CS 579 Online Social Network Analysis

Project Report

On

Social Media Data Analysis on Twitter Data

By

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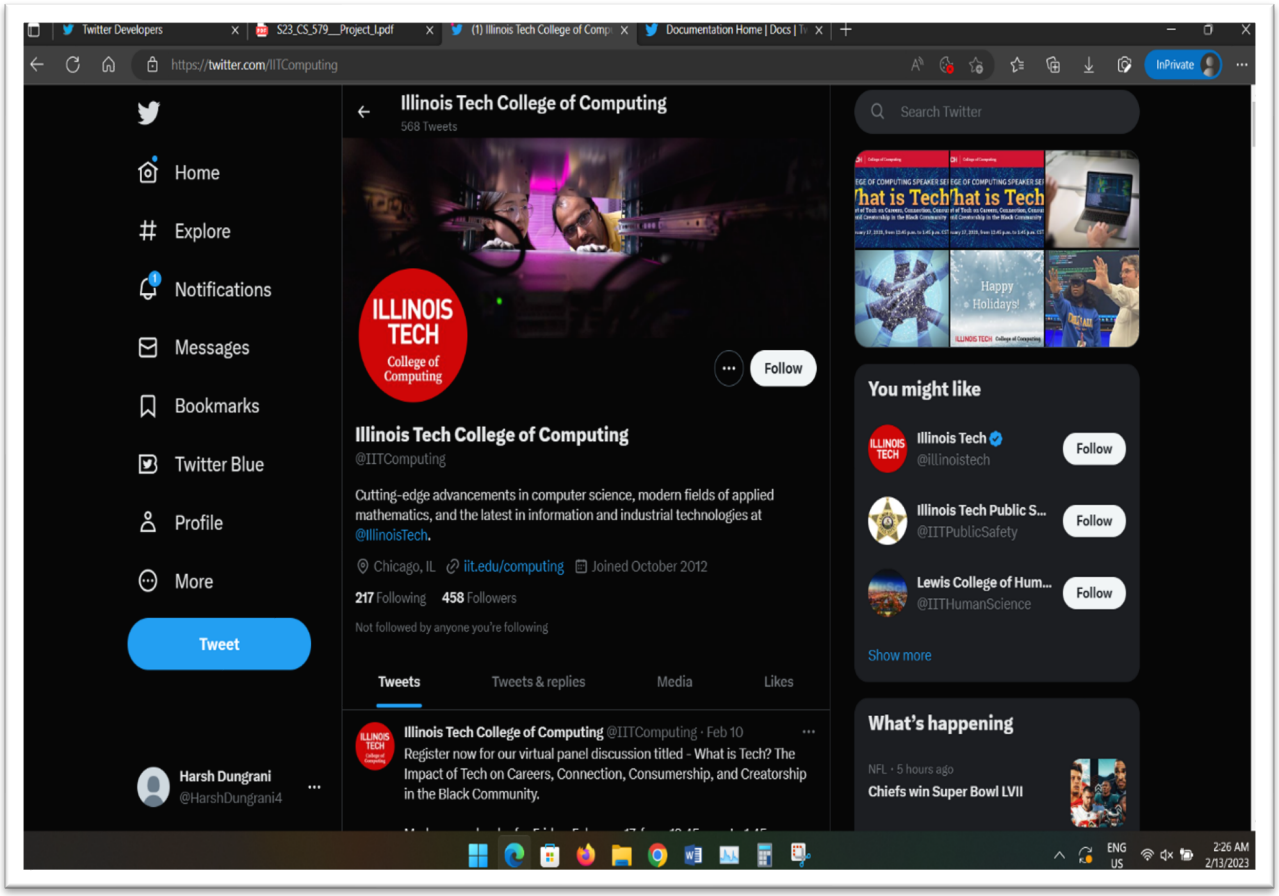
CONTENT:

