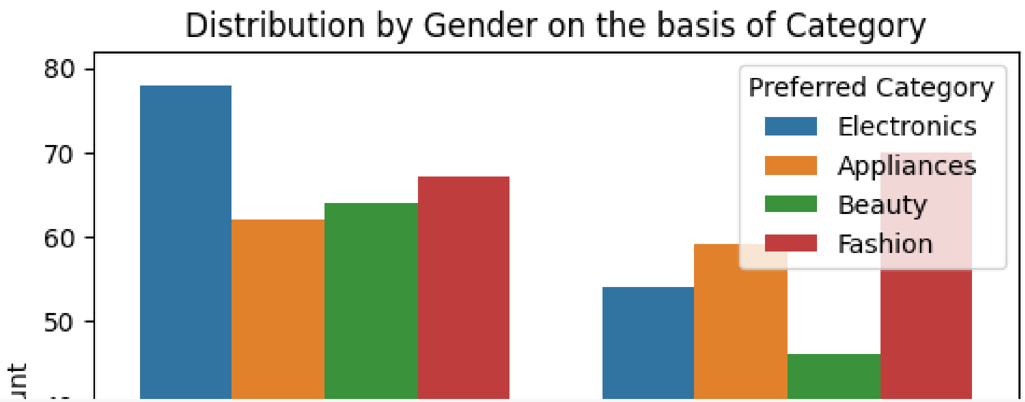
Scatter plot of Age Perentage:

```
scatter_plot_age=px.scatter(data_frame=data_frame_for_top_ten_ages,x='PERCENTAGES',y='AGES',size='AGES',color='AGES',template='plotly_dark',tit
scatter_plot_age.update_layout(title_font=dict(size=15,color="Cyan"))
scatter_plot_age.show()
```

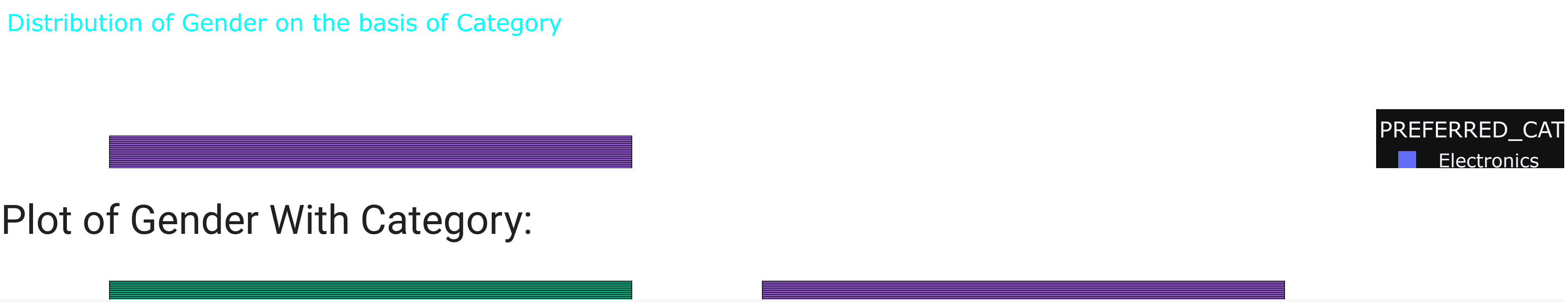


Distribution by Gender on the basis of Category:

```
sb.countplot(data=file, x='GENDER', hue='PREFERRED_CATEGORY')
plt.title('Distribution by Gender on the basis of Category')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.legend(title='Preferred Category', loc='upper right', labels=['Electronics', 'Appliances','Beauty','Fashion'])
plt.show()
```

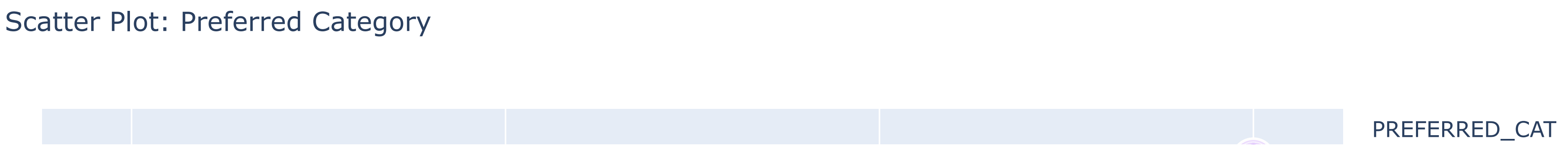


```
gender_dist_basis_of_category = px.bar(data_frame=file, x='GENDER', color='PREFERRED_CATEGORY',
             template='plotly_dark',title='Distribution of Gender on the basis of Category',
             labels={'GENDER': 'GENDER--->', 'PREFERRED_CATEGORY': 'PREFERRED_CATEGORY', 'count': 'COUNT--->'})
gender_dist_basis_of_category.update_layout(title_font=dict(size=15,color="Cyan"))
gender_dist_basis_of_category.show()
```



