

0. Przygotowanie danych

```
import pandas as pd
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go
import matplotlib.pyplot as plt
from sklearn.ensemble import IsolationForest
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA

df = pd.read_csv('data.csv')
#print(df.info())
#print(df.describe())
numerical_features = ['age', 'income', 'outcome']
numerical_df = df[numerical_features]

if numerical_df.isnull().sum().any():
    numerical_df.fillna(numerical_df.mean(), inplace=True)
```

1. Zidentyfikować wartości odstające za pomocą algorytmu Isolation Forest

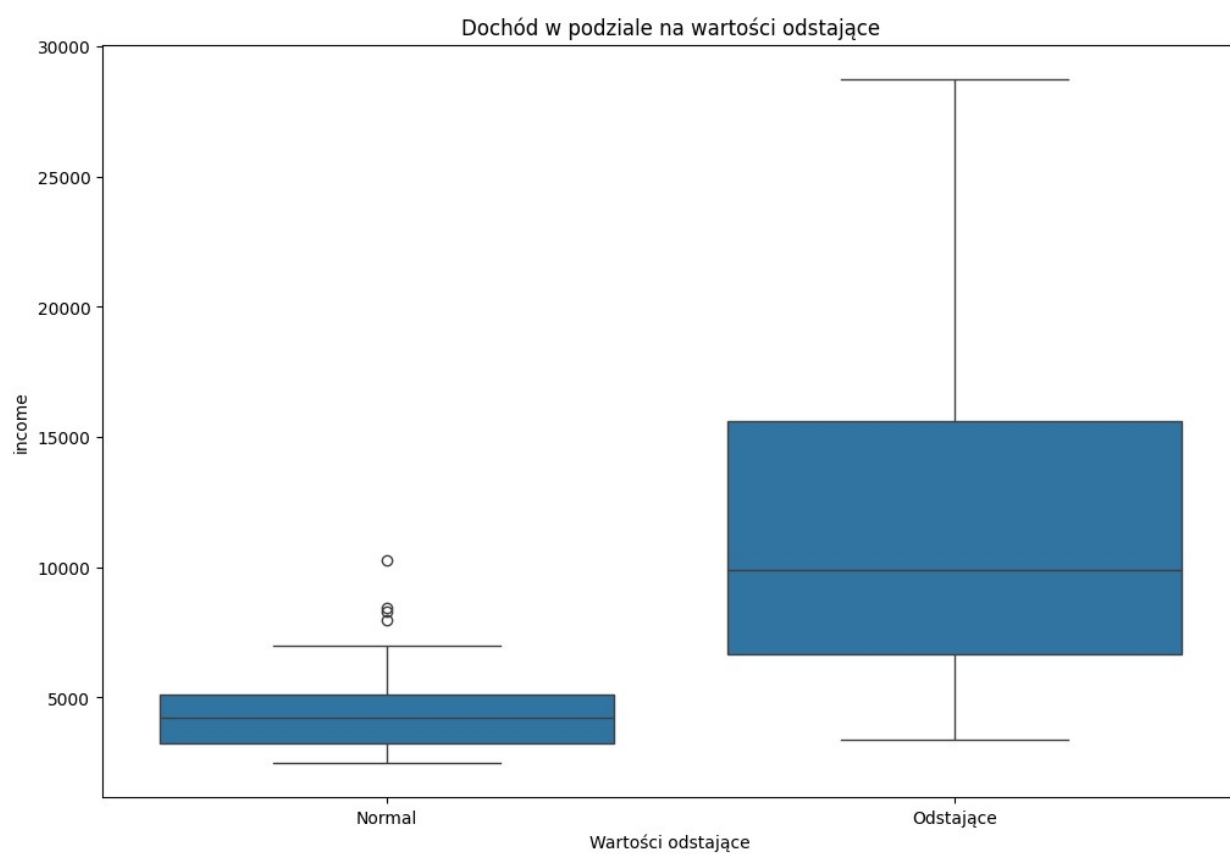
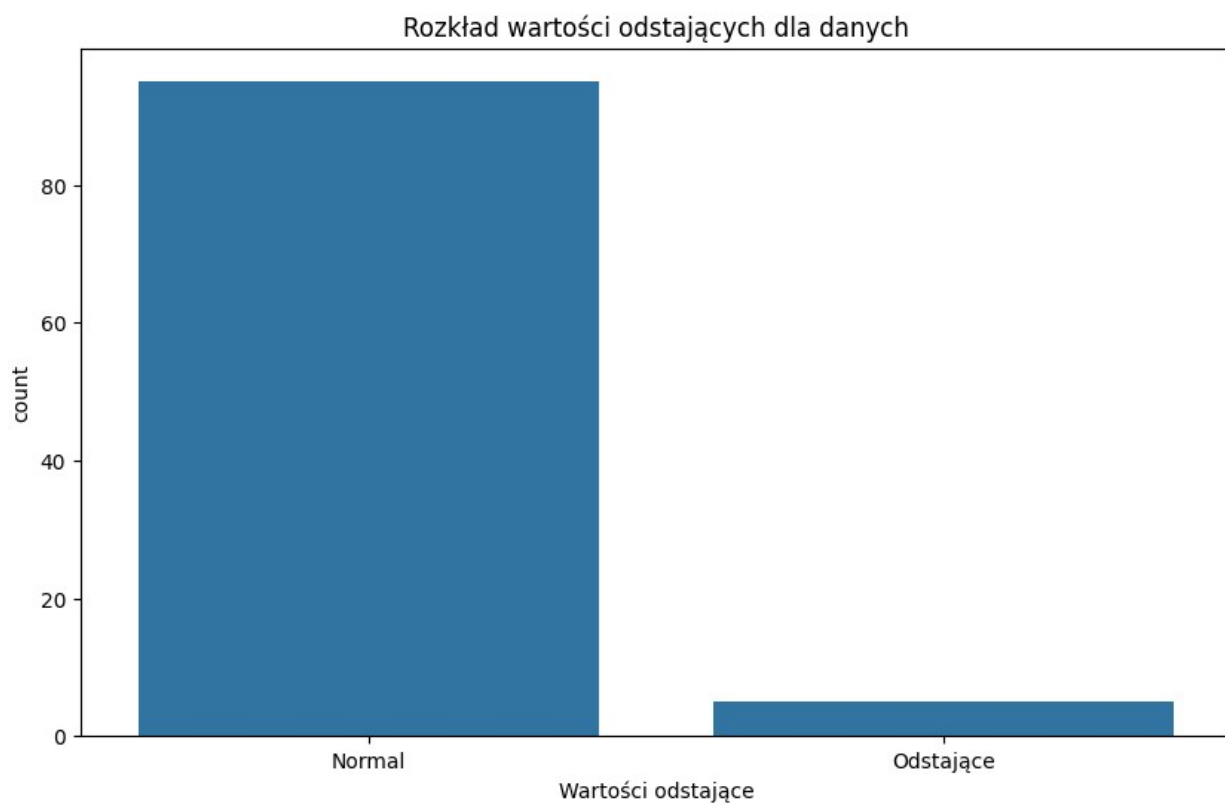
```
scaler = StandardScaler()
numerical_df_scaled = scaler.fit_transform(numerical_df)

# Model Isolation Forest
iso_forest = IsolationForest(contamination=0.05, random_state=42)
df['Wartości odstające'] = iso_forest.fit_predict(numerical_df_scaled)

# Oznaczenie wartości odstających (-1 oznacza odstające, 1 oznacza normalne)
df['Wartości odstające'] = df['Wartości odstające'].apply(lambda x:
    'Odstające' if x == -1 else 'Normal')

# Wizualizacja wyników
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='Wartości odstające')
plt.title("Rozkład wartości odstających dla danych")
plt.show()

# Analiza zmiennych z uwzględnieniem odstających wartości
plt.figure(figsize=(12, 8))
sns.boxplot(data=df, x='Wartości odstające', y='income')
plt.title("Dochód w podziale na wartości odstające")
plt.show()
```



```

# 2. Redukować wymiarowość danych z użyciem PCA,
# Redukcja do 2 wymiarów
pca = PCA(n_components=2)
pca_result = pca.fit_transform(numerical_df_scaled)
df['PC1'] = pca_result[:, 0]
df['PC2'] = pca_result[:, 1]

# Wynik w formie DataFrame
pca_df = pd.DataFrame(pca_result, columns=['PC1', 'PC2'])

explained_variance = pca.explained_variance_ratio_
print(f"Wariancja wyjaśniana przez każdą składową:
{explained_variance}")
print(f"Łączna wariancja: {sum(explained_variance):.2f}")

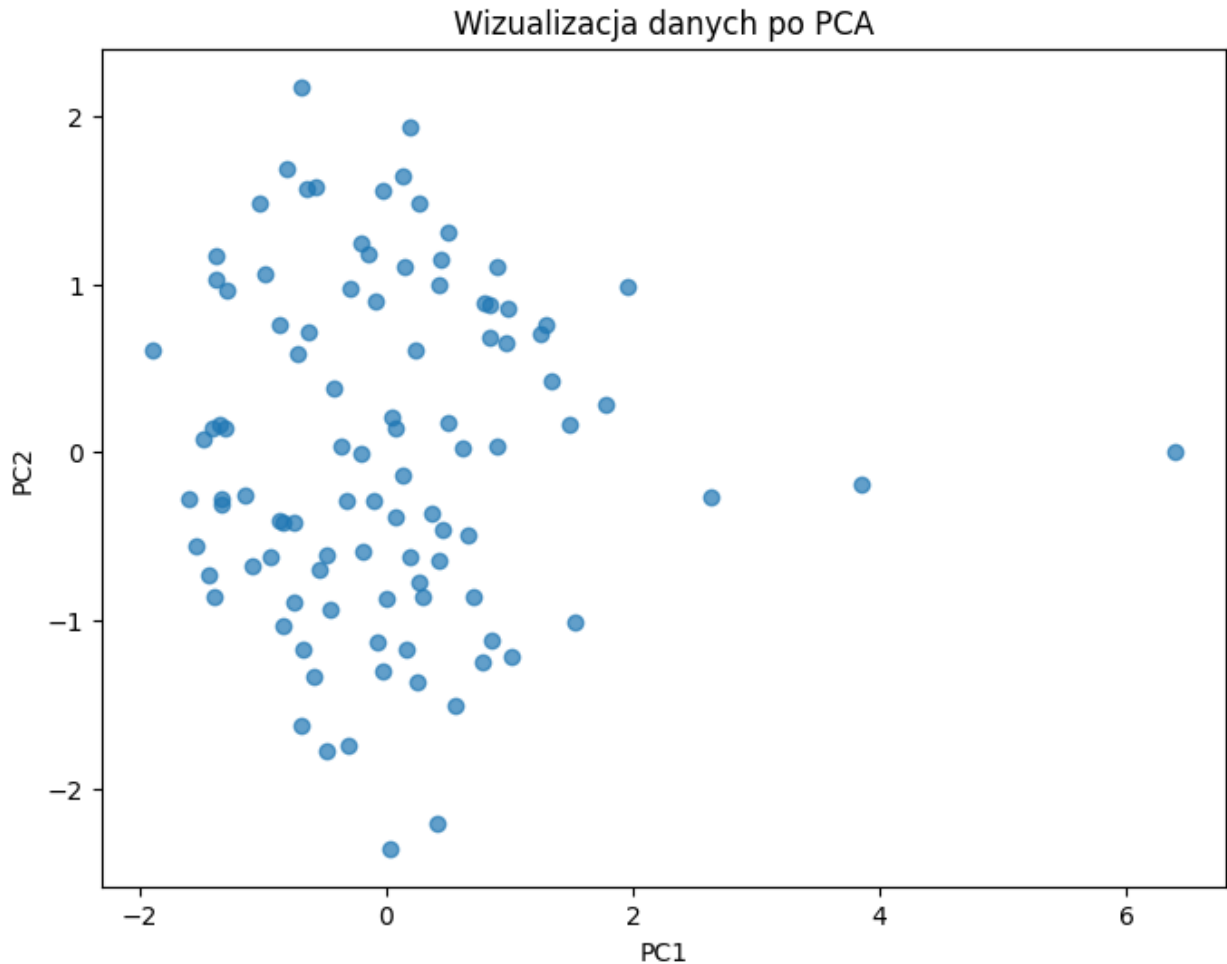
plt.figure(figsize=(8, 6))
plt.scatter(pca_df['PC1'], pca_df['PC2'], alpha=0.7)
plt.xlabel('PC1')
plt.ylabel('PC2')
plt.title('Wizualizacja danych po PCA')
plt.show()

```

```

Wariancja wyjaśniana przez każdą składową: [0.45100556 0.32383586]
Łączna wariancja: 0.77

```



```
# 3. Tworzyć zaawansowane interaktywne wizualizacje danych,
df['Różnica między dochodami a wydatkami'] = df['income'] -
df['outcome']
fig_pca = px.scatter(df, x='Różnica między dochodami a wydatkami',
y='savings', color='income', hover_data=['name', 'age', 'income',
'outcome', 'savings'], title='', labels={'income': 'Dochód
miesięczny'})
fig_pca.show()

{"config":{"plotlyServerURL":"https://plot.ly"},"data":[{"customdata":
[["Allison Hill",65,4245.13,2724.65],["Noah
Rhodes",59,2498.53,781.09],["Angie Henderson",35,4226.72,2928.29],
["Daniel Wagner",20,2716.85,1639.78],["Cristian
Santos",22,2644.28,1379.53],["Connie Lawrence",41,5454.19,3065.95],
["Abigail Shaffer",47,5303.63,2444.11],["Gina
Moore",69,4533.3,1158.85],["Gabrielle Davis",74,5230.72,2201.54],
["Ryan Munoz",43,2832.85,2734.97],["Monica
Herrera",61,3979.53,772.73],["Jamie Arnold",74,5747.25,1904.15],["Lisa
Hensley",66,3454.54,1380.5],["Michele Williams",79,3325.18,2416.85],
["Dylan Miller",33,4256.73,1965.82],["Brian
```