Section I: Project Details

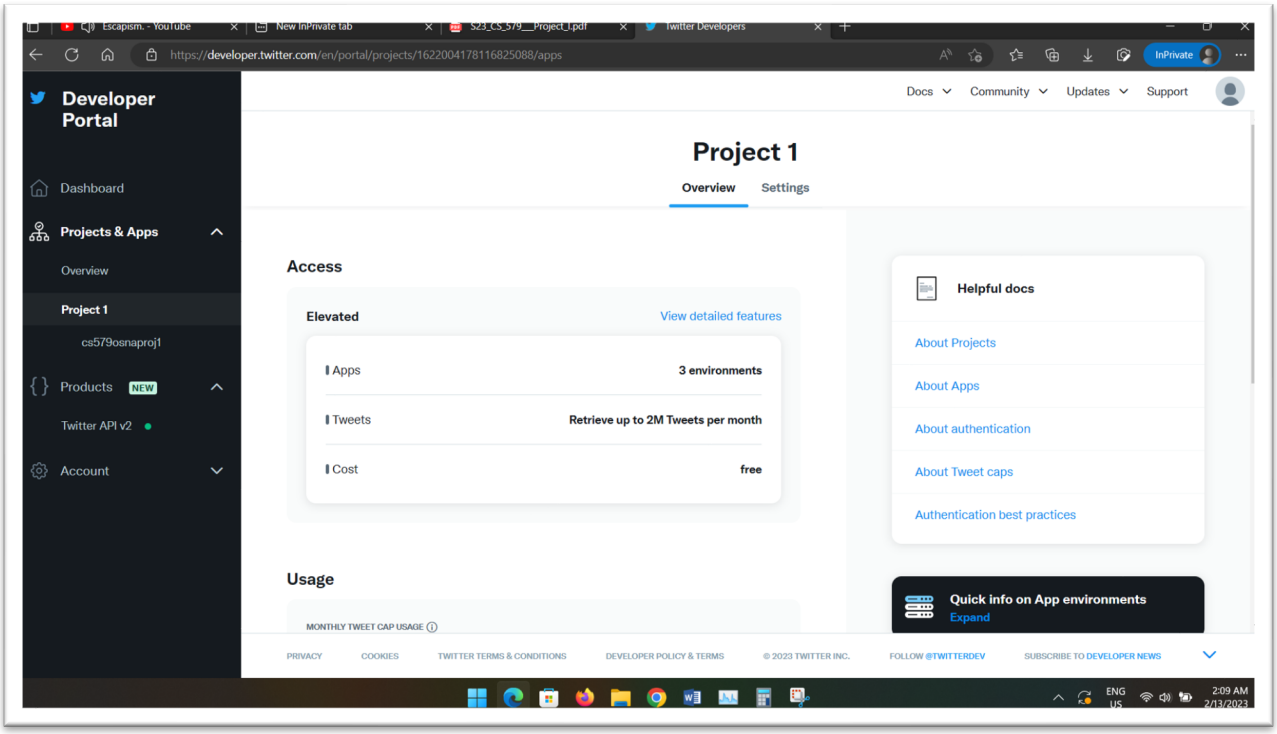
1.1 Project Topic: Crawl data from Twitter website using the necessary credentials and create a social network. Also, we need to calculate the different measurements for the charts, such as degree distribution, clustering coefficient, PageRank, Diameter, Closeness, and Betweenness.

1.2 Application Subject Area: We have created a user's friendship network which is represented as a graph that has the nodes as users and edges as the relation between them. For the friendship network we have used Twitter as the social media platform and the user is the official twitter handler of Illinois Tech's College of Computing "@IITComputing". We have found the followers and following list and represented them in a friendship network.

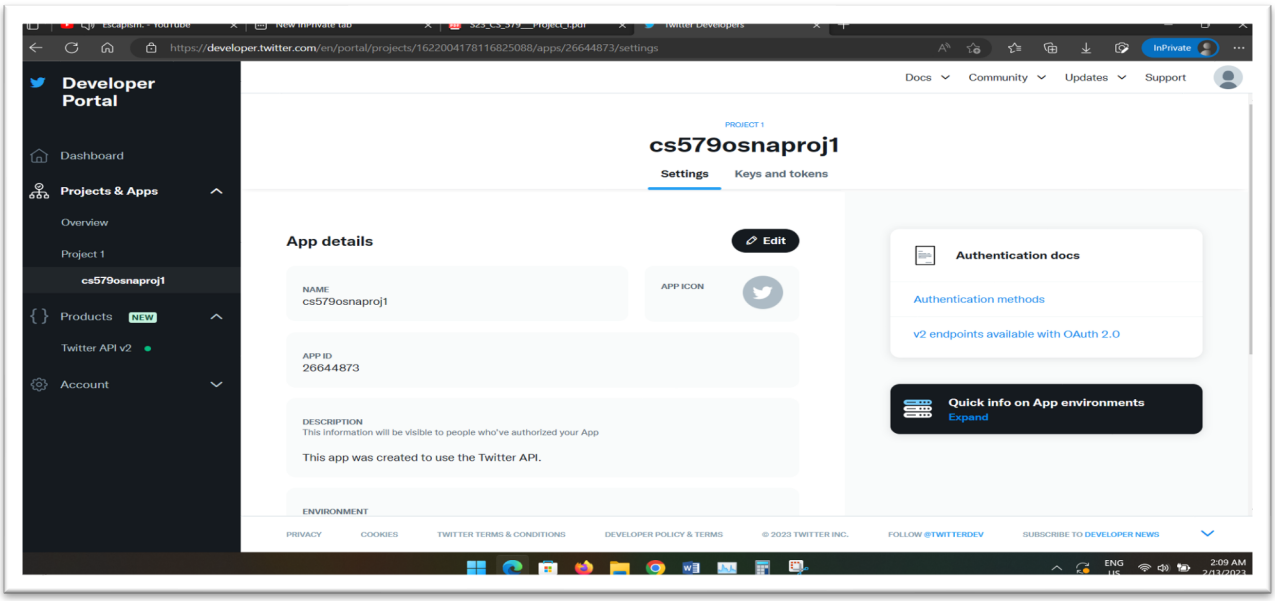


1.3 <u>Data Set Source</u>: We have taken the data from the twitter using the twitter API. The following are the screenshots of the created developer account and the assigned credentials.[1]