Scatter Plot of Gender With Category:

```
data=file.groupby("GENDER")['PREFERRED_CATEGORY'].size()

fig_scatter_category = px.scatter(data_frame=file, x='PREFERRED_CATEGORY', y='Category_Code',color='PREFERRED_CATEGORY',size='AGE',title='Scatt
                                        'TOTAL_PURCHASE': 'Total Purchase'})
fig_scatter_category.show()
```



TOTAL_PURCHASE & ANNUAL_INCOME:

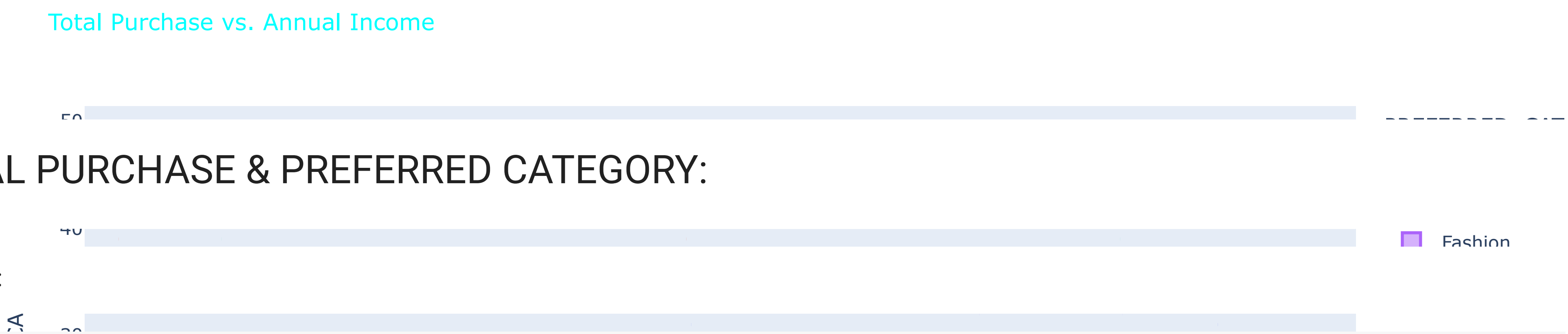
Scatter Plot:

```
scatter_plot_btw_TP_and_AI= px.scatter(data_frame=file, x='ANNUAL_INCOME (USD)', y='TOTAL_PURCAHSE', color='PREFERRED_CATEGORY',
                         hover_name='CUSTOMER_ID',size='AGE', title='Total Purchase vs. Annual Income<br>49 items of 100k worth are purchased b
                        template='plotly_dark')
scatter_plot_btw_TP_and_AI.update_layout(title_font=dict(size=15,color="cyan"))
scatter_plot_btw_TP_and_AI.show()
```

Total Purchase vs. Annual Income
49 items of 100k worth are purchased by the customers
The Beauty category of Tech Electro is the most purchased by customers.
50
PREFERRED_CAT
Electronics
Appliances

Box Plot:

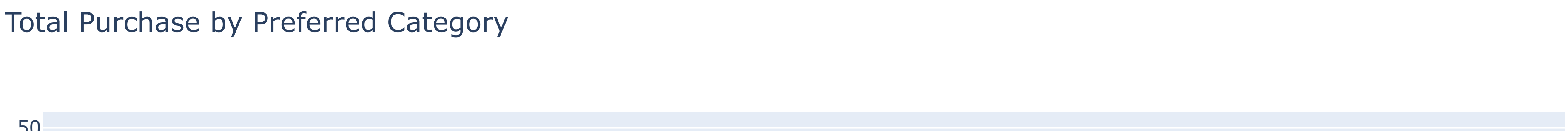
```
box_plot_btw_TP_and_AI= px.box(data_frame=file, x='ANNUAL_INCOME (USD)', y='TOTAL_PURCAHSE', color='PREFERRED_CATEGORY',title='Total Purchase v
box_plot_btw_TP_and_AI.update_layout(title_font=dict(size=15,color="cyan"))
box_plot_btw_TP_and_AI.show()
```



