**Practical 9:**

**Aim: Assosiation rule mining algorithm**

from warnings import filterwarnings

filterwarnings("ignore")

import numpy as np

import pandas as pd

import plotly.graph\_objects as go

import plotly.express as px

from apyori import apriori

df = pd.read\_csv('D:\\STUDENT\\tycs82\\Groceries\_dataset.csv')

print(df.head())

print(df.isnull().any())

all\_products=df['itemDescription'].unique()

print("Total products: {}".format(len(all\_products)))

def ditribution\_plot(x,y,name=None,xaxis=None,yaxis=None):

fig = go.Figure([go.Bar(x=x,y=y)])

fig.update\_layout(title\_text=name,xaxis\_title=xaxis,yaxis\_title=yaxis)

print(fig.show())

x = df['itemDescription'].value\_counts()

x = x.sort\_values(ascending = False)

x = x[:10]

ditribution\_plot(x=x.index,y=x.values,yaxis="Count",xaxis="Products")

one\_hot = pd.get\_dummies(df['itemDescription'])

df.drop('itemDescription',inplace=True, axis=1)

df = df.join(one\_hot)

print(df.head())

records=df.groupby(["Member\_number","Date"])[all\_products[:]].apply(sum)

records=records.reset\_index()[all\_products]

def get\_Pnames(x):

for product in all\_products:

if x[product]>0:

x[product]=product

return x

records=records.apply(get\_Pnames, axis=1)

print(records.head())

x=records.values

x=[sub[~(sub==0)].tolist() for sub in x if sub[sub != 0].tolist()]

transactions=x

print(transactions[0:10])

rules = apriori(transactions,min\_support=0.00030,min\_confidance=0.05,min\_lift=3,min\_length=2,target="rules")

association\_results=list(rules)

for item in association\_results:

pair=item[0]

items=[x for x in pair]

print("Rule: "+items[0] + " -> " + items[1])

print("Support: "+str(item[1]))

print("Confidence: "+str(item[2][0][2]))

print("Lift: "+str(item[2][0][3]))

print("========================================================\n\n")

**Output:**

**===================== RESTART: D:/STUDENT/tycs82/pract9.py =====================**

**Member\_number Date itemDescription**

**0 1808 21-07-2015 tropical fruit**

**1 2552 05-01-2015 whole milk**

**2 2300 19-09-2015 pip fruit**

**3 1187 12-12-2015 other vegetables**

**4 3037 01-02-2015 whole milk**

**Member\_number False**

**Date False**

**itemDescription False**

**dtype: bool**

**Total products: 167**

**None**

**Member\_number Date ... yogurt zwieback**

**0 1808 21-07-2015 ... False False**

**1 2552 05-01-2015 ... False False**

**2 2300 19-09-2015 ... False False**

**3 1187 12-12-2015 ... False False**

**4 3037 01-02-2015 ... False False**

**[5 rows x 169 columns]**

**tropical fruit whole milk ... toilet cleaner preservation products**

**0 0 whole milk ... 0 0**

**1 0 whole milk ... 0 0**

**2 0 0 ... 0 0**

**3 0 0 ... 0 0**

**4 0 0 ... 0 0**

**[5 rows x 167 columns]**

**[['whole milk', 'yogurt', 'sausage', 'semi-finished bread'], ['whole milk', 'pastry', 'salty snack'], ['canned beer', 'misc. beverages'], ['sausage', 'hygiene articles'], ['soda', 'pickled vegetables'], ['frankfurter', 'curd'], ['whole milk', 'rolls/buns', 'sausage'], ['whole milk', 'soda'], ['beef', 'white bread'], ['frankfurter', 'soda', 'whipped/sour cream']]**