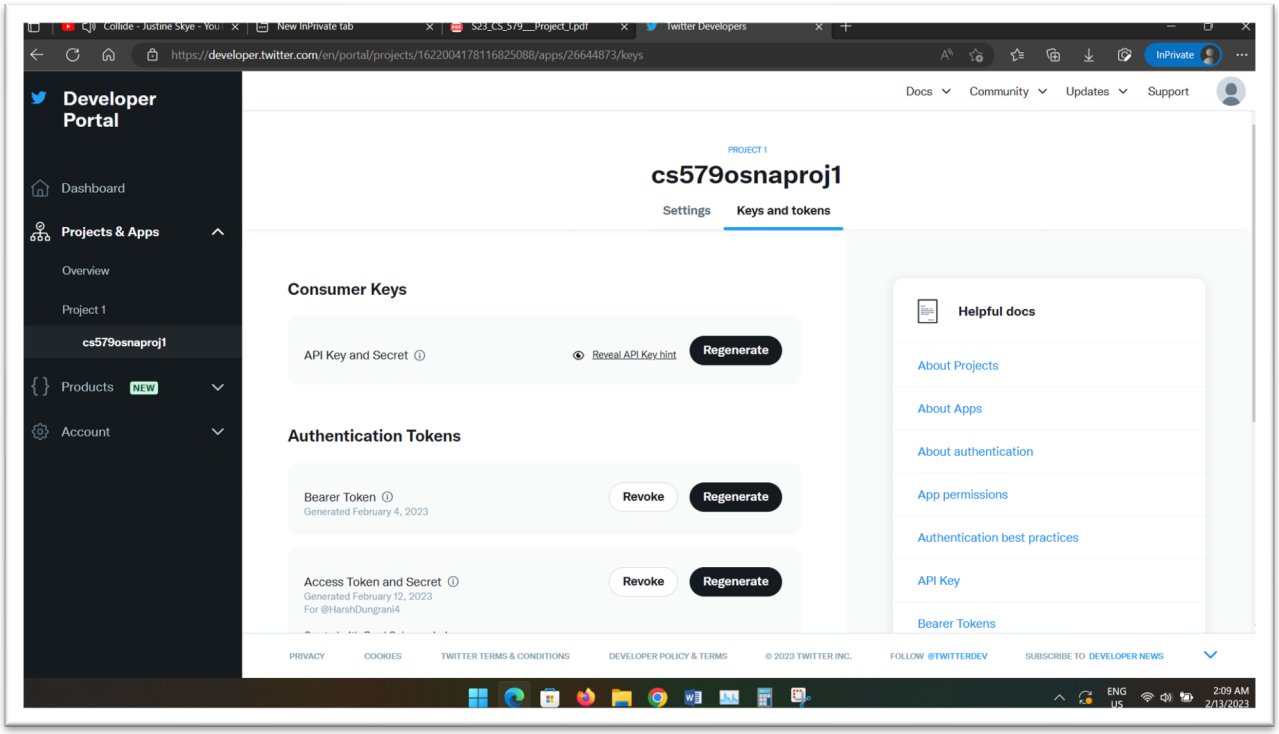
Created Twitter Developer Account with Elevated Access:



Created a project with name "**<u>cs579osnaproj1</u>**":



Generated Keys and Tokens:



Section II: Proposed Approach:

2.1 Data Collection: The above given credentials for the created Twitter developer account were used to collect the required data from Twitter with the use of further libraries.

1) **Tweepy**: Tweepy is a python library that is useful for accessing the Twitter API.
   - Before starting with the setup of the Client API, we need to import the tweepy library, then we need to do an authentication, afterwards we can use the functions, which are available in the library. [3]

2) **Pandas**: Pandas is a Python package used for data analysis.
   - The panda's library has useful functions for analyzing, cleaning, exploring, and manipulating datasets.

