```
#This block of code takes the dataset and  apply transaction encoding on it

import pandas as pd
from mlxtend.preprocessing import TransactionEncoder
import numpy as np
from mlxtend.frequent_patterns import apriori





ds=pd.read_csv("pumsb.csv")

L=[0.80,0.85,0.90,0.95]
attr=[250,500,1000,1500]

y1=[]
y2=[]
y3=[]
y4=[]


for attribute in attr:
  ds1=ds[:attribute]
  ds1=ds1.values.tolist()
  te = TransactionEncoder()
  te_ary = te.fit(ds1).transform(ds1)
  df1 = pd.DataFrame(te_ary, columns=te.columns_)
  y1.append(myfunc(ds1,df1,0.01,0.80))

for attribute in attr:
  ds2=ds[:attribute]
  ds2=ds2.values.tolist()
  te = TransactionEncoder()
  te_ary = te.fit(ds2).transform(ds2)
  df2 = pd.DataFrame(te_ary, columns=te.columns_)
  y2.append(myfunc(ds2,df2,0.01,0.85))


for attribute in attr:
  ds3=ds[:attribute]
  ds3=ds3.values.tolist()
  te = TransactionEncoder()
  te_ary = te.fit(ds3).transform(ds3)
  df3 = pd.DataFrame(te_ary, columns=te.columns_)
  y3.append(myfunc(ds3,df3,0.01,0.90))

for attribute in attr:
  ds4=ds[:attribute]
  ds4=ds4.values.tolist()
  te = TransactionEncoder()
  te_ary = te.fit(ds4).transform(ds4)
  df4 = pd.DataFrame(te_ary, columns=te.columns_)
  y4.append(myfunc(ds4,df4,0.01,0.95))



import matplotlib.pyplot as plt

x=attr

plt.plot(x, y1, label = "hc=0.80")
plt.plot(x, y2, label = "hc= 0.85")
plt.plot(x, y3, label = "line 0.90")
plt.plot(x, y4, label = "line 0.95")
plt.xlabel('Number of attributes')
plt.ylabel('Execution Time')
plt.title('Execution time of hyperclique pattern ')
plt.legend()
plt.show()
```

```
set()
=================================
[frozenset({0}), frozenset({1}), frozenset({2}), frozenset({3}), frozenset({9}), froze
2
{frozenset({4499, 84}), frozenset({17, 4428}), frozenset({4945, 4497}), frozenset({449
3
{frozenset({180, 4430, 4428}), frozenset({4426, 188, 4434}), frozenset({4426, 4940, 44
4
set()
=================================
[frozenset({0}), frozenset({1}), frozenset({2}), frozenset({3}), frozenset({4}), froze
2
{frozenset({17, 4428}), frozenset({4527, 4727}), frozenset({184, 7112}), frozenset({44
3
{frozenset({4426, 188, 7062}), frozenset({188, 180, 4428}), frozenset({17, 3404, 4404}
4
set()
=================================
[frozenset({0}), frozenset({1}), frozenset({2}), frozenset({3}), frozenset({4}), froze
2
{frozenset({4527, 4727}), frozenset({4432, 188}), frozenset({4434, 7092}), frozenset({
3
{frozenset({4426, 188, 7062}), frozenset({188, 180, 4428}), frozenset({17, 3404, 4404}
4
set()
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[frozenset({0}), frozenset({1}), frozenset({2}), frozenset({3}), frozenset({6}), froze
2
{frozenset({4527, 4727}), frozenset({4432, 188}), frozenset({4434, 7092}), frozenset({
3
{frozenset({4426, 188, 7062}), frozenset({188, 180, 4428}), frozenset({180, 4430, 4428
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set()
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[frozenset({0}), frozenset({1}), frozenset({2}), frozenset({3}), frozenset({9}), froze