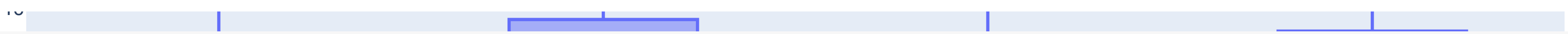
TOTAL PURCHASE & PREFERRED CATEGORY:

Box Plot:

```
fig_box = px.box(data_frame=file, x='PREFERRED_CATEGORY', y='TOTAL_PURCAHSE', title='Total Purchase by Preferred Category',
                 labels={'TOTAL_PURCHASE': 'Total Purchase', 'PREFERRED_CATEGORY': 'Preferred Category'})
fig_box.show()
```



K-Means Clustering:



```
data=file.select_dtypes(include=[int])
data
```

	CUSTOMER_ID	ANNUAL_INCOME (USD)	TOTAL_PURCAHSE	AGE	Category_Code
0	1001	86133	32	56	1
1	1002	91268	19	46	2
2	1003	68243	10	32	3
3	1004	87384	48	60	2
4	1005	61653	24	25	4
...	...	...	...	...	...
495	1496	85204	6	37	4
496	1497	81886	31	41	1
497	1498	45563	25	29	4
498	1499	39847	42	52	1
499	1500	56155	19	50	2

500 rows × 5 columns

```
scaled_data=StandardScaler().fit_transform(data)
scaled_data
```

```
array([[-1.72859016,  1.08876908,  0.44177326,  1.10065463, -1.30610681],
       [-1.72166195,  1.35496053, -0.55875852,  0.35302888, -0.43768473],
       [-1.71473373,  0.16137568, -1.25143437, -0.69364717,  0.43073735],
       ...,
       [ 1.71473373, -1.01432484, -0.09697462, -0.91793489,  1.29915944],
       [ 1.72166195, -1.31063455,  1.2114131 ,  0.80160433, -1.30610681],
       [ 1.72859016, -0.46524989, -0.55875852,  0.65207918, -0.43768473]])
```

Elbow Method:

```
inertia=[]
for i in range(2,13):
  kmeans=KMeans(n_clusters=i)
  kmeans.fit(scaled_data)
  inertia.append(kmeans.inertia_)
plt.plot(list(range(2,13)),inertia,marker='*')
plt.xlabel("Number OF Clusters----->")
plt.ylabel("Inertia--->")
plt.title("*****Elbow Method*****")
plt.show()
```

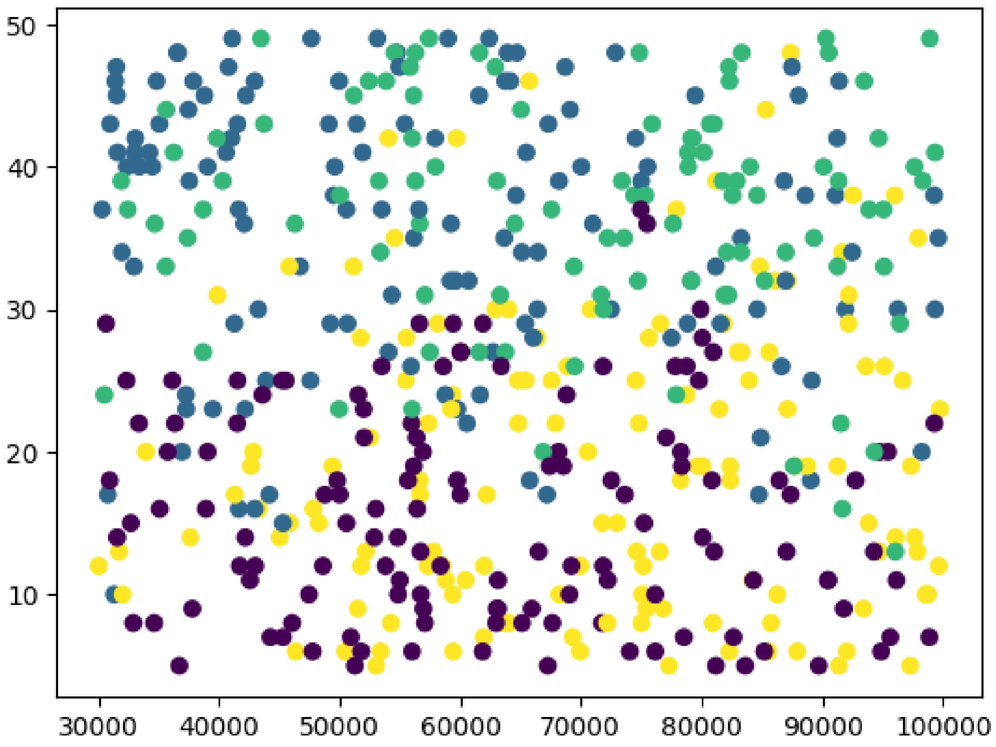
```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning

/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:

The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
```