- Here I attached the screenshots of the code, For running the code, we need to important the necessary libraries, afterwards, we have taken the twitter credentials like Consumer_key, Consumer_secret, access_token and access_token_secret, now before crawling the data on twitter, we need to do authentication using the AuthHandler.[4]

```
[1]  #Import required libraries
     import tweepy
     import numpy as np
     import pandas as pd
     import networkx as nx

[ ]  #Twitter Developer Account: Keys and Tokens
     consumer_key = '6Uzc8TaoYUyRxWPratQYThUh3'
     consumer_secret = 'lYXlEnXgZ9SCGZ1pYTeMpd8qbgp5XfNeWlpmZlmEQLReKKLM0y'
     access_token = '1621995398897479680-QwVJslDD6D97Y66HojXYzjQ7lsfs8b'
     access_token_secret = 'qq5F18xmUlQouPCzi4SKyzClBQVg68NgFwhKQeZgwpzeo'

[ ]  #Set up Twitter API using tweepy for crawling data on Twitter website
     auth = tweepy.OAuthHandler(consumer_key, consumer_secret)
     auth.set_access_token(access_token, access_token_secret)
     api = tweepy.API(auth, wait_on_rate_limit=True, wait_on_rate_limit_notify=True, compression=True)
```

- We have decided to take the friendship network for Illinois Institute of Technology, and specific college of computing department, the Twitter account is start with the '@IITcomputing', Now our task is to find the user_id with the screen time '@IITcomputing', after running the code successfully, we found the user_id = 917528090.

```
#We have decided to create a friendship network for Illinois Tech's College of Computing '@IITComputing' Twitter account
#Get the user id for user with screen name as '@IITComputing'
user = api.get_user(screen_name = '@IITComputing')
uid = user.id
print(uid)

917528090
```

- Now the below code is useful for getting the people, who have been followed by the @IITcomputing account.

```
#Crawl data for the accounts that @IITComputing follows
account = ["917528090"]
following = {}
for user in account:
    follow = []
    for page in tweepy.Cursor(api.friends_ids, user_id=user).pages():
            follow.extend(page)
    for i in follow:
      temp =api.get_user(i)
      following[i] = temp.screen_name
```

- After taking the following data from the screen_name = ‘ IITComputing’, Here we have printed the data, which have three labels like target, label and source.

```
#Following Data for '@IITComputing'
print(df)
```

```
                   target              label      source
0                217147448          iitcsdept   917528090
1     1128095824473276418         KaiShu0327   917528090
2              1225586995   IITHumanScience    917528090
3     1166134633609814016   RealTechNewsIIT   917528090
4                296451422        RayTrygstad   917528090
..                     ...                ...         ...
212              183102912          jamiepixi   917528090
213               17093617          hootsuite   917528090
214              218288929       IITAdmission   917528090
215               87246946     IITCampusLife    917528090
216               16932547       illinoistech   917528090

[217 rows x 3 columns]
```

- On the other hand, using the same way, we found the data for the followers, here there are three labels like source, label and target, here the target is fixed because we can consider target as root node.

```
#Followers Data for '@IITComputing'
print(df1)
```

```
                   source              label      target
0     1621133261505429504   AnnaSrinivasan4   917528090
1     1621853970284044288   Lorenzo87567280   917528090
2     1623050008567095316   VatsalM05797052   917528090
3     1619934482055761920             astjzl   917528090
4              4184514795         Ssanidhya2   917528090
..                    ...                ...         ...
453             726409806      IITCommunity   917528090
454              45899585   ScottPfeiffer54   917528090
455              87246946     IITCampusLife   917528090
456              16932547       illinoistech   917528090
457             218288929       IITAdmission   917528090

[458 rows x 3 columns]
```

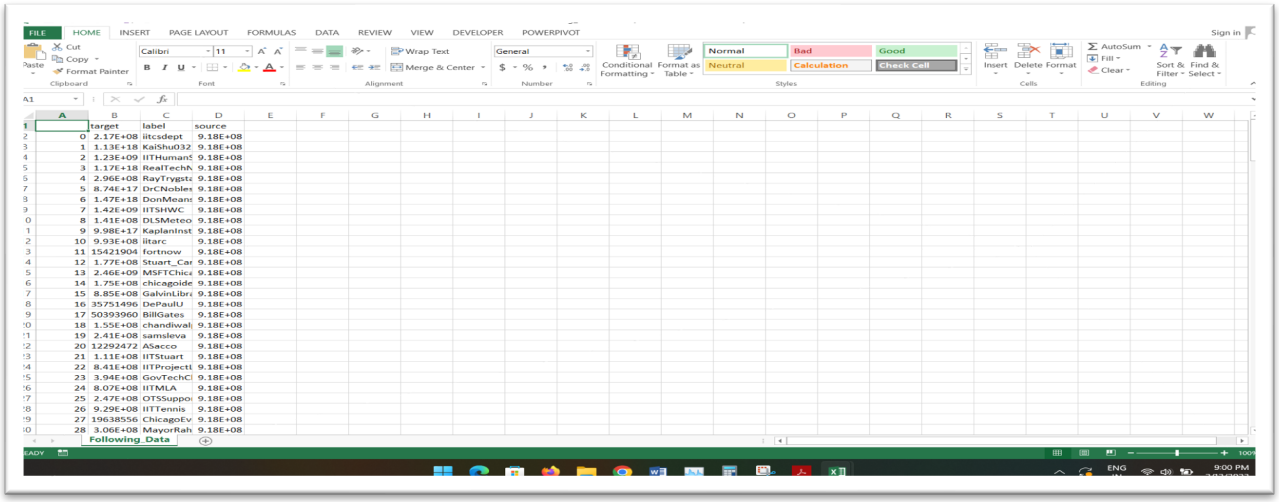
- The below code is useful for creating the .csv file, as we have used the google colab Platform so used the below command; we have downloaded the .csv file into folder.