2
{frozenset({4527, 4727}), frozenset({4432, 188}), frozenset({4434, 7092}), frozenset({
3
{frozenset({188, 180, 4428}), frozenset({180, 4430, 4428}), frozenset({4430, 4428, 443
4
set()
=================================
```

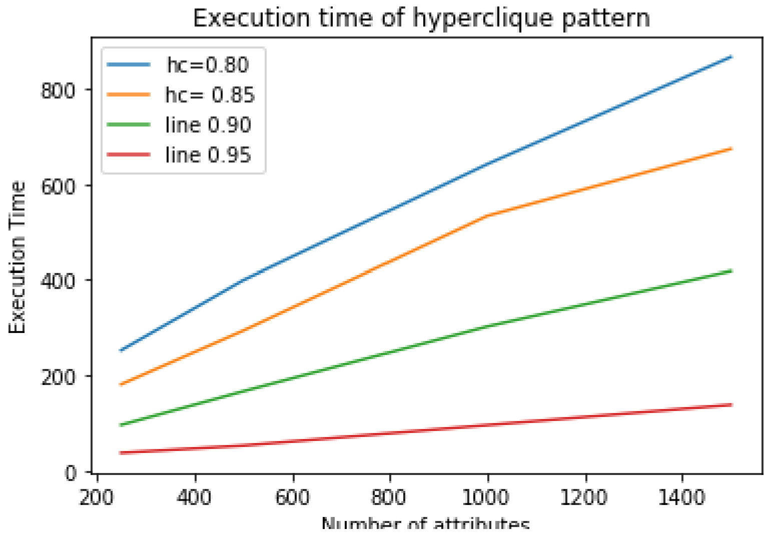

Number of attributes

```
import time


def myfunc(ds,df,min_sup,hc):
  start_time=time.time()
  ck=[]
  count=0
  for i in list(df.columns):
    col=df.loc[:,i]
    col=list(col)
    support_count=0
    for item in col:
        if item==True:
            support_count+=1


    support=support_count/len(df)
    if support >= min_sup :
        x=[]
        x.append(i)
        ck.append(x)



  ck=list(map(frozenset,ck))
  print(ck)
  count+=len(ck)

##################################################




  k=len(df.columns)

  Lk=ck   # ck from previous step 1



  for i in range(2,k):

    print(i)
    CK1=aprioriGen(Lk,i-1)   #i-1

    ck1=CK1


    ck1=antimonotone(Lk,ck1,i-1) #i-1

    ck1=cross_support(ds,ck1,hc)



    #code for step 4 here
    ck_updated=[]
    for item in ck1:
      #print((item))
      dt=list(map(int,item))
      #print(dt)
      #print(calc_sup(item[0]))
      if(calc_sup(dt,df)>min_sup):
        ck_updated.append(item)


    ck_updated1=[]

    for item in ck_updated:
      dt=list(map(int,item))
      #print(dt)
      #print(calc_hc(dt))
      if(calc_hc(dt,df)>hc):
        ck_updated1.append(item)

    print(set(ck_updated1))
    count+=len(ck_updated1)
    if len(ck_updated1)==0:
      print("================================")
      break
    else:
      Lk=ck_updated1
  end_time=time.time()
  return end_time-start_time



def calc_hc(item,df):
    subset=list(itertools.combinations(item,1))
    l=[]

    for i in range(len(subset)):
        temp=list(subset[i])
        l.append(calc_sup(temp,df))



        maximum=max(l)
    return(calc_sup(item,df)/maximum)


def calc_sup(item,df):
    count =0
    for row in range(0,len(df)):
        l=len(item)
        c=0
        for i in range(0,l):
            if df.get_value(row,item[i])==True:
                c=c+1
        if c==l:
            count=count+1

    return(count/len(df))






# Apriori Gen function

def aprioriGen(Lk, k):
    ck1=[]

    for i in range(len(Lk)):
        for j in range(i+1, len(Lk)):
            L1 = list(Lk[i])
            L1=L1[0:k-1]
            L2 = list(Lk[j])
            L2=L2[0:k-1]
            L1.sort()
            L2.sort()
            if L1==L2:
                ck1.append(Lk[i] | Lk[j])
    return ck1



#Anti Monotone function

import itertools
def antimonotone(prev_ck,current_ck,k):

    ck_updated=[]
    for item in current_ck:    #ck
        subset=list(itertools.combinations(item, k))
        subset=list(map(frozenset,subset))
        count=0
        L=len(subset)
        for item1 in subset:
            for item2 in prev_ck:
                if item1==item2:
                    count=count+1

        #print(L)
        #print(count)
        if L == count:
```