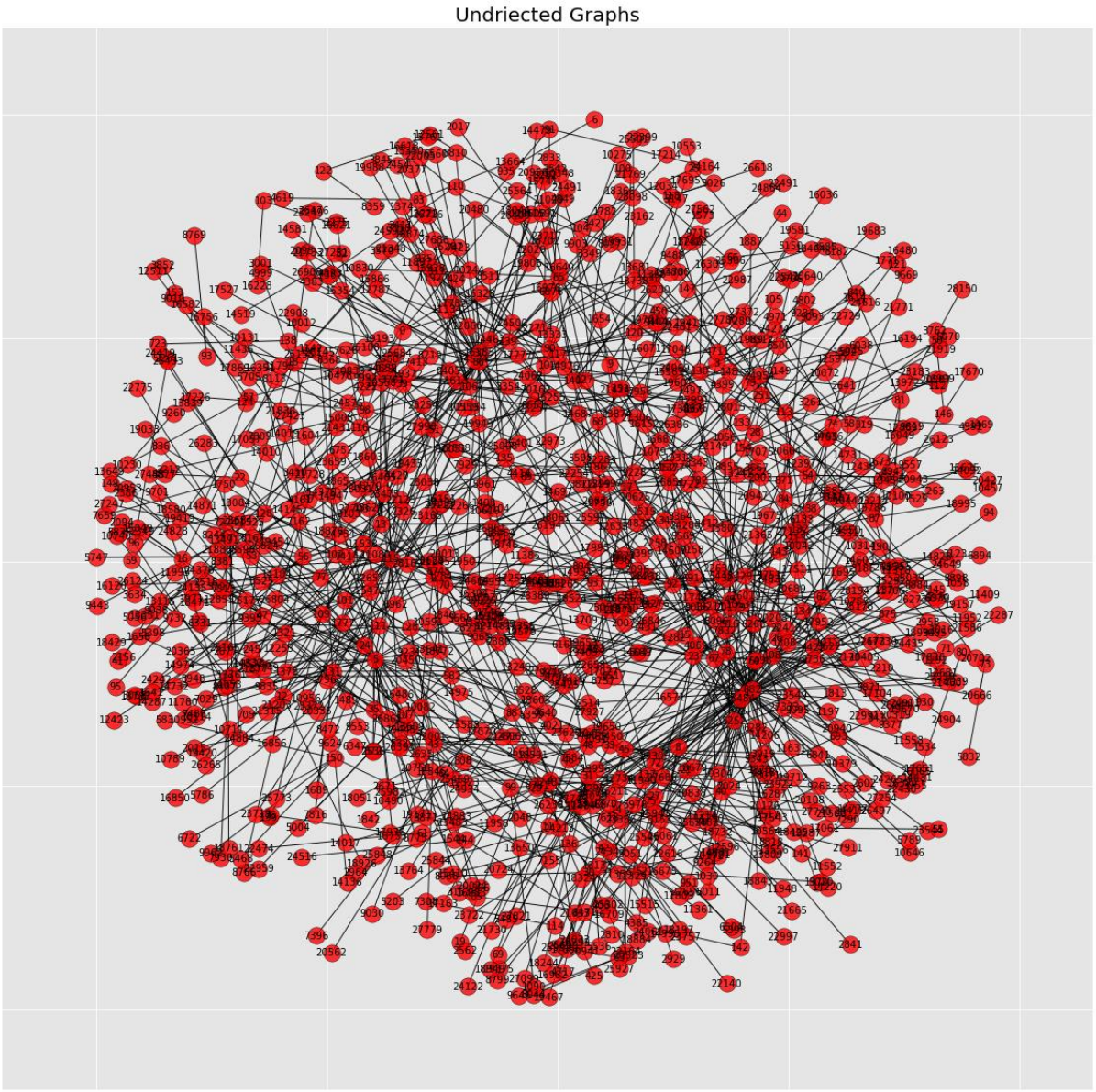
TASK 1

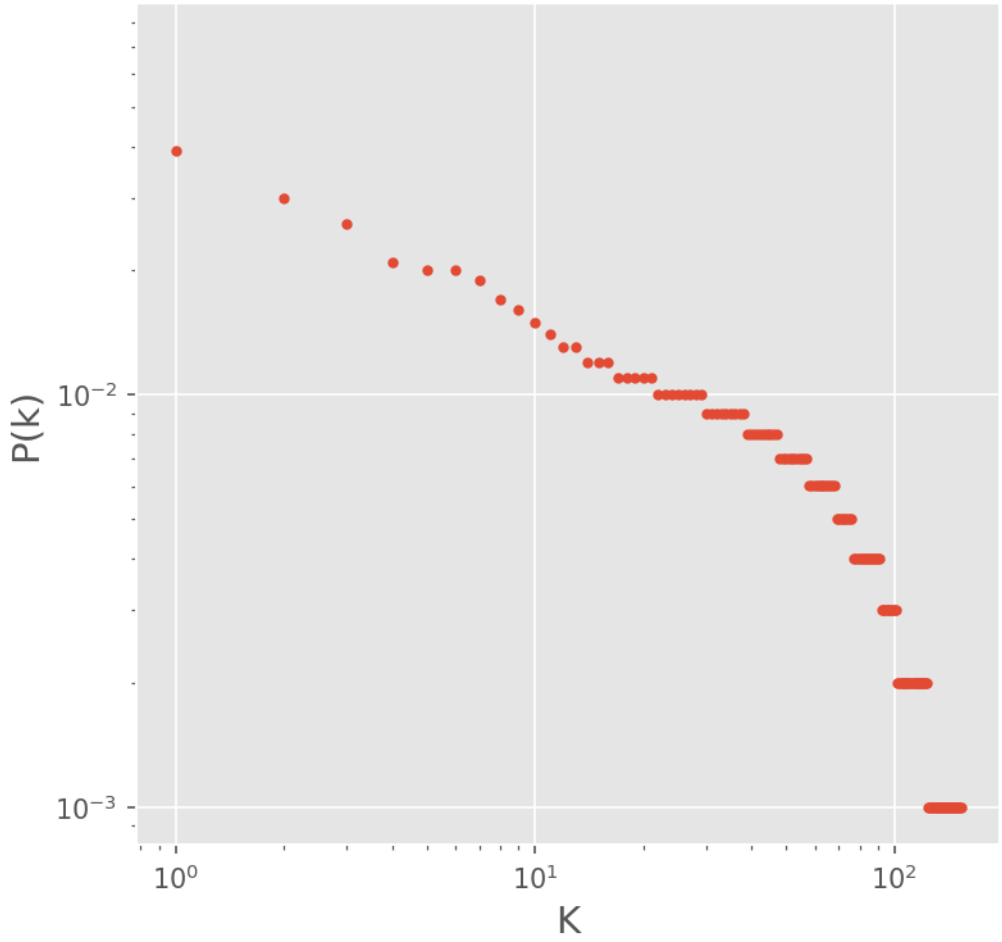
```
import pandas as pd
import networkx as nx
import matplotlib.pyplot as plt
import math


df2=pd.read_csv("secondtraileurope.csv")
print(df2)
df3=df2[['node_1','node_2']]

#Plotting the graph for the followers from one node
G=nx.from_pandas_edgelist(df3,'node_1','node_2')
pos= nx.spring_layout(G,k=0.1,iterations=20)
f,ax=plt.subplots(figsize=(20,20))
plt.style.use('ggplot')

nodes=nx.draw_networkx_nodes(G, pos,alpha=0.8,node_color='r')
nodes.set_edgecolor('k')
nx.draw_networkx_labels(G, pos, font_size=10)
nx.draw_networkx_edges(G, pos, width=1.0, alpha=0.9)
plt.title('Undriected Graphs', fontsize =20)
print(type(G))


#Frequency evaluation w Plotting of the Barabasi Albert model
#Calculation of the log values
```

```
df3=df3.sort_values('node_1')
df3freq=df3['node_1'].value_counts()
df3freq.to_csv("frequencies2.csv")
x=range(len(df3freq))
y=[z/float(sum(df3freq)) for z in df3freq]


plt.figure(figsize=(5.8,5.8),dpi=150)
plt.xlabel("K",size=14)
plt.ylabel("P(k)",size=14)
plt.xscale('log')
plt.yscale('log')
plt.plot(x,y,'.')
plt.show()



print("Total number of nodes",int(G.number_of_nodes()))
print("Total number of edges",int(G.number_of_edges()))
```

OUTPUT

```
     node_1  node_2
0         0   14270
1         0   16976
2         0   12029
3         0    3001
4         0   14581
..      ...     ...
994     154   19579
995     154   21919
996     154   24274
997     154   20640
998     154   16999

[999 rows x 2 columns]
```






```
Total number of nodes 1108
Total number of edges 999
```

A scale free network is a network whose degree distribution follows the power law, ie, P(k) of nodes in the network having k connections to other nodes goes for large values of k. If you add new nodes to a network and attach them to nodes with high degrees, the “rich gets richer” and we end up with hubs of very high degree. Hence this network is a scale free network. There are some nodes present in the graph that tend to have higher degree than the rest and it is called “Hubs”.