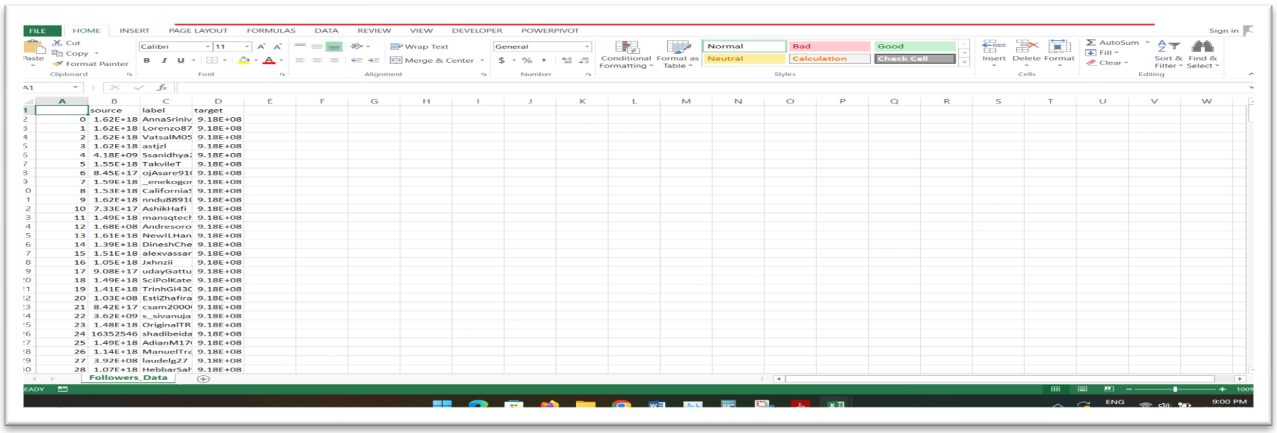
```
#Create csv file from dataframe
df.to_csv('Following_Data.csv')

#Download csv file
from google.colab import files
files.download('Following_Data.csv')
```

```
#Create csv file from dataframe
df1.to_csv('Followers_Data.csv')

#Download csv file
from google.colab import files
files.download('Followers_Data.csv')
```

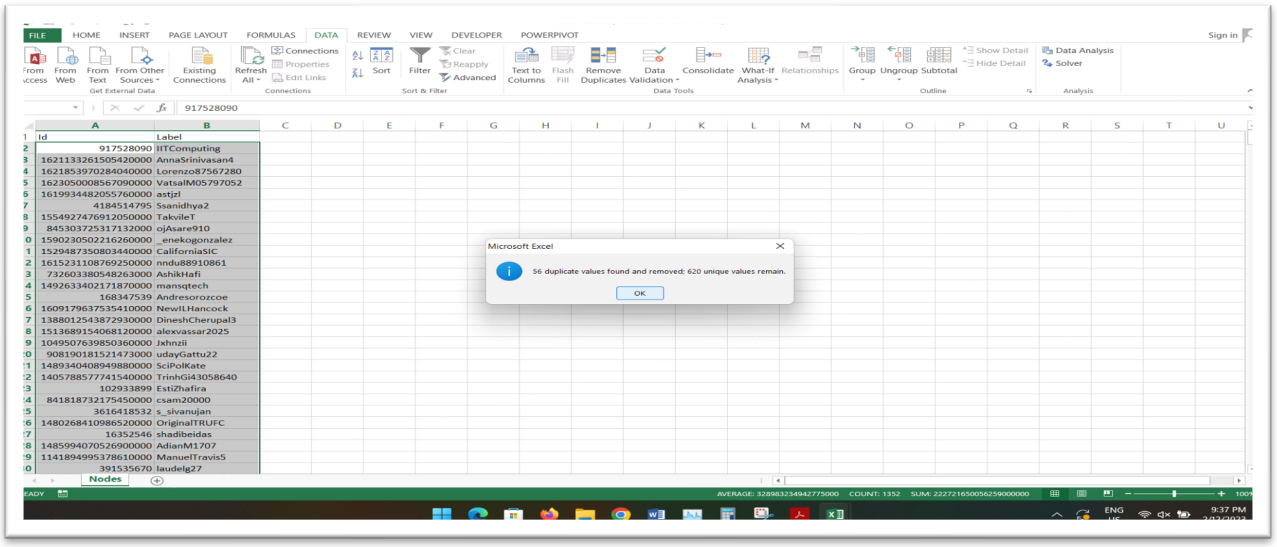
2.2 Data Processing:

- Now after getting the data from .csv file, we have imported into excel, for data cleaning as some of the data may be duplicate so we can filter it.