Ramirez",48,4668.91,2948.07],["Holly Wood",37,5104.54,1769.41],["Derek Zuniga",55,3758.11,2052.73],["Lisa Jackson",50,2620.08,2393.31],["Carla Gray",44,4071.63,2670.06],["Margaret Hawkins DDS",43,4998.32,1733.31],["Patty Perez",33,3170.83,1070.63],["Ethan Adams",44,2703.52,2456.43],["Tommy Walter",45,5197.57,993.91],["Matthew Foster",65,28730.73,2655.22],["Judy Baker",22,4055.44,1930.37],["Justin Baker",23,5151.7,3324.79],["Stephanie Ross",26,3380.75,1282.3],["Zachary Hicks",52,6779.96,3307.2],["Anthony Rodriguez",80,5130.68,3137.81],["Rebecca Henderson",74,4470.38,2163.81],["James Ferrell",49,3273.44,1131.89],["Tricia Valencia",80,2686.13,1770.73],["Nathan Maldonado",20,4587.57,2182.72],["Debra Davidson",61,3732.34,625.49],["Jeffrey Chavez",69,15598.84,3124.14],["Sherri Baker",28,4683.35,1496.56],["Cassandra Gaines",60,5061.64,1167.3],["Elizabeth Fowler",25,5397.36,1337.37],["Brittany Farmer",56,5383.86,1296.4],["Paula Moreno",45,2989.24,633.16],["Fred Smith",44,4331.78,2490.16],["Sherry Decker",53,2794.59,1761.34],["Anthony Humphrey",31,3732.65,2239.95],["Angelica Tucker",70,6678.77,754.39],["Philip Cannon",44,4596.389999999999,1097.39],["John Pierce",73,10285.42,1983.13],["Shane Henderson",47,3078.41,2912.33],["Joshua Blair",46,5462.47,2286.36],["Eric Carney",33,3795.22,2755.33],["Jessica Holmes",62,3126.93,1507.54],["Danny Morgan",55,3663.56,2127.83],["Crystal Robinson",65,8302.76,1930.94],["Mark Perez",28,3913.51,1318.81],["Shannon Jones",45,5555.780000000001,3220.79],["Michael Lewis",78,3206.48,1482.06],["Timothy Duncan",22,3857.95,2747.07],["Richard Aguirre",60,6124.12,1241.85],["Brent Jordan",70,6068.34,2800.69],["John Daniel",30,2479.6,1435.87],["Victoria Garcia",80,4652.83,2591.58],["Gerald Hensley",24,3727.97,1611.71],["Connor West",69,4592.66,1806.46],["Donald Wright",74,5250.280000000001,2693.08],["Jessica Callahan",31,4292.03,1636.97],["Amber Kidd",33,5128.99,2603.55],["Tracy House",32,8461.3,1928.28],["Carol Tucker",62,4202.82,1919.78],["James Brown",31,2774.03,1077.75],["William Baker",41,5427.48,2073.91],["Jordan Henderson",73,2792.41,636.55],["Whitney Peters",25,4179.6,1908.19],["Brittney Phillips",33,4188.77,2559.35],["Lauren Daniels",73,4247.99,2355.26],["Amy Silva",60,4325.18,2328.89],["Sarah Moore",32,2632.7,508.03],["Angela Lopez",25,2620.66,1200.27],["Megan Young",25,4962.56,714.23],["Steve Sanchez",65,6822.3,2001.42],["Lisa Barnes",20,3109.67,2522.9],["Kelly Donovan",48,4419.68,3248.22],["Mike Allen",53,2724.26,982.47],["Michael Evans",21,3402.15,3410.55],["Paul Jones",46,7993.97,1826.12],["Zachary Ferrell",44,6916.76,2326.62],["Daniel Baker",63,3830.49,852.4],["Shirley Suarez",35,3155.57,2153.8],["Christopher Bass",46,5296.17,2023.21],["Lisa Archer",42,4764.91,1631.63],["Aimee Montoya",79,3386.35,1918.93],["Matthew Mcmillan",27,4929.18,801.09],["Brian Rodriguez",23,2631.97,2844.58],["Denise

```

Jacobs",22,5078.0300000000001,1449.98],["Christina
Walters",28,6992.02,2740.3],["John Whitehead",44,3405.56,668.36],
["Anna Henderson",27,2942.72,2328.48],["Aaron
Wise",46,3191.51,528.19],["Deborah Figueroa",72,4380.71,1772.93],
["Jessica Smith",18,3512.77,1387.62],["Stephen
Mckee",69,9894.41,3231.85]],"hovertemplate":"Różnica między dochodami
a wydatkami=%{x}<br>savings=%{y}<br>name=%{customdata[0]}<br>age=%
{customdata[1]}<br>Dochód miesięczny=%{marker.color}<br>outcome=%
{customdata[3]}<extra></extra>","legendgroup":"","marker":{"color":
[4245.13,2498.53,4226.72,2716.85,2644.28,5454.19,5303.63,4533.3,5230.7
2,2832.85,3979.53,5747.25,3454.54,3325.18,4256.73,4668.91,5104.54,3758
.11,2620.08,4071.63,4998.32,3170.83,2703.52,5197.57,28730.73,4055.44,5
151.7,3380.75,6779.96,5130.68,4470.38,3273.44,2686.13,4587.57,3732.34,
15598.84,4683.35,5061.64,5397.36,5383.86,2989.24,4331.78,2794.59,3732.
65,6678.77,4596.3899999999999,10285.42,3078.41,5462.47,3795.22,3126.93,
3663.56,8302.76,3913.51,5555.7800000000001,3206.48,3857.95,6124.12,6068
.34,2479.6,4652.83,3727.97,4592.66,5250.2800000000001,4292.03,5128.99,8
461.3,4202.82,2774.03,5427.48,2792.41,4179.6,4188.77,4247.99,4325.18,2
632.7,2620.66,4962.56,6822.3,3109.67,4419.68,2724.26,3402.15,7993.97,6
916.76,3830.49,3155.57,5296.17,4764.91,3386.35,4929.18,2631.97,5078.03
00000000001,6992.02,3405.56,2942.72,3191.51,4380.71,3512.77,9894.41],"c
oloraxis":"coloraxis","symbol":"circle"},"mode":"markers","name":"","o
rientation":"v","showlegend":false,"type":"scatter","x":
[1520.48,1717.44,1298.43000000000003,1077.07,1264.75000000000002,2388.24
,2859.52,3374.45000000000003,3029.18000000000003,97.880000000000011,3206.
8,3843.1,2074.04,908.3299999999999,2290.91,1720.8399999999997,3335.13,
1705.38,226.76999999999998,1401.57000000000002,3265.0099999999998,2100.
2,247.090000000000015,4203.66,26075.51,2125.07,1826.9099999999999,2098.
45,3472.76,1992.87000000000003,2306.57,2141.55,915.40000000000001,2404.8
5,3106.85000000000004,12474.7,3186.79000000000004,3894.34,4059.99,4087.4
599999999996,2356.08,1841.62,1033.25000000000002,1492.70000000000003,592
4.38,3498.9999999999999,8302.29,166.07999999999993,3176.11,1039.8899999
999999,1619.3899999999999,1535.73,6371.82,2594.70000000000003,2334.9900
000000007,1724.42,1110.8799999999999,4882.27,3267.65,1043.73,2061.25,2
116.25999999999998,2786.2,2557.20000000000007,2655.0599999999995,2525.43
999999999996,6533.0199999999995,2283.04,1696.28000000000002,3353.5699999
999997,2155.8599999999997,2271.41000000000003,1629.42000000000005,1892.7
299999999996,1996.29000000000004,2124.67,1420.3899999999999,4248.33,482
0.88,586.77,1171.46000000000005,1741.79000000000002,-
8.4000000000000091,6167.85,4590.14,2978.0899999999997,1001.77,3272.96,3
133.2799999999997,1467.4199999999998,4128.09,-
212.610000000000013,3628.05000000000006,4251.72,2737.2,614.2399999999998
,2663.32,2607.7799999999997,2125.15,6662.5599999999995],"xaxis":"x","y
":
[5580.27,12633.88,18970.18,21187.36,34740.79,9503.16,35399.13,21071.3,
254540.62,6568.54,21527.57,24276.96,11343.09,17956.44,23227.47,396259.
01,23222.84,6197.64,1685.01,33048.47,85211.27,3504.56,20900.69,24632.7
2,4747.45,3935.82,19848.61,38647.67,11457.14,7124.68,14143.46,5089.93,
1102.17,1881.1,22474.54,39979.1,20055.88,8741.46,30376.23,14914.28,42.

```

```

28,17993.86,16932.95,22889.97,16596.35,1155.34,3689.28,386672.54,62942
6.85,21092.45,2014.44,1556.64,7465.32,725.62,32575.68,8171.15,24997.7,
15533.39,15147.32,640217,21257.33,16188.58,389135.39,8057.61,12357.66,
13894.78,369033.87,8593.93,18572.03,24512.77,13833.97,8517.65,3729.94,
389672.15,114501.82,17234.28,19695.7,19815.71,10943.97,33484.92,24923.
64,17341.84,21622.76,5088.96,17744.57,12459.39,4765.26,7070.97,21740.0
4,9651.97,2492.79,8464.03,626835.14,24458.44,9371.03,15492.76,22530.24
,11420.9,241899.99,372872.74],"yaxis":"y"}],"layout":{"coloraxis":
{"colorbar":{"title":{"text":"Dochód miesięczny"}},"colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]]},"legend":
{"tracegroupgap":0},"margin":{"t":60},"template":{"data":{"bar":
{"error_x":{"color":"#2a3f5f"},"error_y":
{"color":"#2a3f5f"},"marker":{"line":
{"color":"#E5ECF6","width":0.5},"pattern":
{"fillmode":"overlay","size":10,"solidity":0.2}},"type":"bar"}},{"barpo
lar":{"marker":{"line":{"color":"#E5ECF6","width":0.5},"pattern":
{"fillmode":"overlay","size":10,"solidity":0.2}},"type":"barpolar"}},
"carpet":[{"aaxis":
{"endlinecolor":"#2a3f5f","gridcolor":"white","linecolor":"white","min
orgridcolor":"white","startlinecolor":"#2a3f5f"},"baxis":
{"endlinecolor":"#2a3f5f","gridcolor":"white","linecolor":"white","min
orgridcolor":"white","startlinecolor":"#2a3f5f"},"type":"carpet"}],"ch
oropleth":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"choropleth"}],"contour":
{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]]},"type":"contour"}],"contourcarpet":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"contourcarpet"}],"heatmap":
{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]]},"type":"heatmap"}],"heatmapgl":[{"colorbar":
{"outlinewidth":0,"ticks":"","colorscale":[[0,"#0d0887"],
[0.1111111111111111,"#46039f"],[0.2222222222222222,"#7201a8"],
[0.3333333333333333,"#9c179e"],[0.4444444444444444,"#bd3786"],
[0.5555555555555556,"#d8576b"],[0.6666666666666666,"#ed7953"],
[0.7777777777777778,"#fb9f3a"],[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]]},"type":"heatmapgl"}],"histogram":[{"marker":{"pattern":

```



```

{"fillmode":"overlay","size":10,"solidity":0.2},"type":"histogram"}],
"histogram2d":[{"colorbar":{"linewidth":0,"ticks":"","","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"histogram2d"}],"histogram2dcontour":
{"colorbar":{"linewidth":0,"ticks":"","","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"histogram2dcontour"}],"mesh3d":[{"colorbar":
{"linewidth":0,"ticks":"","","type":"mesh3d"}],"parcoords":[{"line":
{"colorbar":{"linewidth":0,"ticks":"","","type":"parcoords"}],"pie":
[{"automargin":true,"type":"pie"}],"scatter":[{"fillpattern":
{"fillmode":"overlay","size":10,"solidity":0.2},"type":"scatter"}],"scatter3d":[{"line":{"colorbar":{"linewidth":0,"ticks":"","","marker":
{"colorbar":
{"linewidth":0,"ticks":"","","type":"scatter3d"}],"scattercarpet":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scattercarpet"}],"scattergeo":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scattergeo"}],"scattergl":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scattergl"}],"scattermapbox":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scattermapbox"}],"scatterpolar":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scatterpolar"}],"scatterpolargl":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scatterpolargl"}],"scatterternary":
[{"marker":{"colorbar":
{"linewidth":0,"ticks":"","","type":"scatterternary"}],"surface":
[{"colorbar":{"linewidth":0,"ticks":"","","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"surface"}],"table":[{"cells":{"fill":
{"color":"#EBF0F8"},"line":{"color":"white"}],"header":{"fill":
{"color":"#C8D4E3"},"line":
{"color":"white"}],"type":"table"}],"layout":{"annotationdefaults":
{"arrowcolor":"#2a3f5f","arrowhead":0,"arrowwidth":1},"autotypenumbers":
"strict","coloraxis":{"colorbar":
{"linewidth":0,"ticks":"","","colorscale":{"diverging":