*****Elbow Method*****
2000
1800

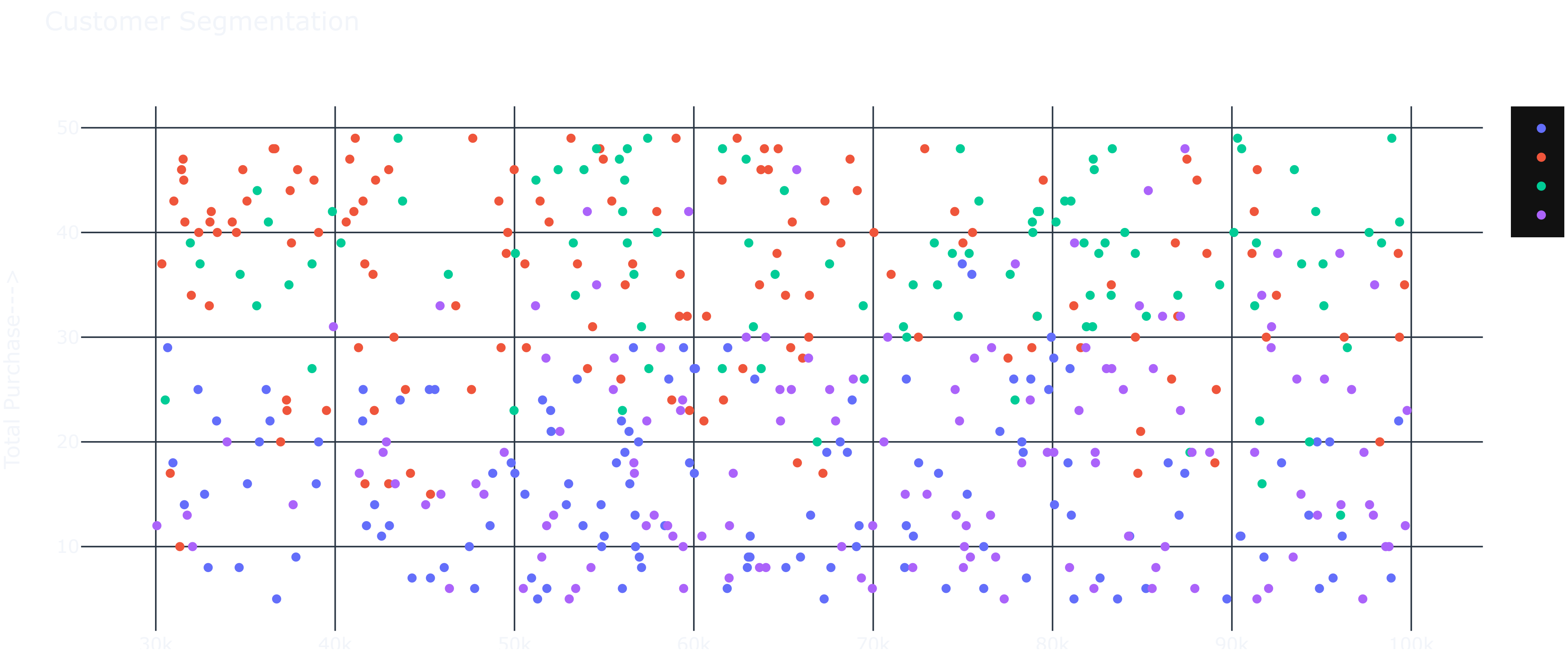
```
number_of_cluster=4
kmeans=KMeans(n_clusters=4)
data["Cluster Number"]=kmeans.fit_predict(scaled_data)
data
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning:
```

```
plt.scatter(file['ANNUAL_INCOME (USD)'],file.TOTAL_PURCAHSE, c=data['Cluster Number'], cmap='viridis')
plt.show()
```