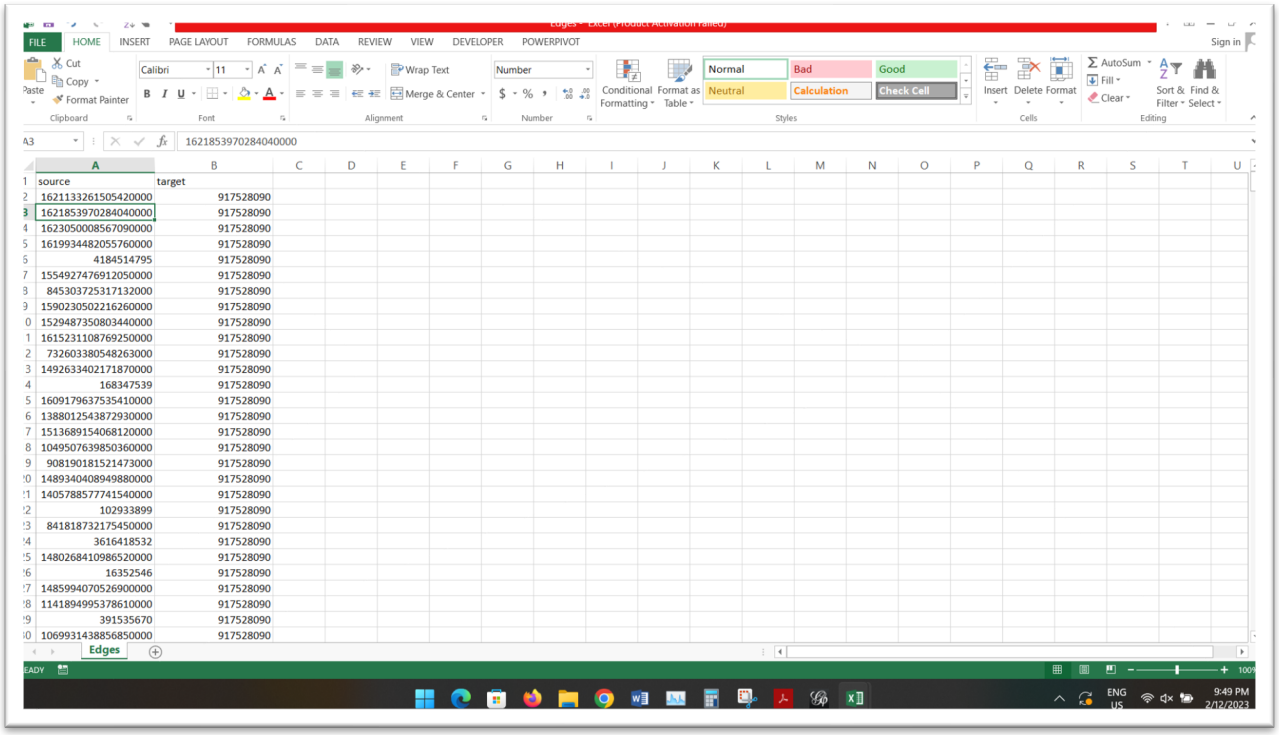




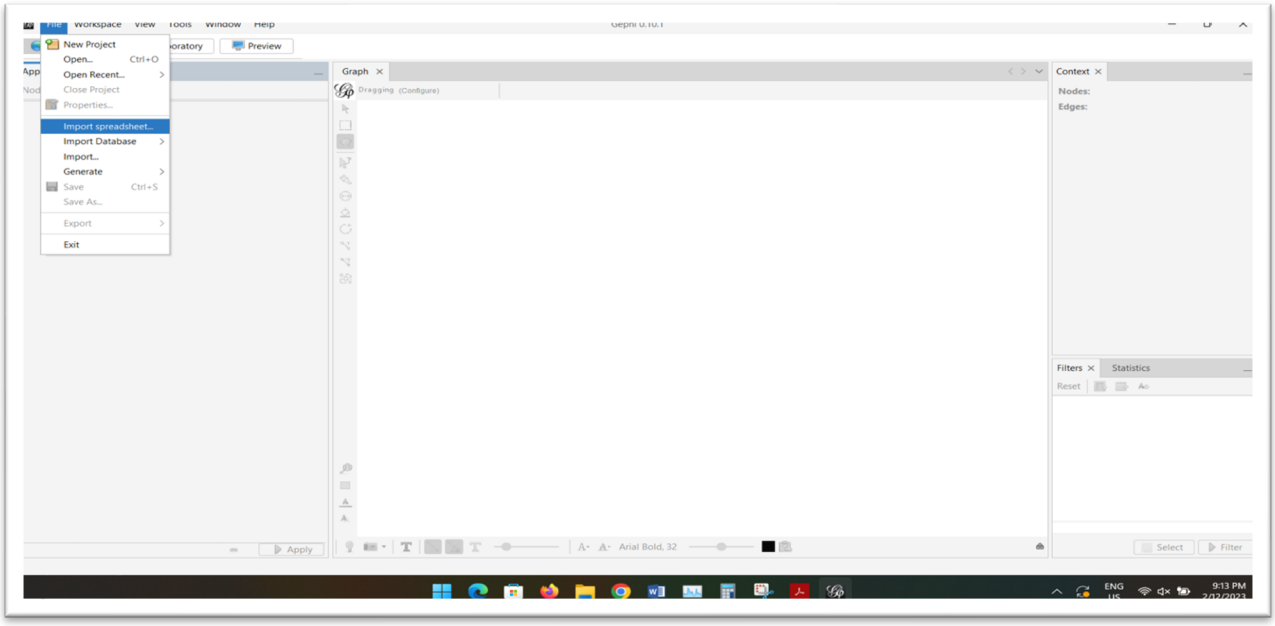
- Now for the nodes, we have found the 56 duplicate values, so have 620 unique