```



```

[[0,"#8e0152"],[0.1,"#c51b7d"],[0.2,"#de77ae"],[0.3,"#f1b6da"],
[0.4,"#fde0ef"],[0.5,"#f7f7f7"],[0.6,"#e6f5d0"],[0.7,"#b8e186"],
[0.8,"#7fb341"],[0.9,"#4d9221"],[1,"#276419"]], "sequential":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]], "sequentialminus":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]]], "colorway":
["#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
"#B6E880", "#FF97FF", "#FECB52"], "font": {"color": "#2a3f5f"}, "geo":
{"bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white"}, "hoverlabel":
{"align": "left"}, "hovermode": "closest", "mapbox":
{"style": "light"}, "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": {"angularaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "radialaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "scene":
{"xaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"},
"yaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"},
"zaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
}, "shapedefaults": {"line": {"color": "#2a3f5f"}}, "ternary": {"aaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "baxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "caxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "title":
{"x": 5.0e-2, "xaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}, "yaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}}}, "xaxis":
{"anchor": "y", "domain": [0, 1], "title": {"text": "Różnica między dochodami
a wydatkami"}}, "yaxis": {"anchor": "x", "domain": [0, 1], "title":
{"text": "savings"}}}]

```

```

fig_box = px.box(df, x='Wartości odstające', y='income',
color='Wartości odstające',

```

[illegible]

```

orgridcolor":"white","startlinecolor":"#2a3f5f"},"baxis":
{"endlinecolor":"#2a3f5f","gridcolor":"white","linecolor":"white","min
orgridcolor":"white","startlinecolor":"#2a3f5f"},"type":"carpet"},"ch
oropleth":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"choropleth"},"contour":
[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"contour"},"contourcarpet":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"contourcarpet"},"heatmap":
[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"heatmap"},"heatmapgl":[{"colorbar":
{"outlinewidth":0,"ticks":"","colorscale":[[0,"#0d0887"],
[0.1111111111111111,"#46039f"],[0.2222222222222222,"#7201a8"],
[0.3333333333333333,"#9c179e"],[0.4444444444444444,"#bd3786"],
[0.5555555555555556,"#d8576b"],[0.6666666666666666,"#ed7953"],
[0.7777777777777778,"#fb9f3a"],[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"heatmapgl"},"histogram":[{"marker":{"pattern":
{"fillmode":"overlay","size":10,"solidity":0.2},"type":"histogram"}},
"histogram2d":[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"histogram2d"},"histogram2dcontour":
[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"histogram2dcontour"},"mesh3d":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"mesh3d"},"parcoords":[{"line":
{"colorbar":{"outlinewidth":0,"ticks":"","type":"parcoords"},"pie":
[{"automargin":true,"type":"pie"},"scatter":[{"fillpattern":
{"fillmode":"overlay","size":10,"solidity":0.2},"type":"scatter"},"sc
atter3d":[{"line":{"colorbar":{"outlinewidth":0,"ticks":"","type":"scatter3d"},"marker":
{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scatter3d"},"scattercarpet":
[{"marker":{"colorbar":

```

```

{"outlinewidth":0,"ticks":"","type":"scattercarpet"},"scattergeo":
[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scattergeo"},"scattergl":
[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scattergl"},"scattermapbox":
[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scattermapbox"},"scatterpolar":
[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scatterpolar"},"scatterpolargl":
[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scatterpolargl"},"scatterterna
ry":[{"marker":{"colorbar":
{"outlinewidth":0,"ticks":"","type":"scatterternary"},"surface":
[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]],"type":"surface"},"table":[{"cells":{"fill":
{"color":"#EBF0F8"},"line":{"color":"white"},"header":{"fill":
{"color":"#C8D4E3"},"line":
{"color":"white"},"type":"table"}]},"layout":{"annotationdefaults":
{"arrowcolor":"#2a3f5f","arrowhead":0,"arrowwidth":1},"autotypenumbers
":"strict","coloraxis":{"colorbar":
{"outlinewidth":0,"ticks":"","colorscale":{"diverging":
[[0,"#8e0152"],[0.1,"#c51b7d"],[0.2,"#de77ae"],[0.3,"#f1b6da"],
[0.4,"#fde0ef"],[0.5,"#f7f7f7"],[0.6,"#e6f5d0"],[0.7,"#b8e186"],
[0.8,"#7fbca1"],[0.9,"#4d9221"],[1,"#276419"]],"sequential":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]],"sequentialminus":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]]}],"colorway":
["#636efa","#EF553B","#00cc96","#ab63fa","#FFA15A","#19d3f3","#FF6692",
"#B6E880","#FF97FF","#FECB52"],"font":{"color":"#2a3f5f"},"geo":
{"bgcolor":"white","lakecolor":"white","landcolor":"#E5ECF6","showlake
s":true,"showland":true,"subunitcolor":"white"},"hoverlabel":
{"align":"left"},"hovermode":"closest","mapbox":
{"style":"light"},"paper_bgcolor":"white","plot_bgcolor":"#E5ECF6","po
lar":{"angularaxis":
{"gridcolor":"white","linecolor":"white","ticks":"","bgcolor":"#E5ECF
6","radialaxis":
{"gridcolor":"white","linecolor":"white","ticks":"","scene":

```


[illegible]


```

[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar":
{"linewidth":0, "ticks":""}, "type": "contourcarpet"}], "heatmap":
[{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar":
{"linewidth":0, "ticks":""}, "colorscale": [[0, "#0d0887"],
[0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"],
[0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"],
[0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"],
[0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}],
"histogram2d": [{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2d"}], "histogram2dcontour":
[{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth":0, "ticks":""}, "type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth":0, "ticks":""}, "type": "parcoords"}], "pie":
[{"automargin": true, "type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}, "type": "scatter"}], "scatter3d": [{"line": {"colorbar": {"linewidth":0, "ticks":""}, "marker":
{"colorbar":
{"linewidth":0, "ticks":""}, "type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattermapbox"}], "scatterpolar":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scatterpolar"}], "scatterpolargl":

```



```

": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterpolargl"}], "scatterterna
ry": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, "line": {"color": "white"}}, "header": {"fill":
{"color": "#C8D4E3"}, "line":
{"color": "white"}}, "type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead": 0, "arrowwidth": 1}, "autotypenumbers
": "strict", "coloraxis": {"colorbar":
{"linewidth": 0, "ticks": ""}, "colorscale": {"diverging":
[[0, "#8e0152"], [0.1, "#c51b7d"], [0.2, "#de77ae"], [0.3, "#f1b6da"],
[0.4, "#fde0ef"], [0.5, "#f7f7f7"], [0.6, "#e6f5d0"], [0.7, "#b8e186"],
[0.8, "#7fbc41"], [0.9, "#4d9221"], [1, "#276419"]], "sequential":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "sequentialminus":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "colorway":
["#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
"#B6E880", "#FF97FF", "#FECB52"], "font": {"color": "#2a3f5f"}, "geo":
{"bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white"}, "hoverlabel":
{"align": "left"}, "hovermode": "closest", "mapbox":
{"style": "light"}, "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": {"angularaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "radialaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "scene":
{"xaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "yaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "zaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}

```

```

}, "shapedefaults": {"line": {"color": "#2a3f5f"}}, "ternary": {"aaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "baxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "caxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "title":
{"x": 5.0e-2, "xaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}, "yaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}}}, "title":
{"text": "Rozkład wartości odstających w danych"}, "xaxis":
{"anchor": "y", "categoryarray":
["Normal", "Odstające"], "categoryorder": "array", "domain": [0, 1], "title":
{"text": "Wartości odstające"}}, "xaxis2": {"anchor": "y2", "domain":
[0, 1], "matches": "x", "showgrid": true, "showticklabels": false}, "yaxis":
{"anchor": "x", "domain": [0, 0.7326], "title": {"text": "count"}}, "yaxis2":
{"anchor": "x2", "domain":
[0.7426, 1], "matches": "y2", "showgrid": false, "showline": false, "showtickl
abels": false, "ticks": ""}}}]

```

```

fig_children_income = px.scatter(df, x='children', y='income',
color='income', hover_data=['name', 'age', 'income'],
                                title='Zależność między liczbą dzieci
a dochodem')
fig_children_income.show()

```

```

{"config": {"plotlyServerURL": "https://plot.ly"}, "data": [{"customdata":
[["Allison Hill", 65], ["Noah Rhodes", 59], ["Angie Henderson", 35],
["Daniel Wagner", 20], ["Cristian Santos", 22], ["Connie Lawrence", 41],
["Abigail Shaffer", 47], ["Gina Moore", 69], ["Gabrielle Davis", 74], ["Ryan
Munoz", 43], ["Monica Herrera", 61], ["Jamie Arnold", 74], ["Lisa
Hensley", 66], ["Michele Williams", 79], ["Dylan Miller", 33], ["Brian
Ramirez", 48], ["Holly Wood", 37], ["Derek Zuniga", 55], ["Lisa
Jackson", 50], ["Carla Gray", 44], ["Margaret Hawkins DDS", 43], ["Patty
Perez", 33], ["Ethan Adams", 44], ["Tommy Walter", 45], ["Matthew
Foster", 65], ["Judy Baker", 22], ["Justin Baker", 23], ["Stephanie
Ross", 26], ["Zachary Hicks", 52], ["Anthony Rodriguez", 80], ["Rebecca
Henderson", 74], ["James Ferrell", 49], ["Tricia Valencia", 80], ["Nathan
Maldonado", 20], ["Debra Davidson", 61], ["Jeffrey Chavez", 69], ["Sherri
Baker", 28], ["Cassandra Gaines", 60], ["Elizabeth Fowler", 25], ["Brittany
Farmer", 56], ["Paula Moreno", 45], ["Fred Smith", 44], ["Sherry
Decker", 53], ["Anthony Humphrey", 31], ["Angelica Tucker", 70], ["Philip
Cannon", 44], ["John Pierce", 73], ["Shane Henderson", 47], ["Joshua
Blair", 46], ["Eric Carney", 33], ["Jessica Holmes", 62], ["Danny
Morgan", 55], ["Crystal Robinson", 65], ["Mark Perez", 28], ["Shannon
Jones", 45], ["Michael Lewis", 78], ["Timothy Duncan", 22], ["Richard
Aguirre", 60], ["Brent Jordan", 70], ["John Daniel", 30], ["Victoria
Garcia", 80], ["Gerald Hensley", 24], ["Connor West", 69], ["Donald

```

```

Wright",74],["Jessica Callahan",31],["Amber Kidd",33],["Tracy
House",32],["Carol Tucker",62],["James Brown",31],["William
Baker",41],["Jordan Henderson",73],["Whitney Peters",25],["Brittney
Phillips",33],["Lauren Daniels",73],["Amy Silva",60],["Sarah
Moore",32],["Angela Lopez",25],["Megan Young",25],["Steve
Sanchez",65],["Lisa Barnes",20],["Kelly Donovan",48],["Mike
Allen",53],["Michael Evans",21],["Paul Jones",46],["Zachary
Ferrell",44],["Daniel Baker",63],["Shirley Suarez",35],["Christopher
Bass",46],["Lisa Archer",42],["Aimee Montoya",79],["Matthew
Mcmillan",27],["Brian Rodriguez",23],["Denise Jacobs",22],["Christina
Walters",28],["John Whitehead",44],["Anna Henderson",27],["Aaron
Wise",46],["Deborah Figueroa",72],["Jessica Smith",18],["Stephen
Mckee",69]],"hvertemplate":"children=%{x}<br>income=%
{marker.color}<br>name=%{customdata[0]}<br>age=%
{customdata[1]}<extra></extra>","legendgroup":"","marker":{"color":
[4245.13,2498.53,4226.72,2716.85,2644.28,5454.19,5303.63,4533.3,5230.7
2,2832.85,3979.53,5747.25,3454.54,3325.18,4256.73,4668.91,5104.54,3758
.11,2620.08,4071.63,4998.32,3170.83,2703.52,5197.57,28730.73,4055.44,5
151.7,3380.75,6779.96,5130.68,4470.38,3273.44,2686.13,4587.57,3732.34,
15598.84,4683.35,5061.64,5397.36,5383.86,2989.24,4331.78,2794.59,3732.
65,6678.77,4596.389999999999,10285.42,3078.41,5462.47,3795.22,3126.93,
3663.56,8302.76,3913.51,5555.780000000001,3206.48,3857.95,6124.12,6068
.34,2479.6,4652.83,3727.97,4592.66,5250.280000000001,4292.03,5128.99,8
461.3,4202.82,2774.03,5427.48,2792.41,4179.6,4188.77,4247.99,4325.18,2
632.7,2620.66,4962.56,6822.3,3109.67,4419.68,2724.26,3402.15,7993.97,6
916.76,3830.49,3155.57,5296.17,4764.91,3386.35,4929.18,2631.97,5078.03
0000000001,6992.02,3405.56,2942.72,3191.51,4380.71,3512.77,9894.41],"c
oloraxis":"coloraxis","symbol":"circle"},"mode":"markers","name":"","o
rientation":"v","showlegend":false,"type":"scatter","x":
[5,0,1,4,2,3,4,0,5,4,1,0,5,2,2,1,5,0,0,1,5,1,0,2,1,4,4,1,4,3,1,5,2,5,0
,1,5,1,5,2,4,2,1,3,4,3,5,0,4,4,1,3,3,2,0,3,2,1,5,3,4,0,5,1,2,4,0,5,5,1
,5,0,4,3,1,3,5,4,4,0,3,2,0,4,2,5,4,2,5,5,3,5,3,5,1,1,5,2,5,2],"xaxis":
"x","y":
[4245.13,2498.53,4226.72,2716.85,2644.28,5454.19,5303.63,4533.3,5230.7
2,2832.85,3979.53,5747.25,3454.54,3325.18,4256.73,4668.91,5104.54,3758
.11,2620.08,4071.63,4998.32,3170.83,2703.52,5197.57,28730.73,4055.44,5
151.7,3380.75,6779.96,5130.68,4470.38,3273.44,2686.13,4587.57,3732.34,
15598.84,4683.35,5061.64,5397.36,5383.86,2989.24,4331.78,2794.59,3732.
65,6678.77,4596.389999999999,10285.42,3078.41,5462.47,3795.22,3126.93,
3663.56,8302.76,3913.51,5555.780000000001,3206.48,3857.95,6124.12,6068
.34,2479.6,4652.83,3727.97,4592.66,5250.280000000001,4292.03,5128.99,8
461.3,4202.82,2774.03,5427.48,2792.41,4179.6,4188.77,4247.99,4325.18,2
632.7,2620.66,4962.56,6822.3,3109.67,4419.68,2724.26,3402.15,7993.97,6
916.76,3830.49,3155.57,5296.17,4764.91,3386.35,4929.18,2631.97,5078.03
0000000001,6992.02,3405.56,2942.72,3191.51,4380.71,3512.77,9894.41],"y
axis":"y"}],"layout":{"coloraxis":{"colorbar":{"title":
{"text":"income"}}, "colorscale":[[0,"#0d0887"],
[0.1111111111111111,"#46039f"],[0.2222222222222222,"#7201a8"],
[0.3333333333333333,"#9c179e"],[0.4444444444444444,"#bd3786"],