**Rule: frozen fish -> specialty chocolate**

**Support: 0.0003341575887188398**

**Confidence: 0.049019607843137254**

**Lift: 3.0689556157190907**

**========================================================**

**Rule: liver loaf -> fruit/vegetable juice**

**Support: 0.00040098910646260775**

**Confidence: 0.011787819253438114**

**Lift: 3.52762278978389**

**========================================================**

**Rule: ham -> pickled vegetables**

**Support: 0.0005346521419501437**

**Confidence: 0.03125**

**Lift: 3.4895055970149254**

**========================================================**

**Rule: meat -> roll products**

**Support: 0.0003341575887188398**

**Confidence: 0.019841269841269844**

**Lift: 3.620547812620984**

**========================================================**

**Rule: salt -> misc. beverages**

**Support: 0.0003341575887188398**

**Confidence: 0.0211864406779661**

**Lift: 3.5619405827461437**

**========================================================**

**Rule: spread cheese -> misc. beverages**

**Support: 0.0003341575887188398**

**Confidence: 0.0211864406779661**

**Lift: 3.170127118644068**

**========================================================**

**Rule: seasonal products -> soups**

**Support: 0.0003341575887188398**

**Confidence: 0.04716981132075471**

**Lift: 14.704205974842766**

**========================================================**

**Rule: spread cheese -> sugar**

**Support: 0.00040098910646260775**

**Confidence: 0.06**

**Lift: 3.3878490566037733**

**========================================================**

**Rule: butter -> bottled beer**

**Support: 0.0003341575887188398**

**Confidence: 0.007374631268436578**

**Lift: 3.8050554368833285**

**========================================================**

**Rule: hard cheese -> whole milk**

**Support: 0.0003341575887188398**

**Confidence: 0.007374631268436578**

**Lift: 3.9409502739148756**

**========================================================**

**Rule: frozen vegetables -> canned beer**

**Support: 0.0003341575887188398**

**Confidence: 0.008880994671403198**

**Lift: 6.644316163410303**

**========================================================**

**Rule: canned beer -> sausage**

**Support: 0.00040098910646260775**

**Confidence: 0.010657193605683837**

**Lift: 4.309826700590467**

**========================================================**

**Rule: butter -> soda**

**Support: 0.0003341575887188398**

**Confidence: 0.009487666034155597**

**Lift: 3.086172758023265**

**========================================================**

**Rule: butter milk -> yogurt**

**Support: 0.0003341575887188398**

**Confidence: 0.019011406844106463**

**Lift: 4.9046151829028455**

**========================================================**

**Rule: frozen vegetables -> canned beer**

**Support: 0.0003341575887188398**

**Confidence: 0.007122507122507123**

**Lift: 3.437873357228196**

**========================================================**

**Rule: whole milk -> canned beer**

**Support: 0.00040098910646260775**

**Confidence: 0.008547008547008546**

**Lift: 4.918803418803418**

**========================================================**

**Rule: soda -> chewing gum**

**Support: 0.00040098910646260775**

**Confidence: 0.03333333333333333**

**Lift: 5.732950191570881**

**========================================================**

**Rule: pork -> yogurt**

**Support: 0.00040098910646260775**

**Confidence: 0.004669260700389105**

**Lift: 3.4933073929961087**

**========================================================**

**Rule: coffee -> frankfurter**

**Support: 0.0003341575887188398**

**Confidence: 0.008849557522123895**

**Lift: 3.6782202556538843**

**========================================================**

**Rule: coffee -> frankfurter**

**Support: 0.0003341575887188398**

**Confidence: 0.010570824524312896**

**Lift: 3.438505377332475**

**========================================================**

**Rule: coffee -> sausage**

**Support: 0.0003341575887188398**

**Confidence: 0.010570824524312896**

**Lift: 3.2952343199436225**

**========================================================**

**Rule: curd -> fruit/vegetable juice**

**Support: 0.0003341575887188398**

**Confidence: 0.009920634920634922**

**Lift: 5.497868900646679**

**========================================================**

**Rule: curd -> margarine**

**Support: 0.0003341575887188398**

**Confidence: 0.009920634920634922**

**Lift: 5.301516439909298**

**========================================================**

**Rule: curd -> yogurt**

**Support: 0.00046782062420637575**

**Confidence: 0.007751937984496124**

**Lift: 3.4115367077063383**

**========================================================**

**Rule: hard cheese -> sausage**

**Support: 0.0003341575887188398**

**Confidence: 0.022727272727272728**

**Lift: 3.7785353535353536**

**========================================================**

**Rule: pip fruit -> rolls/buns**

**Support: 0.0003341575887188398**

**Confidence: 0.022026431718061675**

**Lift: 4.453804024288606**

**========================================================**

**Rule: root vegetables -> margarine**

**Support: 0.0003341575887188398**

**Confidence: 0.01037344398340249**

**Lift: 3.1043568464730287**

**========================================================**

**Rule: yogurt -> margarine**

**Support: 0.00040098910646260775**

**Confidence: 0.0066445182724252485**

**Lift: 3.106935215946843**

**========================================================**

**Rule: newspapers -> sausage**

**Support: 0.0003341575887188398**

**Confidence: 0.006459948320413437**

**Lift: 3.580007656235047**

**========================================================**

**Rule: onions -> yogurt**

**Support: 0.0003341575887188398**

**Confidence: 0.016501650165016504**

**Lift: 3.1655665566556657**

**========================================================**

**Rule: waffles -> sausage**

**Support: 0.0003341575887188398**

**Confidence: 0.002736726874657909**

**Lift: 3.4124703521255246**

**========================================================**

**Rule: soft cheese -> yogurt**

**Support: 0.0003341575887188398**

**Confidence: 0.03333333333333333**

**Lift: 4.122038567493113**

**========================================================**

**Rule: pork -> yogurt**

**Support: 0.00040098910646260775**

**Confidence: 0.004669260700389105**

**Lift: 3.037658602605312**

**========================================================**

**Rule: soda -> pastry**

**Support: 0.0003341575887188398**

**Confidence: 0.006459948320413437**

**Lift: 5.685894512843897**

**========================================================**

**Rule: yogurt -> rolls/buns**

**Support: 0.0003341575887188398**

**Confidence: 0.005537098560354374**

**Lift: 4.142580287929125**

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