nodes available for the id and label.

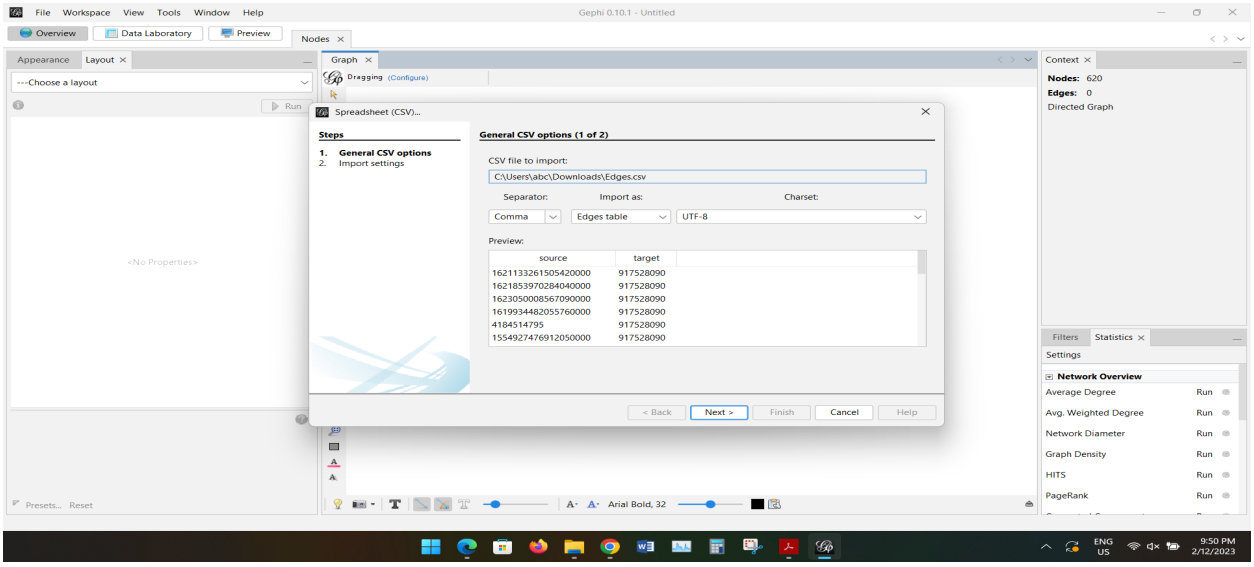


- Now for the edges, we have two labels, one is the source and another one is target.