```

```

[0.5555555555555556,"#d8576b"],[0.6666666666666666,"#ed7953"],
[0.7777777777777778,"#fb9f3a"],[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]]], "legend": {"tracegroupgap":0}, "template": {"data":
{"bar": [{"error_x": {"color": "#2a3f5f"}, "error_y":
{"color": "#2a3f5f"}, "marker": {"line":
{"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "bar"}], "barpo
lar": [{"marker": {"line": {"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "barpolar"}], "
carpet": [{"aaxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "baxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "type": "carpet"}], "ch
oropleth": [{"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "choropleth"}], "contour":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "contourcarpet"}], "heatmap":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar":
{"linewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"],
[0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"],
[0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"],
[0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"],
[0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}],
"histogram2d": [{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2d"}], "histogram2dcontour":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],

```

```

[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth":0, "ticks":""}, {"type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth":0, "ticks":""}, {"type": "parcoords"}], "pie":
[{"automargin":true, {"type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size":10, "solidity":0.2}, {"type": "scatter"}], "scatter3d": [{"line": {"colorbar": {"linewidth":0, "ticks":""}, {"marker":
{"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattermapbox"}], "scatterpolar":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterpolar"}], "scatterpolargl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterpolargl"}], "scatterternary":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth":0, "ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, {"line": {"color": "white"}}, {"header": {"fill":
{"color": "#C8D4E3"}, {"line":
{"color": "white"}}, {"type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead":0, "arrowwidth":1}, "autotypenumbers":
"strict", "coloraxis": {"colorbar":
{"linewidth":0, "ticks":""}, {"colorscale": {"diverging":
[[0,"#8e0152"],[0.1,"#c51b7d"],[0.2,"#de77ae"],[0.3,"#f1b6da"],
[0.4,"#fde0ef"],[0.5,"#f7f7f7"],[0.6,"#e6f5d0"],[0.7,"#b8e186"],
[0.8,"#7fb341"],[0.9,"#4d9221"],[1,"#276419"]], "sequential":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]], "sequentialminus":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],

```



```
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]]], "colorway":
["#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
"#B6E880", "#FF97FF", "#FECB52"], "font": {"color": "#2a3f5f"}, "geo":
{"bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white"}, "hoverlabel":
{"align": "left"}, "hovermode": "closest", "mapbox":
{"style": "light"}, "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": {"angularaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "radialaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "scene":
{"xaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"},
"yaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"},
"zaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
}, "shapedefaults": {"line": {"color": "#2a3f5f"}}, "ternary": {"aaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "baxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "caxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "title":
{"x": 5.0e-2}, "xaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}, "yaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}}}, "title":
{"text": "Zależność między liczbą dzieci a dochodem"}, "xaxis":
{"anchor": "y", "domain": [0, 1], "title": {"text": "children"}}, "yaxis":
{"anchor": "x", "domain": [0, 1], "title": {"text": "income"}}}]}
```

4. Zwizualizować dane wielowymiarowe za pomocą zaawansowanych algorytmów (t-SNE, UMAP)

```
from sklearn.manifold import TSNE
from umap import UMAP
```

```
columns_of_interest = ['age', 'income', 'outcome', 'savings',
'credit_score', 'spending_score']
X = df[columns_of_interest]
```

```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

```
# Użycie UMAP do redukcji wymiarowości
umap_model = UMAP(n_components=2, random_state=42)
umap_results = umap_model.fit_transform(X_scaled)

tsne_model = TSNE(n_components=2, random_state=42, perplexity=30,
n_iter=300)
tsne_results = tsne_model.fit_transform(X_scaled)

umap_df = pd.DataFrame(umap_results, columns=['UMAP1', 'UMAP2'])
tsne_df = pd.DataFrame(tsne_results, columns=['t-SNE1', 't-SNE2'])
df_umap = pd.concat([df, umap_df], axis=1)
df_tsne = pd.concat([df, tsne_df], axis=1)
```

```
# UMAP
```

```
plt.figure(figsize=(10, 8))
sns.scatterplot(data=df_umap, x='UMAP1', y='UMAP2', hue='city',
palette='viridis', s=100, alpha=0.8)
plt.title('UMAP Visualization')
plt.show()
```

```
# t-SNE
```

```
plt.figure(figsize=(10, 8))
sns.scatterplot(data=df_tsne, x='t-SNE1', y='t-SNE2', hue='city',
palette='viridis', s=100, alpha=0.8)
plt.title('t-SNE Visualization')
plt.show()
```

```
c:\Programs\Pythonek\3.11\Lib\site-packages\sklearn\utils\
deprecation.py:151: FutureWarning:
```

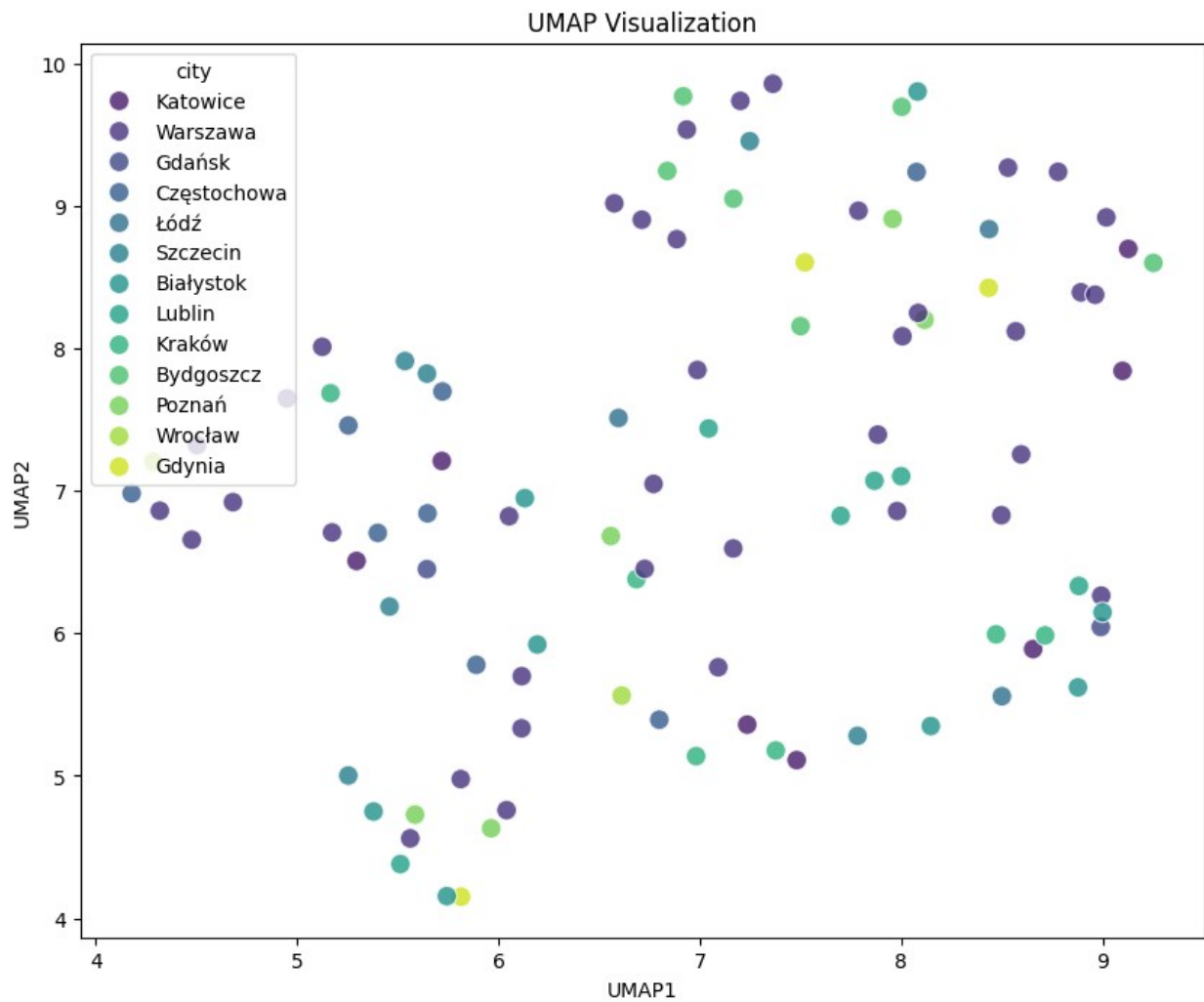
```
'force_all_finite' was renamed to 'ensure_all_finite' in 1.6 and will
be removed in 1.8.
```

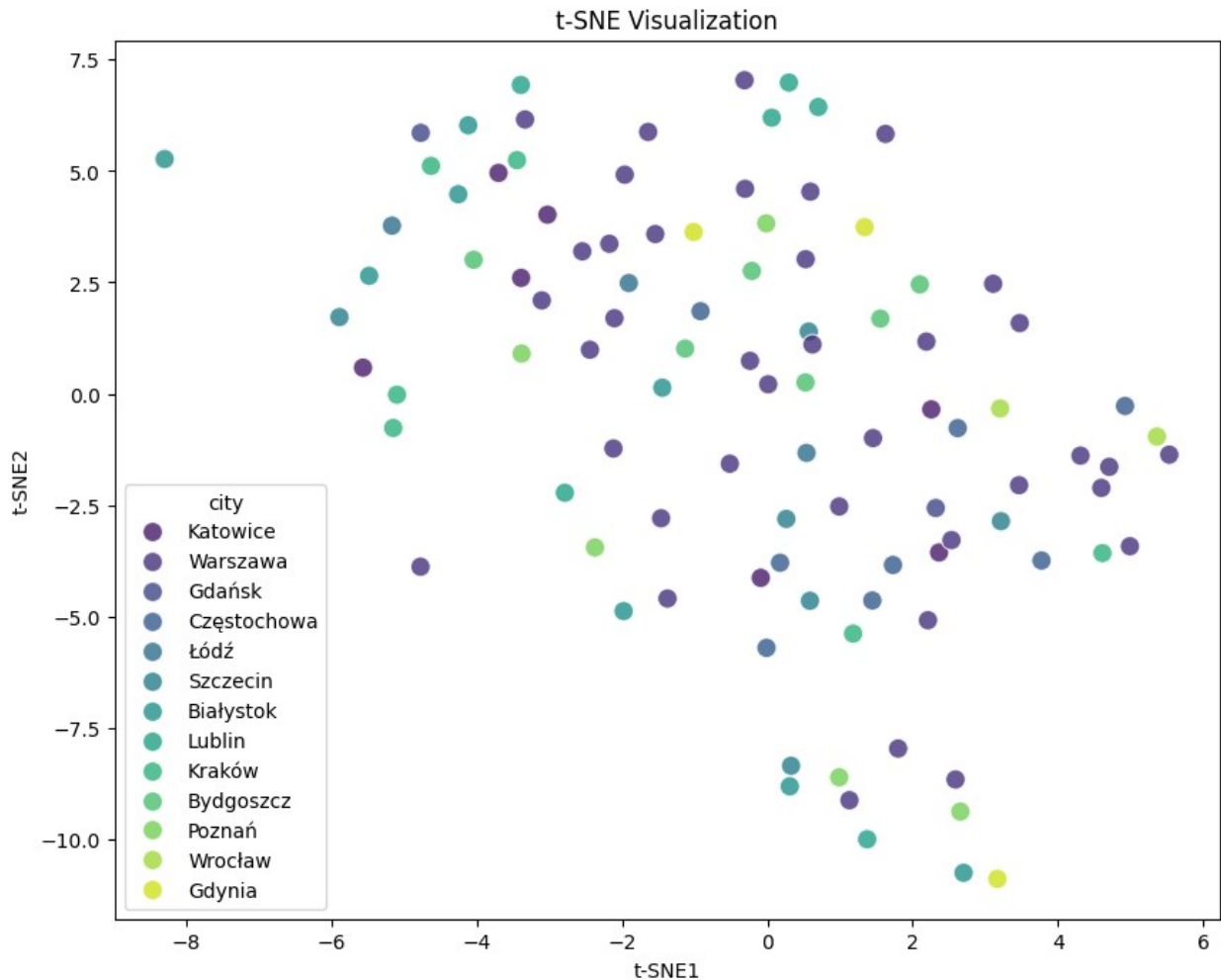
```
c:\Programs\Pythonek\3.11\Lib\site-packages\umap\umap_.py:1952:
UserWarning:
```

```
n_jobs value 1 overridden to 1 by setting random_state. Use no seed
for parallelism.
```

```
c:\Programs\Pythonek\3.11\Lib\site-packages\sklearn\manifold\
_t_sne.py:1164: FutureWarning:
```

```
'n_iter' was renamed to 'max_iter' in version 1.5 and will be removed
in 1.7.
```