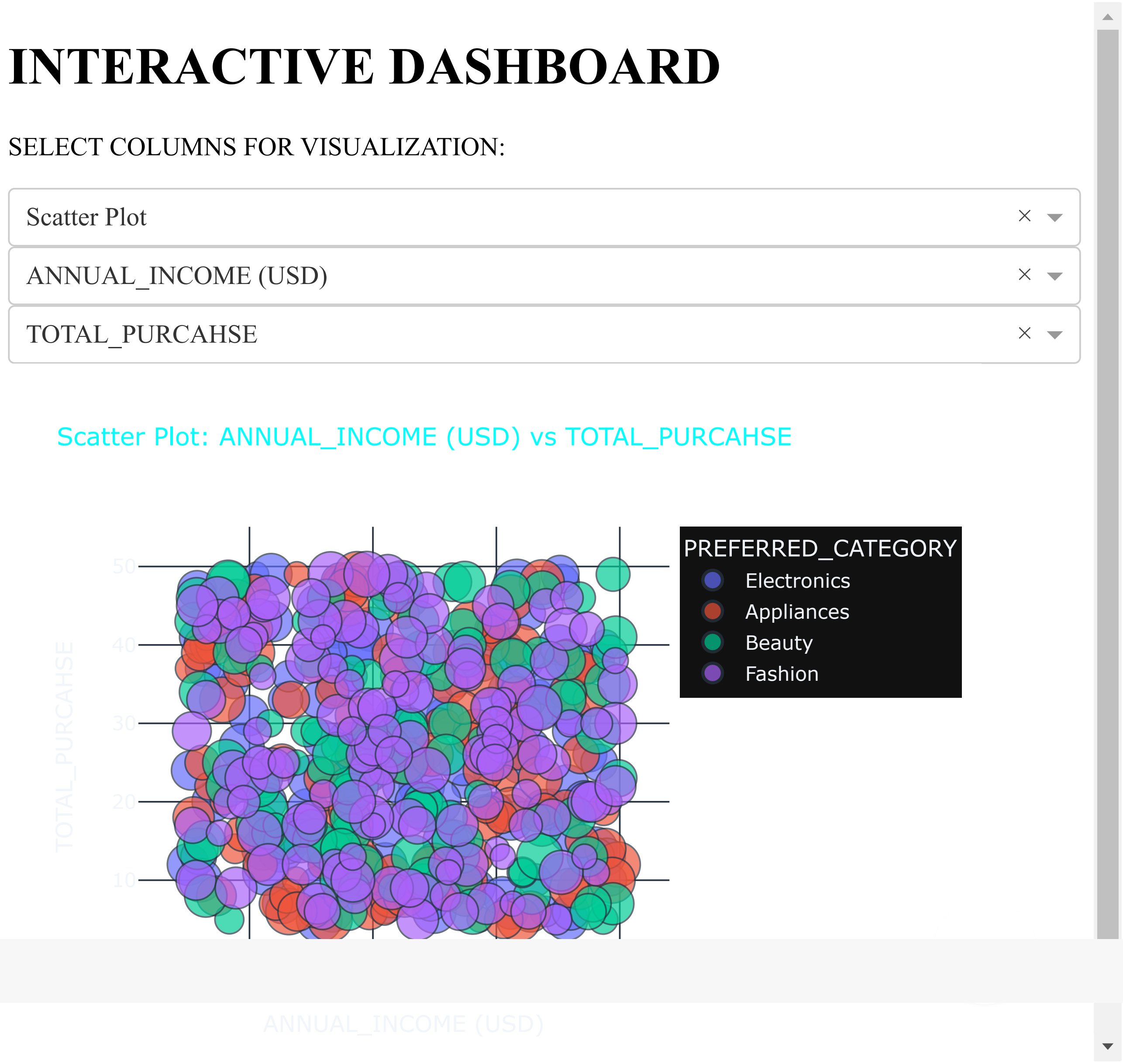
```
color_map = {0: 'red', 1: 'blue', 2: 'green', 3: 'orange', 4: 'purple'}
fig = go.Figure()
for cluster_number,color_name in color_map.items():
    cluster_data = data[data['Cluster Number'] == cluster_number]
    fig.add_trace(go.Scatter(x=cluster_data['ANNUAL_INCOME (USD)'],y=cluster_data['TOTAL_PURCAHSE'],mode='markers'))
fig.update_layout(title='Customer Segmentation',template='plotly_dark',xaxis_title='Annual Income (USD)--->',yaxis_title='Total Purchase--->')
fig.show()
```