Websites used

https://www.malinga.me/networkx-visualization-with-graphviz-example

http://localhost:8891/notebooks/Untitled5.ipynb?kernel_name=python3

https://towardsdatascience.com/how-to-download-and-visualize-your-twitter-network-f009dbbf107b

https://networkx.org/documentation/networkx-1.10/reference/generated/networkx.convert_matrix.from_pandas_dataframe.html

https://networkx.org/documentation/networkx-1.10/reference/readwrite.edgelist.html

https://www.kite.com/python/answers/how-to-convert-a-%60.csv%60-file-to-a-pandas-dataframe-in-python

https://networkx.org/documentation/stable/reference/generated/networkx.convert_matrix.from_pandas_edgelist.html#:~:text=Returns%20a%20graph%20from%20Pandas,more%20columns%20of%20edge%20attributes.

https://towardsdatascience.com/from-dataframe-to-network-graph-bbb35c8ab675

https://www.kite.com/python/docs/networkx.from_pandas_edgelist

https://towardsdatascience.com/how-to-download-and-visualize-your-twitter-network-f009dbbf107b

https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.loglog.html

https://networkx.org/documentation/stable/reference/drawing.html

https://stackoverflow.com/questions/5850782/change-color-of-nodes-when-in-a-spring-layout-networkx

https://blog.csdn.net/weixin_40935887/article/details/114691590?utm_medium=distribute.pc_aggpage_search_result.none-task-blog-2~aggregatepage~first_rank_ecpm_v1~rank_v31_ecpm-2-114691590.pc_agg_new_rank&utm_term=python%E5%A4%8D%E6%9D%82%E7%BD%91%E7%BB%9C%E5%BA%A6%E5%88%86%E5%B8%83&spm=1000.2123.3001.4430

https://numpy.org/doc/stable/reference/generated/numpy.array.html\

https://github.com/AlxndrMlk/Barabasi-Albert_Network

https://www.nature.com/articles/s41467-019-08746-5