```
# 5. tworzyć interaktywne wizualizacje danych w 2D i 3D,
fig = px.scatter(df, x='income', y='outcome', color='city',
hover_data=['name', 'city'])
fig.update_layout(title="Wykres dochodów i wydatków w zależności od
miasta",
                  xaxis_title="Dochód",
                  yaxis_title="Wydatki")
fig.show()

fig = px.scatter(df, x='savings', y='children',
color='employment_status', hover_data=['name', 'employment_status'])
fig.update_layout(title="Zależność między oszczędnościami a liczbą
dzieci",
                  xaxis_title="Oszczędności",
                  yaxis_title="Liczba dzieci")
fig.show()
```

```
fig = px.scatter_3d(df, x='credit_score', y='age', z='spending_score',
color='city', hover_data=['name'])
fig.update_layout(title="Zależność między wiekiem, punktami
kredytowymi i wydatkami",)
fig.show()
```

```
{
  "config": {
    "plotlyServerURL": "https://plot.ly"
  },
  "data": [
    {
      "customdata": [
        ["Allison Hill", "Katowice"],
        ["Jamie Arnold", "Katowice"],
        ["Fred Smith", "Katowice"],
        ["Anthony Humphrey", "Katowice"],
        ["Eric Carney", "Katowice"],
        ["Shannon Jones", "Katowice"],
        ["Brian Rodriguez", "Katowice"]
      ],
      "hovertemplate": "city=%  
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%  
{customdata[0]}<extra></extra>",
      "legendgroup": "Katowice",
      "marker": {
        "color": "#636efa",
        "symbol": "circle"
      },
      "mode": "markers",
      "name": "Katowice",
      "orientation": "v",
      "showlegend": true,
      "type": "scatter",
      "x": [
        4245.13, 5747.25, 4331.78, 3732.65, 3795.22, 5555.78, 0, 0, 0, 0, 0, 0, 1, 2631.97
      ],
      "xaxis": "x",
      "y": [
        2724.65, 1904.15, 2490.16, 2239.95, 2755.33, 3220.79, 2844.58
      ],
      "yaxis": "y"
    },
    {
      "customdata": [
        ["Noah Rhodes", "Warszawa"],
        ["Cristian Santos", "Warszawa"],
        ["Abigail Shaffer", "Warszawa"],
        ["Gina Moore", "Warszawa"],
        ["Monica Herrera", "Warszawa"],
        ["Michele Williams", "Warszawa"],
        ["Dylan Miller", "Warszawa"],
        ["Brian Ramirez", "Warszawa"],
        ["Holly Wood", "Warszawa"],
        ["Derek Zuniga", "Warszawa"],
        ["Margaret Hawkins DDS", "Warszawa"],
        ["Ethan Adams", "Warszawa"],
        ["Tricia Valencia", "Warszawa"],
        ["Nathan Maldonado", "Warszawa"],
        ["Jeffrey Chavez", "Warszawa"],
        ["Sherri Baker", "Warszawa"],
        ["Cassandra Gaines", "Warszawa"],
        ["Elizabeth Fowler", "Warszawa"],
        ["Paula Moreno", "Warszawa"],
        ["Shane Henderson", "Warszawa"],
        ["Jessica Holmes", "Warszawa"],
        ["Timothy Duncan", "Warszawa"],
        ["Richard Aguirre", "Warszawa"],
        ["Jessica Callahan", "Warszawa"],
        ["Amber Kidd", "Warszawa"],
        ["James Brown", "Warszawa"],
        ["Jordan Henderson", "Warszawa"],
        ["Amy Silva", "Warszawa"],
        ["Sarah Moore", "Warszawa"],
        ["Angela Lopez", "Warszawa"],
        ["Paul Jones", "Warszawa"],
        ["Shirley Suarez", "Warszawa"],
        ["Lisa Archer", "Warszawa"],
        ["Aimee Montoya", "Warszawa"],
        ["John Whitehead", "Warszawa"],
        ["Aaron Wise", "Warszawa"],
        ["Deborah Figueroa", "Warszawa"],
        ["Stephen Mckee", "Warszawa"]
      ],
      "hovertemplate": "city=%{customdata[1]}<br>income=%  
{x}<br>outcome=%{y}<br>name=%{customdata[0]}<extra></extra>",
      "legendgroup": "Warszawa",
      "marker": {
        "color": "#EF553B",
        "symbol": "circle"
      },
      "mode": "markers",
      "name": "Warszawa",
      "orientation": "v",
      "showlegend": true,
      "type": "scatter",
      "x": [
        2498.53, 2644.28, 5303.63, 4533.3, 3979.53, 3325.18, 4256.73, 4668.91, 5104.5,
        4, 3758.11, 4998.32, 2703.52, 2686.13, 4587.57, 15598.84, 4683.35, 5061.64, 539,
        7.36, 2989.24, 3078.41, 3126.93, 3857.95, 6124.12, 4292.03, 5128.99, 2774.03, 2,
        792.41, 4325.18, 2632.7, 2620.66, 7993.97, 3155.57, 4764.91, 3386.35, 3405.56,
        3191.51, 4380.71, 9894.41
      ],
      "xaxis": "x",
      "y": [
        2498.53, 2644.28, 5303.63, 4533.3, 3979.53, 3325.18, 4256.73, 4668.91, 5104.5,
        4, 3758.11, 4998.32, 2703.52, 2686.13, 4587.57, 15598.84, 4683.35, 5061.64, 539,
        7.36, 2989.24, 3078.41, 3126.93, 3857.95, 6124.12, 4292.03, 5128.99, 2774.03, 2,
        792.41, 4325.18, 2632.7, 2620.66, 7993.97, 3155.57, 4764.91, 3386.35, 3405.56,
        3191.51, 4380.71, 9894.41
      ],
      "yaxis": "y"
    }
  ]
}
```

```

[781.09,1379.53,2444.11,1158.85,772.73,2416.85,1965.82,2948.07,1769.41
,2052.73,1733.31,2456.43,1770.73,2182.72,3124.14,1496.56,1167.3,1337.3
7,633.16,2912.33,1507.54,2747.07,1241.85,1636.97,2603.55,1077.75,636.5
5,2328.89,508.03,1200.27,1826.12,2153.8,1631.63,1918.93,668.36,528.19,
1772.93,3231.85], "yaxis": "y"}, {"customdata": [{"Angie
Henderson", "Gdańsk"}, {"Carol Tucker", "Gdańsk"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Gdańsk", "marker":
{"color": "#00cc96", "symbol": "circle"}, "mode": "markers", "name": "Gdańsk"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[4226.72,4202.82], "xaxis": "x", "y": [2928.29,1919.78], "yaxis": "y"},
{"customdata": [{"Daniel Wagner", "Częstochowa"}, {"Carla
Gray", "Częstochowa"}, {"John Pierce", "Częstochowa"}, {"Danny
Morgan", "Częstochowa"}, {"Michael Lewis", "Częstochowa"}, {"Brent
Jordan", "Częstochowa"}, {"Victoria Garcia", "Częstochowa"}, {"Mike
Allen", "Częstochowa"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Częstochowa", "marker":
{"color": "#ab63fa", "symbol": "circle"}, "mode": "markers", "name": "Częstoc
howa", "orientation": "v", "showlegend": true, "type": "scatter", "x":
[2716.85,4071.63,10285.42,3663.56,3206.48,6068.34,4652.83,2724.26], "xa
xis": "x", "y":
[1639.78,2670.06,1983.13,2127.83,1482.06,2800.69,2591.58,982.47], "yaxi
s": "y"}, {"customdata": [{"Connie Lawrence", "Łódź"}, {"Judy
Baker", "Łódź"}, {"Christopher Bass", "Łódź"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Łódź", "marker":
{"color": "#FFA15A", "symbol": "circle"}, "mode": "markers", "name": "Łódź", "
orientation": "v", "showlegend": true, "type": "scatter", "x":
[5454.19,4055.44,5296.17], "xaxis": "x", "y":
[3065.95,1930.37,2023.21], "yaxis": "y"}, {"customdata": [{"Gabrielle
Davis", "Szczecin"}, {"Stephanie Ross", "Szczecin"}, {"Brittany
Farmer", "Szczecin"}, {"Sherry Decker", "Szczecin"}, {"Steve
Sanchez", "Szczecin"}, {"Michael
Evans", "Szczecin"}], "hvertemplate": "city=%{customdata[1]}<br>income=%
{x}<br>outcome=%{y}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Szczecin", "marker":
{"color": "#19d3f3", "symbol": "circle"}, "mode": "markers", "name": "Szczeci
n", "orientation": "v", "showlegend": true, "type": "scatter", "x":
[5230.72,3380.75,5383.86,2794.59,6822.3,3402.15], "xaxis": "x", "y":
[2201.54,1282.3,1296.4,1761.34,2001.42,3410.55], "yaxis": "y"},
{"customdata": [{"Ryan Munoz", "Białystok"}, {"Matthew
Foster", "Białystok"}, {"Justin Baker", "Białystok"}, {"Anthony
Rodriguez", "Białystok"}, {"Connor West", "Białystok"}, {"Lisa
Barnes", "Białystok"}, {"Denise Jacobs", "Białystok"}, {"Anna
Henderson", "Białystok"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Białystok", "marker":
{"color": "#FF6692", "symbol": "circle"}, "mode": "markers", "name": "Białyst

```

```

ok", "orientation": "v", "showlegend": true, "type": "scatter", "x":
[2832.85, 28730.73, 5151.7, 5130.68, 4592.66, 3109.67, 5078.030000000001, 294
2.72], "xaxis": "x", "y":
[2734.97, 2655.22, 3324.79, 3137.81, 1806.46, 2522.9, 1449.98, 2328.48], "yaxis": "y"}, {"customdata": [{"Lisa Hensley", "Lublin"}, {"James
Ferrell", "Lublin"}, {"Joshua Blair", "Lublin"}, {"Crystal
Robinson", "Lublin"}, {"Zachary Ferrell", "Lublin"}, {"Daniel
Baker", "Lublin"}], "hvertemplate": "city=%{customdata[1]}<br>income=%
{x}<br>outcome=%{y}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Lublin", "marker":
{"color": "#B6E880", "symbol": "circle", "mode": "markers", "name": "Lublin"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[3454.54, 3273.44, 5462.47, 8302.76, 6916.76, 3830.49], "xaxis": "x", "y":
[1380.5, 1131.89, 2286.36, 1930.94, 2326.62, 852.4], "yaxis": "y"},
{"customdata": [{"Lisa Jackson", "Kraków"}, {"Zachary Hicks", "Kraków"},
["Rebecca Henderson", "Kraków"}, {"Angelica Tucker", "Kraków"}, {"Brittney
Phillips", "Kraków"}, {"Kelly Donovan", "Kraków"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Kraków", "marker":
{"color": "#FF97FF", "symbol": "circle", "mode": "markers", "name": "Kraków"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[2620.08, 6779.96, 4470.38, 6678.77, 4188.77, 4419.68], "xaxis": "x", "y":
[2393.31, 3307.2, 2163.81, 754.39, 2559.35, 3248.22], "yaxis": "y"},
{"customdata": [{"Patty Perez", "Bydgoszcz"}, {"Philip
Cannon", "Bydgoszcz"}, {"Gerald Hensley", "Bydgoszcz"}, {"Whitney
Peters", "Bydgoszcz"}, {"Megan Young", "Bydgoszcz"}, {"Christina
Walters", "Bydgoszcz"}], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Bydgoszcz", "marker":
{"color": "#FECB52", "symbol": "circle", "mode": "markers", "name": "Bydgosz
cz", "orientation": "v", "showlegend": true, "type": "scatter", "x":
[3170.83, 4596.389999999999, 3727.97, 4179.6, 4962.56, 6992.02], "xaxis": "x"
, "y": [1070.63, 1097.39, 1611.71, 1908.19, 714.23, 2740.3], "yaxis": "y"},
{"customdata": [{"Tommy Walter", "Poznań"}, {"Donald Wright", "Poznań"},
["Tracy House", "Poznań"}, {"Lauren Daniels", "Poznań"}, {"Jessica
Smith", "Poznań"}], "hvertemplate": "city=%{customdata[1]}<br>income=%
{x}<br>outcome=%{y}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Poznań", "marker":
{"color": "#636efa", "symbol": "circle", "mode": "markers", "name": "Poznań"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[5197.57, 5250.280000000001, 8461.3, 4247.99, 3512.77], "xaxis": "x", "y":
[993.91, 2693.08, 1928.28, 2355.26, 1387.62], "yaxis": "y"}, {"customdata":
[["Debra Davidson", "Wrocław"], ["William
Baker", "Wrocław"]], "hvertemplate": "city=%{customdata[1]}<br>income=%
{x}<br>outcome=%{y}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Wrocław", "marker":
{"color": "#EF553B", "symbol": "circle", "mode": "markers", "name": "Wrocław"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[3732.34, 5427.48], "xaxis": "x", "y": [625.49, 2073.91], "yaxis": "y"},

```

```

{"customdata": [["Mark Perez", "Gdynia"], ["John Daniel", "Gdynia"],
["Matthew Mcmillan", "Gdynia"]], "hvertemplate": "city=%
{customdata[1]}<br>income=%{x}<br>outcome=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Gdynia", "marker":
{"color": "#00cc96", "symbol": "circle"}, "mode": "markers", "name": "Gdynia"
, "orientation": "v", "showlegend": true, "type": "scatter", "x":
[3913.51, 2479.6, 4929.18], "xaxis": "x", "y":
[1318.81, 1435.87, 801.09], "yaxis": "y"}], "layout": {"legend": {"title":
{"text": "city"}, "tracegroupgap": 0}, "margin": {"t": 60}, "template":
{"data": {"bar": [{"error_x": {"color": "#2a3f5f"}, "error_y":
{"color": "#2a3f5f"}, "marker": {"line":
{"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "bar"}], "barpo
lar": [{"marker": {"line": {"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "barpolar"}], "
carpet": [{"aaxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "baxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "type": "carpet"}], "ch
oropleth": [{"colorbar":
{"outlinewidth": 0, "ticks": ""}, "type": "choropleth"}], "contour":
[{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar":
{"outlinewidth": 0, "ticks": ""}, "type": "contourcarpet"}], "heatmap":
[{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar":
{"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"],
[0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"],
[0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"],
[0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"],
[0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}],
"histogram2d": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],

```