Creating DashBoard:

```
App = dash.Dash(__name__)
App.layout = html.Div([html.H1("INTERACTIVE DASHBOARD"),html.P("SELECT COLUMNS FOR VISUALIZATION:"),
    dcc.Dropdown(id='Plot-Type',
        options=[
            {'label': 'Scatter Plot', 'value': 'Scatter Plot'},
            {'label': 'Pie Chart', 'value': 'Pie Chart'},
            {'label': 'Bar Chart', 'value': 'Bar Chart'},
            {'label': 'K-MEAN CLUSTERING BETWEEN ANNUAL INCOME(USD) AND TOTAL PURCHASE ONLY', 'value': 'K-Means'},
            {'label': 'Box Plot', 'value': 'Box Plot'}
        ],value='Scatter Plot'),
    dcc.Dropdown(id='column_x',options=[{'label': col, 'value': col} for col in file.columns],value='ANNUAL_INCOME (USD)',),
    dcc.Dropdown(id='column_y',options=[{'label': col, 'value': col} for col in file.columns],value='TOTAL_PURCAHSE',),
    dcc.Graph(id='DATA_VISUALIZATION')])
@App.callback(
    Output('DATA_VISUALIZATION', 'figure'),[Input('Plot-Type', 'value'),Input('column_x', 'value'),Input('column_y', 'value')]
)
def UPDATE_PLOT(selected_plot, column_x, column_y):
    if selected_plot == 'Scatter Plot':
        plot = px.scatter(data_frame=file, x=column_x, y=column_y, color='PREFERRED_CATEGORY',size='AGE', hover_data=['CUSTOMER_ID', 'PREFERRED
                          title=f'Scatter Plot: {column_x} vs {column_y}')
        plot.update_layout(title_font=dict(size=15, color="cyan"), template="plotly_dark")
    elif selected_plot == 'Pie Chart':
        plot = px.pie(data_frame=file, names=column_x, values=column_y,title=f'Pie Chart: {column_y} and {column_x}')
        plot.update_layout(title_font=dict(size=15, color="cyan"), template='plotly_dark')
    elif selected_plot == 'K-Means':
        scaled_data = StandardScaler().fit_transform(file.select_dtypes(include=['int']))
        kmeans = KMeans(n_clusters=4, random_state=42)  # based on elbow method.
        file['Cluster Number'] = kmeans.fit_predict(scaled_data)
        color_map = {0: 'red', 1: 'blue', 2: 'green', 3: 'orange', 4: 'purple'}
        plot = go.Figure()
        for cluster_number, color_name in color_map.items():
            cluster_data = file[file['Cluster Number'] == cluster_number]
            plot.add_trace(go.Scatter(x=cluster_data['ANNUAL_INCOME (USD)'],y=cluster_data['TOTAL_PURCAHSE'],mode='markers',marker=dict(color=c
        plot.update_layout(title='CUSTOMER SEGMENTATION',template='plotly_dark',xaxis_title='Annual Income (USD)--->',yaxis_title='Total Purcha
    elif selected_plot == 'Box Plot':
        plot = px.box(data_frame=file, x=column_x, y=column_y, title=f'Box Plot Between {column_x} and {column_y}')
        plot.update_layout(title_font=dict(size=15, color="cyan"), template='plotly_dark')
    else:
        plot = px.bar(data_frame=file, x=column_x, y=column_y, color='GENDER',title=f'Bar Chart: {column_y} and {column_x}')
        plot.update_layout(title_font=dict(size=15, color="cyan"), template='plotly_dark')
    return plot
```

```
if __name__ == '__main__':
    App.run_server(debug=True)
```



INTERACTIVE DASHBOARD

SELECT COLUMNS FOR VISUALIZATION:

Scatter Plot

ANNUAL_INCOME (USD)

TOTAL_PURCAHSE

Scatter Plot: ANNUAL_INCOME (USD) vs TOTAL_PURCAHSE

✓ 0s completed at 10:41 AM ● ×