```

[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "histogram2d"}, "histogram2dcontour":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth": 0, "ticks": ""}}, "type": "parcoords"}], "pie":
[{"automargin": true, "type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}, "type": "scatter"}], "scatter3d": [{"line": {"colorbar": {"linewidth": 0, "ticks": ""}}, "marker":
{"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scattermapbox"}], "scatterpolar":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scatterpolar"}], "scatterpolargl":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scatterpolargl"}], "scatterternary":
[{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}}, "type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, "line": {"color": "white"}}, "header": {"fill":
{"color": "#C8D4E3"}, "line":
{"color": "white"}}, "type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead": 0, "arrowwidth": 1}, "autotypenumbers":
"strict", "coloraxis": {"colorbar":
{"linewidth": 0, "ticks": ""}, "colorscale": {"diverging":
[[0, "#8e0152"], [0.1, "#c51b7d"], [0.2, "#de77ae"], [0.3, "#f1b6da"],
[0.4, "#fde0ef"], [0.5, "#f7f7f7"], [0.6, "#e6f5d0"], [0.7, "#b8e186"],
[0.8, "#7fb341"], [0.9, "#4d9221"], [1, "#276419"]], "sequential":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],

```



```

[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]],"sequentialminus":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],[1,"#f0f921"]]],"colorway":
["#636efa","#EF553B","#00cc96","#ab63fa","#FFA15A","#19d3f3","#FF6692",
"#B6E880","#FF97FF","#FECB52"],"font":{"color":"#2a3f5f"},"geo":
{"bgcolor":"white","lakecolor":"white","landcolor":"#E5ECF6","showlake
s":true,"showland":true,"subunitcolor":"white"},"hoverlabel":
{"align":"left"},"hovermode":"closest","mapbox":
{"style":"light"},"paper_bgcolor":"white","plot_bgcolor":"#E5ECF6","po
lar":{"angularaxis":
{"gridcolor":"white","linecolor":"white","ticks":""},"bgcolor":"#E5ECF
6","radialaxis":
{"gridcolor":"white","linecolor":"white","ticks":""}}},"scene":
{"xaxis":
{"backgroundcolor":"#E5ECF6","gridcolor":"white","gridwidth":2,"lineco
lor":"white","showbackground":true,"ticks":"","zerolinecolor":"white"}
,"yaxis":
{"backgroundcolor":"#E5ECF6","gridcolor":"white","gridwidth":2,"lineco
lor":"white","showbackground":true,"ticks":"","zerolinecolor":"white"}
,"zaxis":
{"backgroundcolor":"#E5ECF6","gridcolor":"white","gridwidth":2,"lineco
lor":"white","showbackground":true,"ticks":"","zerolinecolor":"white"}
},"shapedefaults":{"line":{"color":"#2a3f5f"}},ternary":{"aaxis":
{"gridcolor":"white","linecolor":"white","ticks":""},"baxis":
{"gridcolor":"white","linecolor":"white","ticks":""},"bgcolor":"#E5ECF
6","caxis":
{"gridcolor":"white","linecolor":"white","ticks":""}}},"title":
{"x":5.0e-2},"xaxis":
{"automargin":true,"gridcolor":"white","linecolor":"white","ticks":"","
"title":
{"standoff":15},"zerolinecolor":"white","zerolinewidth":2},"yaxis":
{"automargin":true,"gridcolor":"white","linecolor":"white","ticks":"","
"title":
{"standoff":15},"zerolinecolor":"white","zerolinewidth":2}}},"title":
{"text":"Wykres dochodów i wydatków w zależności od miasta"},"xaxis":
{"anchor":"y","domain":[0,1],"title":{"text":"Dochód"},"yaxis":
{"anchor":"x","domain":[0,1],"title":{"text":"Wydatki"}}}}

{"config":{"plotlyServerURL":"https://plot.ly"},"data":[{"customdata":
[["Allison Hill","employed"],["Jamie Arnold","employed"],["Margaret
Hawkins DDS","employed"],["Matthew Foster","employed"],["Judy
Baker","employed"],["Justin Baker","employed"],["Zachary
Hicks","employed"],["Philip Cannon","employed"],["John
Pierce","employed"],["Shannon Jones","employed"],["Brent
Jordan","employed"],["Victoria Garcia","employed"],["Donald
Wright","employed"],["Tracy House","employed"],["Steve

```

```

Sanchez","employed"],["Zachary Ferrell","employed"],["Matthew
Mcmillan","employed"],["Denise Jacobs","employed"],["Christina
Walters","employed"]],{"hovertemplate":"employment_status=%
{customdata[1]}<br>savings=%{x}<br>children=%{y}<br>name=%
{customdata[0]}<extra></extra>","legendgroup":"employed","marker":
{"color":"#636efa","symbol":"circle"},"mode":"markers","name":"employe
d","orientation":"v","showlegend":true,"type":"scatter","x":
[5580.27,24276.96,85211.27,4747.45,3935.82,19848.61,11457.14,1155.34,3
689.28,32575.68,15147.32,21257.33,8057.61,369033.87,10943.97,17744.57,
2492.79,626835.14,24458.44],"xaxis":"x","y":
[5,0,5,1,4,4,4,3,5,0,5,4,1,0,4,2,3,3,5],"yaxis":"y"},{"customdata":
[["Noah Rhodes","unemployed"],["Cristian Santos","unemployed"],
["Abigail Shaffer","unemployed"],["Gina Moore","unemployed"],["Monica
Herrera","unemployed"],["Michele Williams","unemployed"],["Dylan
Miller","unemployed"],["Brian Ramirez","unemployed"],["Holly
Wood","unemployed"],["Ethan Adams","unemployed"],["Tricia
Valencia","unemployed"],["Nathan Maldonado","unemployed"],["Jeffrey
Chavez","unemployed"],["Sherri Baker","unemployed"],["Cassandra
Gaines","unemployed"],["Paula Moreno","unemployed"],["Shane
Henderson","unemployed"],["Jessica Holmes","unemployed"],["Timothy
Duncan","unemployed"],["Richard Aguirre","unemployed"],["Jessica
Callahan","unemployed"],["Amber Kidd","unemployed"],["James
Brown","unemployed"],["Jordan Henderson","unemployed"],["Amy
Silva","unemployed"],["Angela Lopez","unemployed"],["Paul
Jones","unemployed"],["Shirley Suarez","unemployed"],["Lisa
Archer","unemployed"],["Aimee Montoya","unemployed"],["John
Whitehead","unemployed"],["Aaron Wise","unemployed"],["Deborah
Figuerola","unemployed"],["Stephen
Mckee","unemployed"]],{"hovertemplate":"employment_status=%
{customdata[1]}<br>savings=%{x}<br>children=%{y}<br>name=%
{customdata[0]}<extra></extra>","legendgroup":"unemployed","marker":
{"color":"#EF553B","symbol":"circle"},"mode":"markers","name":"unemplo
yed","orientation":"v","showlegend":true,"type":"scatter","x":
[12633.88,34740.79,35399.13,21071.3,21527.57,17956.44,23227.47,396259.
01,23222.84,20900.69,1102.17,1881.1,39979.1,20055.88,8741.46,42.28,386
672.54,2014.44,24997.7,15533.39,12357.66,13894.78,18572.03,13833.97,11
4501.82,19695.7,5088.96,4765.26,21740.04,9651.97,9371.03,22530.24,1142
0.9,372872.74],"xaxis":"x","y":
[0,2,4,0,1,2,2,1,5,0,2,5,1,5,1,4,0,1,2,1,2,4,5,5,1,5,4,4,5,5,1,5,2,2],
"yaxis":"y"},{"customdata":[["Angie Henderson","retired"],["Gabrielle
Davis","retired"],["Ryan Munoz","retired"],["Carla Gray","retired"],
["Tommy Walter","retired"],["Anthony Humphrey","retired"],["Joshua
Blair","retired"],["Eric Carney","retired"],["Danny
Morgan","retired"],["Crystal Robinson","retired"],["Mark
Perez","retired"],["John Daniel","retired"],["Gerald
Hensley","retired"],["Lauren Daniels","retired"],["Kelly
Donovan","retired"],["Mike Allen","retired"],["Michael
Evans","retired"],["Christopher Bass","retired"],["Brian
Rodriguez","retired"],["Anna Henderson","retired"],["Jessica

```

```

Smith", "retired"]], "hvertemplate": "employment_status=%
{customdata[1]}<br>savings=%{x}<br>children=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "retired", "marker":
{"color": "#00cc96", "symbol": "circle"}, "mode": "markers", "name": "retired",
"orientation": "v", "showlegend": true, "type": "scatter", "x":
[18970.18, 254540.62, 6568.54, 33048.47, 24632.72, 22889.97, 629426.85, 21092
.45, 1556.64, 7465.32, 725.62, 640217, 16188.58, 389672.15, 24923.64, 17341.84
, 21622.76, 7070.97, 8464.03, 15492.76, 241899.99], "xaxis": "x", "y":
[1, 5, 4, 1, 2, 3, 4, 4, 3, 3, 2, 3, 0, 3, 3, 2, 0, 2, 5, 1, 5], "yaxis": "y"},
{"customdata": [{"Daniel Wagner", "student"}, {"Connie
Lawrence", "student"}, {"Lisa Hensley", "student"}, {"Derek
Zuniga", "student"}, {"Lisa Jackson", "student"}, {"Patty
Perez", "student"}, {"Stephanie Ross", "student"}, {"Anthony
Rodriguez", "student"}, {"Rebecca Henderson", "student"}, {"James
Ferrell", "student"}, {"Debra Davidson", "student"}, {"Elizabeth
Fowler", "student"}, {"Brittany Farmer", "student"}, {"Fred
Smith", "student"}, {"Sherry Decker", "student"}, {"Angelica
Tucker", "student"}, {"Michael Lewis", "student"}, {"Connor
West", "student"}, {"Carol Tucker", "student"}, {"William
Baker", "student"}, {"Whitney Peters", "student"}, {"Brittney
Phillips", "student"}, {"Sarah Moore", "student"}, {"Megan
Young", "student"}, {"Lisa Barnes", "student"}, {"Daniel
Baker", "student"}], "hvertemplate": "employment_status=%
{customdata[1]}<br>savings=%{x}<br>children=%{y}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "student", "marker":
{"color": "#ab63fa", "symbol": "circle"}, "mode": "markers", "name": "student",
"orientation": "v", "showlegend": true, "type": "scatter", "x":
[21187.36, 9503.16, 11343.09, 6197.64, 1685.01, 3504.56, 38647.67, 7124.68, 14
143.46, 5089.93, 22474.54, 30376.23, 14914.28, 17993.86, 16932.95, 16596.35, 8
171.15, 389135.39, 8593.93, 24512.77, 8517.65, 3729.94, 17234.28, 19815.71, 33
484.92, 12459.39], "xaxis": "x", "y":
[4, 3, 5, 0, 0, 1, 1, 3, 1, 5, 0, 5, 2, 2, 1, 4, 3, 5, 5, 1, 0, 4, 3, 4, 0, 5], "yaxis": "y"}], "l
ayout": {"legend": {"title":
{"text": "employment_status"}, "tracegroupgap": 0}, "margin":
{"t": 60}, "template": {"data": {"bar": [{"error_x":
{"color": "#2a3f5f"}, "error_y": {"color": "#2a3f5f"}, "marker": {"line":
{"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "bar"}], "barpo
lar": [{"marker": {"line": {"color": "#E5ECF6", "width": 0.5}, "pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "barpolar"}], "
carpet": [{"aaxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "baxis":
{"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "min
orgridcolor": "white", "startlinecolor": "#2a3f5f"}, "type": "carpet"}], "ch
oropleth": [{"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "choropleth"}], "contour":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],

```

```

[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar":
{"linewidth":0,"ticks":"","type": "contourcarpet"}], "heatmap":
[{"colorbar": {"linewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar":
{"linewidth":0,"ticks":"","colorscale": [[0,"#0d0887"],
[0.1111111111111111,"#46039f"],[0.2222222222222222,"#7201a8"],
[0.3333333333333333,"#9c179e"],[0.4444444444444444,"#bd3786"],
[0.5555555555555556,"#d8576b"],[0.6666666666666666,"#ed7953"],
[0.7777777777777778,"#fb9f3a"],[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}],
"histogram2d": [{"colorbar": {"linewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "histogram2d"}], "histogram2dcontour":
[{"colorbar": {"linewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],
[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth":0,"ticks":"","type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth":0,"ticks":"","type": "parcoords"}], "pie":
[{"automargin": true, "type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}, "type": "scatter"}], "sc
atter3d": [{"line": {"colorbar": {"linewidth":0,"ticks":"","marker":
{"colorbar":
{"linewidth":0,"ticks":"","type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth":0,"ticks":"","type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth":0,"ticks":"","type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth":0,"ticks":"","type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth":0,"ticks":"","type": "scattermapbox"}], "scatterpolar"

```

```

: [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterpolar"}], "scatterpolargl
": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterpolargl"}], "scatterterna
ry": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, "line": {"color": "white"}}, "header": {"fill":
{"color": "#C8D4E3"}, "line":
{"color": "white"}}, "type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead": 0, "arrowwidth": 1}, "autotypenumbers
": "strict", "coloraxis": {"colorbar":
{"linewidth": 0, "ticks": ""}, "colorscale": {"diverging":
[[0, "#8e0152"], [0.1, "#c51b7d"], [0.2, "#de77ae"], [0.3, "#f1b6da"],
[0.4, "#fde0ef"], [0.5, "#f7f7f7"], [0.6, "#e6f5d0"], [0.7, "#b8e186"],
[0.8, "#7fbc41"], [0.9, "#4d9221"], [1, "#276419"]], "sequential":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "sequentialminus":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]]]}, "colorway":
["#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
"#B6E880", "#FF97FF", "#FECB52"], "font": {"color": "#2a3f5f"}, "geo":
{"bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white"}, "hoverlabel":
{"align": "left"}, "hovermode": "closest", "mapbox":
{"style": "light"}, "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": {"angularaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "radialaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "scene":
{"xaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "yaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "zaxis":

```



```

{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "linecolor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}, {"shapedefaults": {"line": {"color": "#2a3f5f"}}, "ternary": {"aaxis": {"gridcolor": "white", "linecolor": "white", "ticks": ""}, "baxis": {"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF6", "caxis": {"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "title": {"x": 5.0e-2, "xaxis": {"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "", "title": {"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}, "yaxis": {"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "", "title": {"standoff": 15}, "zerolinecolor": "white", "zerolinewidth": 2}}}, {"text": "Zależność między oszczędnościami a liczbą dzieci", "xaxis": {"anchor": "y", "domain": [0, 1], "title": {"text": "Oszczędności"}}, "yaxis": {"anchor": "x", "domain": [0, 1], "title": {"text": "Liczba dzieci"}}}

{"config": {"plotlyServerURL": "https://plot.ly"}, "data": [{"customdata": [{"Allison Hill"}, {"Jamie Arnold"}, {"Fred Smith"}, {"Anthony Humphrey"}, {"Eric Carney"}, {"Shannon Jones"}, {"Brian Rodriguez"}], "hovern": "city=Katowice<br>credit_score=%{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></extra>", "legendgroup": "Katowice", "marker": {"color": "#636efa", "symbol": "circle"}, "mode": "markers", "name": "Katowice", "scene": "scene", "showlegend": true, "type": "scatter3d", "x": [790.7, 595.33, 479.4, 581.15, 451.03, 374.63, 768.47], "y": [65, 74, 44, 31, 33, 45, 23], "z": [9.61, 27.42, 70.02, 79.58, 8.67, 46.71, 85.38]}, {"customdata": [{"Noah Rhodes"}, {"Cristian Santos"}, {"Abigail Shaffer"}, {"Gina Moore"}, {"Monica Herrera"}, {"Michele Williams"}, {"Dylan Miller"}, {"Brian Ramirez"}, {"Holly Wood"}, {"Derek Zuniga"}, {"Margaret Hawkins DDS"}, {"Ethan Adams"}, {"Tricia Valencia"}, {"Nathan Maldonado"}, {"Jeffrey Chavez"}, {"Sherri Baker"}, {"Cassandra Gaines"}, {"Elizabeth Fowler"}, {"Paula Moreno"}, {"Shane Henderson"}, {"Jessica Holmes"}, {"Timothy Duncan"}, {"Richard Aguirre"}, {"Jessica Callahan"}, {"Amber Kidd"}, {"James Brown"}, {"Jordan Henderson"}, {"Amy Silva"}, {"Sarah Moore"}, {"Angela Lopez"}, {"Paul Jones"}, {"Shirley Suarez"}, {"Lisa Archer"}, {"Aimee Montoya"}, {"John Whitehead"}, {"Aaron Wise"}, {"Deborah Figueroa"}, {"Stephen McKee"}], "hovern": "city=Warszawa<br>credit_score=%{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></extra>", "legendgroup": "Warszawa", "marker": {"color": "#EF553B", "symbol": "circle"}, "mode": "markers", "name": "Warszawa", "scene": "scene", "showlegend": true, "type": "scatter3d", "x": [685.73, 325.2, 508.7, 473.5, 532.19, 728.24, 782.91, 820.77, 519.45, 604.66, 700.52, 567.1, 444.08, 759.03, 397.38, 733.06, 406.22, 782.37, 338.49, 373.34, 384.04, 729.68, 362.91, 495.15, 696.04, 706.23, 714.04, 344.65, 458.46, 599.51, 784.47, 724.97, 428.46, 320.36, 611.26, 819.88, 565.76, 493.78], "y": [59, 22, 47, 69, 61, 79, 33, 48, 37, 55, 43, 44, 80, 20, 69, 28, 60, 25, 45, 47, 62, 22, 60, 31, 33, 31, 73, 60, 32, 25, 46, 35, 42, 79, 44, 46, 72, 69], "z":

```

```
[42.53,23.56,98.96,27.51,7.29,53.51,94.75,17.35,67.5,59.26,80.26,22.16
,74.38,58.67,41.82,11.7,33.5,26.86,66.76,47,22.18,65.52,94.83,26.58,49
.37,28.37,11.16,24.75,28.99,65.12,48.99,85.59,77.78,50.73,79.46,98.78,
24.48,64.03]],{"customdata":["Angie Henderson"],["Carol
Tucker"]],"hovertemplate":"city=Gdańsk<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>","legendgroup":"Gdańsk","marker":
{"color":"#00cc96","symbol":"circle"},"mode":"markers","name":"Gdańsk"
,"scene":"scene","showlegend":true,"type":"scatter3d","x":
[385.51,549.56],"y":[35,62],"z":[95.76,31.36]],{"customdata":["Daniel
Wagner"],["Carla Gray"],["John Pierce"],["Danny Morgan"],["Michael
Lewis"],["Brent Jordan"],["Victoria Garcia"],["Mike
Allen"]],"hovertemplate":"city=Częstochowa<br>credit_score=%
{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%
{customdata[0]}<extra></extra>","legendgroup":"Częstochowa","marker":
{"color":"#ab63fa","symbol":"circle"},"mode":"markers","name":"Częstoc
howa","scene":"scene","showlegend":true,"type":"scatter3d","x":
[701.35,404.73,723.53,820.33,757.56,390.07,611.26,320.18],"y":
[20,44,73,55,78,70,80,53],"z":
[54.09,10.6,11.55,2.93,25.97,31.79,5.07,9.72]],{"customdata":["Connie
Lawrence"],["Judy Baker"],["Christopher
Bass"]],"hovertemplate":"city=Łódź<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>","legendgroup":"Łódź","marker":
{"color":"#FFA15A","symbol":"circle"},"mode":"markers","name":"Łódź",
"scene":"scene","showlegend":true,"type":"scatter3d","x":
[495.4,627.27,596.22],"y":[41,22,46],"z":[67.35,67.85,35.17]],
{"customdata":["Gabrielle Davis"],["Stephanie Ross"],["Brittany
Farmer"],["Sherry Decker"],["Steve Sanchez"],["Michael
Evans"]],"hovertemplate":"city=Szczecin<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>","legendgroup":"Szczecin","marker":
{"color":"#19d3f3","symbol":"circle"},"mode":"markers","name":"Szczeci
n","scene":"scene","showlegend":true,"type":"scatter3d","x":
[803,669.43,841.33,758.55,477.28,403.17],"y":[74,26,56,53,65,21],"z":
[46.43,30.7,12.45,31.08,25.79,36.82]],{"customdata":["Ryan Munoz"],
["Matthew Foster"],["Justin Baker"],["Anthony Rodriguez"],["Connor
West"],["Lisa Barnes"],["Denise Jacobs"],["Anna
Henderson"]],"hovertemplate":"city=Białystok<br>credit_score=%
{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%
{customdata[0]}<extra></extra>","legendgroup":"Białystok","marker":
{"color":"#FF6692","symbol":"circle"},"mode":"markers","name":"Białyst
ok","scene":"scene","showlegend":true,"type":"scatter3d","x":
[499.1,598.21,530.57,842.98,805.79,719.71,429.12,427.7],"y":
[43,65,23,80,69,20,22,27],"z":
[99.74,75.05,58.78,65.74,77.69,18.34,68.76,64.15]],{"customdata":
[["Lisa Hensley"],["James Ferrell"],["Joshua Blair"],["Crystal
Robinson"],["Zachary Ferrell"],["Daniel
Baker"]],"hovertemplate":"city=Lublin<br>credit_score=%{x}<br>age=%
```



```

{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Lublin", "marker":
{"color": "#B6E880", "symbol": "circle", "mode": "markers", "name": "Lublin"
, "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[398.26, 438.12, 793.46, 704.05, 351.27, 450.38], "y":
[66, 49, 46, 65, 44, 63], "z": [91.35, 90.91, 74.62, 80.19, 99.23, 83.64]},
{"customdata": [["Lisa Jackson"], ["Zachary Hicks"], ["Rebecca
Henderson"], ["Angelica Tucker"], ["Brittney Phillips"], ["Kelly
Donovan"]], "hovertemplate": "city=Kraków<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Kraków", "marker":
{"color": "#FF97FF", "symbol": "circle", "mode": "markers", "name": "Kraków"
, "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[430.9, 417.23, 358.87, 823.6, 365.15, 491.38], "y": [50, 52, 74, 70, 33, 48], "z":
[67.23, 27.25, 55.77, 24.25, 76.68, 34]}, {"customdata": [["Patty Perez"],
["Philip Cannon"], ["Gerald Hensley"], ["Whitney Peters"], ["Megan
Young"], ["Christina
Walters"]], "hovertemplate": "city=Bydgoszcz<br>credit_score=%
{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Bydgoszcz", "marker":
{"color": "#FECB52", "symbol": "circle", "mode": "markers", "name": "Bydgosz
cz", "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[780.97, 787.38, 538.44, 752.16, 557.78, 681.7], "y":
[33, 44, 24, 25, 25, 28], "z": [8.46, 57.99, 36.86, 40.67, 31.11, 90.44]},
{"customdata": [["Tommy Walter"], ["Donald Wright"], ["Tracy House"],
["Lauren Daniels"], ["Jessica
Smith"]], "hovertemplate": "city=Poznań<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Poznań", "marker":
{"color": "#636efa", "symbol": "circle", "mode": "markers", "name": "Poznań"
, "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[683.13, 547.94, 522.42, 623.69, 611.26], "y": [45, 74, 32, 73, 18], "z":
[73.32, 75.3, 25.09, 43.45, 68.89]}, {"customdata": [["Debra Davidson"],
["William Baker"]], "hovertemplate": "city=Wrocław<br>credit_score=%
{x}<br>age=%{y}<br>spending_score=%{z}<br>name=%
{customdata[0]}<extra></extra>", "legendgroup": "Wrocław", "marker":
{"color": "#EF553B", "symbol": "circle", "mode": "markers", "name": "Wrocław
", "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[437.24, 398.69], "y": [61, 41], "z": [11.18, 2.4]}, {"customdata": [["Mark
Perez"], ["John Daniel"], ["Matthew
Mcmillan"]], "hovertemplate": "city=Gdynia<br>credit_score=%{x}<br>age=%
{y}<br>spending_score=%{z}<br>name=%{customdata[0]}<extra></
extra>", "legendgroup": "Gdynia", "marker":
{"color": "#00cc96", "symbol": "circle", "mode": "markers", "name": "Gdynia"
, "scene": "scene", "showlegend": true, "type": "scatter3d", "x":
[762.28, 341.8, 525.49], "y": [28, 30, 27], "z":
[92.03, 69.37, 65.82]}], "layout": {"legend": {"title":
{"text": "city", "tracegroupgap": 0}, "margin": {"t": 60}, "scene":
{"domain": {"x": [0, 1], "y": [0, 1]}, "xaxis": {"title":

```

```

{"text": "credit_score"}, {"yaxis": {"title": {"text": "age"}}, {"zaxis": {"title": {"text": "spending_score"}}}, {"template": {"data": {"bar": [{"error_x": {"color": "#2a3f5f"}, "error_y": {"color": "#2a3f5f"}, "marker": {"line": {"color": "#E5ECF6", "width": 0.5}, "pattern": {"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "bar"}], "barpolar": [{"marker": {"line": {"color": "#E5ECF6", "width": 0.5}, "pattern": {"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "barpolar"}], "carpet": [{"aaxis": {"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "minorgridcolor": "white", "startlinecolor": "#2a3f5f"}, "baxis": {"endlinecolor": "#2a3f5f", "gridcolor": "white", "linecolor": "white", "minorgridcolor": "white", "startlinecolor": "#2a3f5f"}, "type": "carpet"}], "choropleth": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "type": "choropleth"}], "contour": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"], [0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "type": "contourcarpet"}], "heatmap": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"], [0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"], [0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern": {"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}], "histogram2d": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"], [0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "type": "histogram2d"}], "histogram2dcontour": [{"colorbar": {"outlinewidth": 0, "ticks": ""}, "colorscale": [[0, "#0d0887"], [0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "type": "histogram2dcontour"}]}

```

```
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth":0, "ticks":""}, {"type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth":0, "ticks":""}, {"type": "parcoords"}], "pie":
[{"automargin": true, "type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}, {"type": "scatter"}], "scatter3d": [{"line": {"colorbar": {"linewidth":0, "ticks":""}, {"marker":
{"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scattermapbox"}], "scatterpolar":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterpolar"}], "scatterpolargl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterpolargl"}], "scatterternary":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, {"type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth":0, "ticks":""}, {"colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, {"line": {"color": "white"}}, {"header": {"fill":
{"color": "#C8D4E3"}, {"line":
{"color": "white"}}, {"type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead": 0, "arrowwidth": 1}, {"autotypenumbers": "strict", "coloraxis": {"colorbar":
{"linewidth":0, "ticks":""}, {"colorscale": {"diverging":
[[0, "#8e0152"], [0.1, "#c51b7d"], [0.2, "#de77ae"], [0.3, "#f1b6da"],
[0.4, "#fde0ef"], [0.5, "#f7f7f7"], [0.6, "#e6f5d0"], [0.7, "#b8e186"],
[0.8, "#7fb341"], [0.9, "#4d9221"], [1, "#276419"]], "sequential":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "sequentialminus":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]]]], "colorway":
```

```
[ "#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
  "#B6E880", "#FF97FF", "#FECB52" ], "font": { "color": "#2a3f5f" }, "geo":
{ "bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white" }, "hoverlabel":
{ "align": "left", "hovermode": "closest", "mapbox":
{ "style": "light", "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": { "angularaxis":
{ "gridcolor": "white", "linecolor": "white", "ticks": "" }, "bgcolor": "#E5ECF
6", "radialaxis":
{ "gridcolor": "white", "linecolor": "white", "ticks": "" } } }, "scene":
{ "xaxis":
{ "backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white" }
, "yaxis":
{ "backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white" }
, "zaxis":
{ "backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white" }
}, "shapedefaults": { "line": { "color": "#2a3f5f" } }, "ternary": { "aaxis":
{ "gridcolor": "white", "linecolor": "white", "ticks": "" }, "baxis":
{ "gridcolor": "white", "linecolor": "white", "ticks": "" }, "bgcolor": "#E5ECF
6", "caxis":
{ "gridcolor": "white", "linecolor": "white", "ticks": "" } }, "title":
{ "x": 5.0e-2 }, "xaxis":
{ "automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"titles":
{ "standoff": 15 }, "zerolinecolor": "white", "zerolinewidth": 2 }, "yaxis":
{ "automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"titles":
{ "standoff": 15 }, "zerolinecolor": "white", "zerolinewidth": 2 } } }, "title":
{ "text": "Zależność między wiekiem, punktami kredytowymi i
wydatkami" } } }
```

6. Analizować zależności między zmiennymi za pomocą macierzy korelacji.

```
import plotly.figure_factory as ff
```

```
#Numeric dataframe:
```

```
numerical_features = ['income', 'outcome', 'savings']
```

```
numeric_df = df[numerical_features]
```

```
correlation_matrix = numeric_df.corr()
```

```
fig = ff.create_annotated_heatmap(
    z=correlation_matrix.values,
    x=correlation_matrix.columns.tolist(),
    y=correlation_matrix.columns.tolist(),
    colorscale='Viridis',
    showscale=True,

```

```
)
```

```

fig.update_layout(title="Macierz korelacji zmiennych")
fig.show()

{"config":{"plotlyServerURL":"https://plot.ly"},"data":[{"colorscale":
[[0,"#440154"],[0.1111111111111111,"#482878"],
[0.2222222222222222,"#3e4989"],[0.3333333333333333,"#31688e"],
[0.4444444444444444,"#26828e"],[0.5555555555555556,"#1f9e89"],
[0.6666666666666666,"#35b779"],[0.7777777777777778,"#6ece58"],
[0.8888888888888888,"#b5de2b"],
[1,"#fde725"]],"reversescale":false,"showscale":true,"type":"heatmap",
"x":["income","outcome","savings"],"y":
["income","outcome","savings"],"z":
[[[1,0.25364841749990436,2.5086460288088967e-2],
[0.25364841749990436,1,9.506268268514993e-2],[2.5086460288088967e-
2,9.506268268514993e-2,1]]]],"layout":{"annotations":[{"font":
{"color":"#000000"},"showarrow":false,"text":"1.0","x":"income","xref":
"x","y":"income","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.25364841749990436","x"
:"outcome","xref":"x","y":"income","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.025086460288088967","x"
:"savings","xref":"x","y":"income","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.25364841749990436","x"
:"income","xref":"x","y":"outcome","yref":"y"},{"font":
{"color":"#000000"},"showarrow":false,"text":"1.0","x":"outcome","xref":
"x","y":"outcome","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.09506268268514993","x"
:"savings","xref":"x","y":"outcome","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.025086460288088967","x"
:"income","xref":"x","y":"savings","yref":"y"},{"font":
{"color":"#FFFFFF"},"showarrow":false,"text":"0.09506268268514993","x"
:"outcome","xref":"x","y":"savings","yref":"y"},{"font":
{"color":"#000000"},"showarrow":false,"text":"1.0","x":"savings","xref":
"x","y":"savings","yref":"y"}],"template":{"data":{"bar":
[{"error_x":{"color":"#2a3f5f"},"error_y":
{"color":"#2a3f5f"},"marker":{"line":
{"color":"#E5ECF6","width":0.5},"pattern":
{"fillmode":"overlay","size":10,"solidity":0.2}},{"type":"bar"}],"barpo
lar":[{"marker":{"line":{"color":"#E5ECF6","width":0.5},"pattern":
{"fillmode":"overlay","size":10,"solidity":0.2}},{"type":"barpolar"}],"
carpet":[{"aaxis":
{"endlinecolor":"#2a3f5f","gridcolor":"white","linecolor":"white","min
orgridcolor":"white","startlinecolor":"#2a3f5f"},"baxis":
{"endlinecolor":"#2a3f5f","gridcolor":"white","linecolor":"white","min
orgridcolor":"white","startlinecolor":"#2a3f5f"},"type":"carpet"}],"ch
oropleth":[{"colorbar":
{"outlinewidth":0,"ticks":"","type":"choropleth"}],"contour":
[{"colorbar":{"outlinewidth":0,"ticks":"","colorscale":
[[0,"#0d0887"],[0.1111111111111111,"#46039f"],
[0.2222222222222222,"#7201a8"],[0.3333333333333333,"#9c179e"],
[0.4444444444444444,"#bd3786"],[0.5555555555555556,"#d8576b"],

```



```

[0.6666666666666666,"#ed7953"],[0.7777777777777778,"#fb9f3a"],
[0.8888888888888888,"#fdca26"],
[1,"#f0f921"]], "type": "contour"}], "contourcarpet": [{"colorbar":
{"linewidth":0, "ticks":""}, "type": "contourcarpet"}], "heatmap":
[{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmap"}], "heatmapgl": [{"colorbar":
{"linewidth":0, "ticks":""}, "colorscale": [[0, "#0d0887"],
[0.1111111111111111, "#46039f"], [0.2222222222222222, "#7201a8"],
[0.3333333333333333, "#9c179e"], [0.4444444444444444, "#bd3786"],
[0.5555555555555556, "#d8576b"], [0.6666666666666666, "#ed7953"],
[0.7777777777777778, "#fb9f3a"], [0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "heatmapgl"}], "histogram": [{"marker": {"pattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}}, "type": "histogram"}],
"histogram2d": [{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2d"}], "histogram2dcontour":
[{"colorbar": {"linewidth":0, "ticks":""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "histogram2dcontour"}], "mesh3d": [{"colorbar":
{"linewidth":0, "ticks":""}, "type": "mesh3d"}], "parcoords": [{"line":
{"colorbar": {"linewidth":0, "ticks":""}, "type": "parcoords"}], "pie":
[{"automargin": true, "type": "pie"}], "scatter": [{"fillpattern":
{"fillmode": "overlay", "size": 10, "solidity": 0.2}, "type": "scatter"}], "scatter3d": [{"line": {"colorbar": {"linewidth":0, "ticks":""}, "marker":
{"colorbar":
{"linewidth":0, "ticks":""}, "type": "scatter3d"}], "scattercarpet":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattercarpet"}], "scattergeo":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattergeo"}], "scattergl":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattergl"}], "scattermapbox":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scattermapbox"}], "scatterpolar":
[{"marker": {"colorbar":
{"linewidth":0, "ticks":""}, "type": "scatterpolar"}], "scatterpolargl":

```



```

": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterpolargl"}], "scatterterna
ry": [{"marker": {"colorbar":
{"linewidth": 0, "ticks": ""}, "type": "scatterternary"}], "surface":
[{"colorbar": {"linewidth": 0, "ticks": ""}, "colorscale":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"],
[1, "#f0f921"]], "type": "surface"}], "table": [{"cells": {"fill":
{"color": "#EBF0F8"}, "line": {"color": "white"}}, "header": {"fill":
{"color": "#C8D4E3"}, "line":
{"color": "white"}}, "type": "table"}], "layout": {"annotationdefaults":
{"arrowcolor": "#2a3f5f", "arrowhead": 0, "arrowwidth": 1}, "autotypenumbers
": "strict", "coloraxis": {"colorbar":
{"linewidth": 0, "ticks": ""}, "colorscale": {"diverging":
[[0, "#8e0152"], [0.1, "#c51b7d"], [0.2, "#de77ae"], [0.3, "#f1b6da"],
[0.4, "#fde0ef"], [0.5, "#f7f7f7"], [0.6, "#e6f5d0"], [0.7, "#b8e186"],
[0.8, "#7fbc41"], [0.9, "#4d9221"], [1, "#276419"]], "sequential":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "sequentialminus":
[[0, "#0d0887"], [0.1111111111111111, "#46039f"],
[0.2222222222222222, "#7201a8"], [0.3333333333333333, "#9c179e"],
[0.4444444444444444, "#bd3786"], [0.5555555555555556, "#d8576b"],
[0.6666666666666666, "#ed7953"], [0.7777777777777778, "#fb9f3a"],
[0.8888888888888888, "#fdca26"], [1, "#f0f921"]], "colorway":
["#636efa", "#EF553B", "#00cc96", "#ab63fa", "#FFA15A", "#19d3f3", "#FF6692",
"#B6E880", "#FF97FF", "#FECB52"], "font": {"color": "#2a3f5f"}, "geo":
{"bgcolor": "white", "lakecolor": "white", "landcolor": "#E5ECF6", "showlake
s": true, "showland": true, "subunitcolor": "white"}, "hoverlabel":
{"align": "left"}, "hovermode": "closest", "mapbox":
{"style": "light"}, "paper_bgcolor": "white", "plot_bgcolor": "#E5ECF6", "po
lar": {"angularaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "radialaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "scene":
{"xaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "yaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}
, "zaxis":
{"backgroundcolor": "#E5ECF6", "gridcolor": "white", "gridwidth": 2, "lineco
lor": "white", "showbackground": true, "ticks": "", "zerolinecolor": "white"}

```

```

}, "shapedefaults": {"line": {"color": "#2a3f5f"}}, "ternary": {"aaxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "baxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}, "bgcolor": "#E5ECF
6", "caxis":
{"gridcolor": "white", "linecolor": "white", "ticks": ""}}, "title":
{"x": 5.0e-2, "xaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15, "zerolinecolor": "white", "zerolinewidth": 2}, "yaxis":
{"automargin": true, "gridcolor": "white", "linecolor": "white", "ticks": "",
"title":
{"standoff": 15, "zerolinecolor": "white", "zerolinewidth": 2}}}, "title":
{"text": "Macierz korelacji zmiennych", "xaxis":
{"dtick": 1, "gridcolor": "rgb(0, 0,
0)", "side": "top", "ticks": ""}, "yaxis":
{"dtick": 1, "ticks": "", "ticksuffix": "  "}}}

```

7. Przeprowadzić testy statystyczne dla analizy różnic w grupach.

```

from scipy import stats
from statsmodels.formula.api import ols
from statsmodels.stats.anova import anova_lm
from scipy.stats import chi2_contingency

# Test T-studenta
group1 = df[df['employment_status'] == 'employed']['income']
group2 = df[df['employment_status'] == 'retired']['income']

t_stat, p_value = stats.ttest_ind(group1, group2)

print(f"T-statystyka: {t_stat}")
print(f"P-wartość: {p_value}")
if p_value < 0.05:
    print("Istnieje istotna różnica w średnich income między grupą
zatrudnionych a emerytami.")
else:
    print("Brak istotnej różnicy w średnich income między grupą
zatrudnionych a emerytami.")

# Test ANOVA
model = ols('outcome ~ employment_status', data=df).fit()
anova_table = anova_lm(model)

print(anova_table)

if anova_table['PR(>F)'][0] < 0.05:
    print("Istnieje istotna różnica w średnich outcome między
przynajmniej dwoma grupami employment_status. (Pracujący zarabiają
więcej niż emeryci)")

```

```

else:
    print("Brak istotnej różnicy w średnich outcome między
    przynajmniej dwoma grupami employment_status.")

# Test Chi-kwadrat
contingency_table = pd.crosstab(df['employment_status'], df['city'])

chi2_stat, p_val, dof, expected = chi2_contingency(contingency_table)

print(f"Chi-kwadrat statystyka: {chi2_stat}")
print(f"P-wartość: {p_val}")

if p_val < 0.05:
    print("Istnieje istotna zależność między employment_status a city.
    (np. w Warszawie jest więcej bezrobotnych)")
else:
    print("Brak istotnej zależności między employment_status a city.")

```

T-statystyka: 2.475167674044197

P-wartość: 0.017892150211199005

Istnieje istotna różnica w średnich income między grupą zatrudnionych a emerytami.

	df	sum_sq	mean_sq	F
PR(>F)				
employment_status	3.0	5.985035e+06	1.995012e+06	3.656684
0.015169				
Residual	96.0	5.237563e+07	5.455795e+05	NaN
NaN				

Istnieje istotna różnica w średnich outcome między przynajmniej dwoma grupami employment_status. (Pracujący zarabiają więcej niż emeryci)

Chi-kwadrat statystyka: 108.93872127301096

P-wartość: 2.9199950121951688e-09

Istnieje istotna zależność między employment_status a city. (np. w Warszawie jest więcej bezrobotnych)

C:\Users\mindgoner\AppData\Local\Temp\ipykernel_2660\4206117422.py:28:
FutureWarning:

Series.__getitem__ treating keys as positions is deprecated. In a future version, integer keys will always be treated as labels (consistent with DataFrame behavior). To access a value by position, use `ser.iloc[pos]`