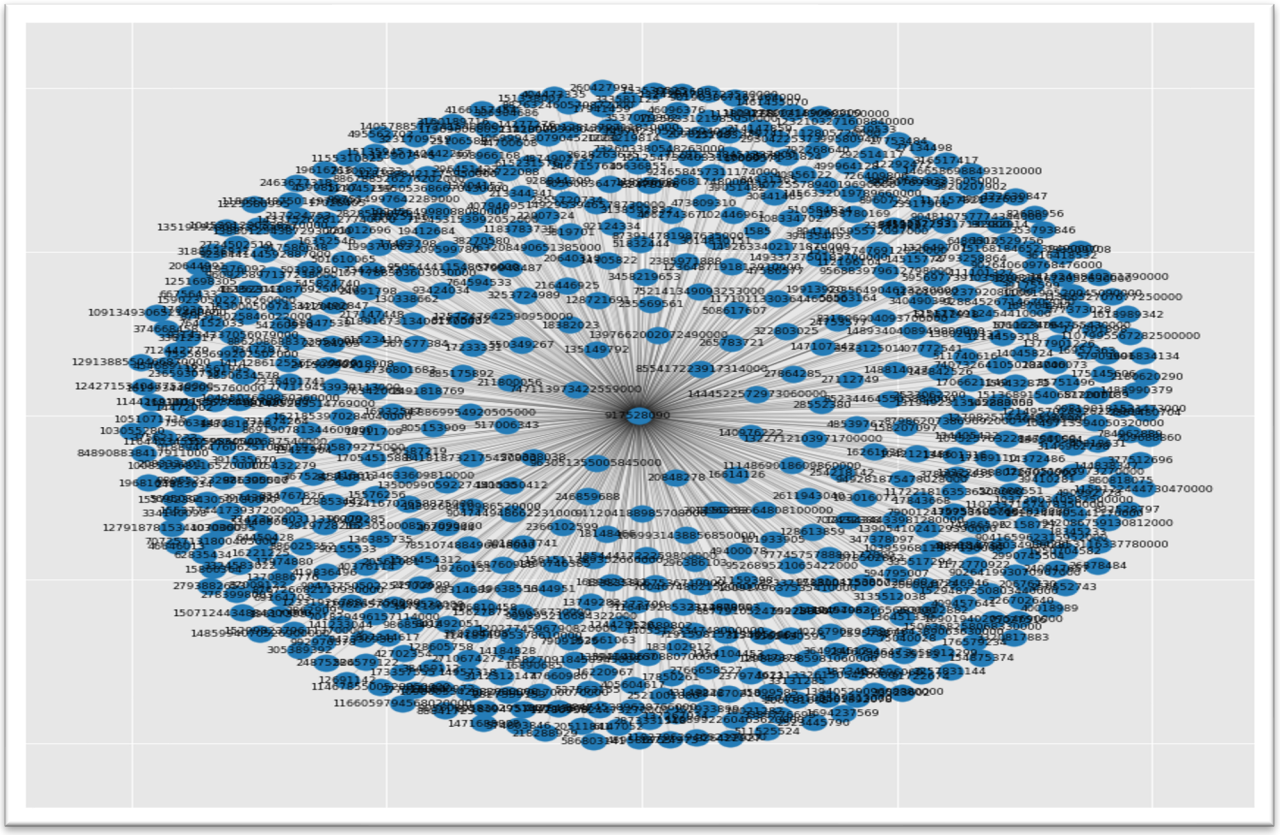


2.3 <u>Data Visualization:</u> Now for the data visualization part, we have used the Gephi, for the first step, we need to import the spreadsheet into .csv format.[6]

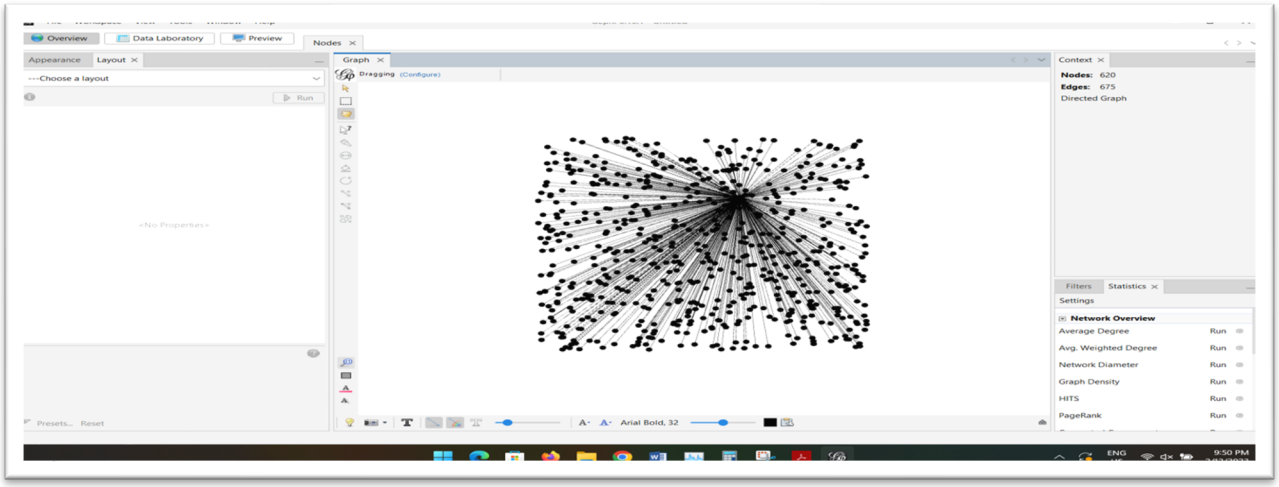




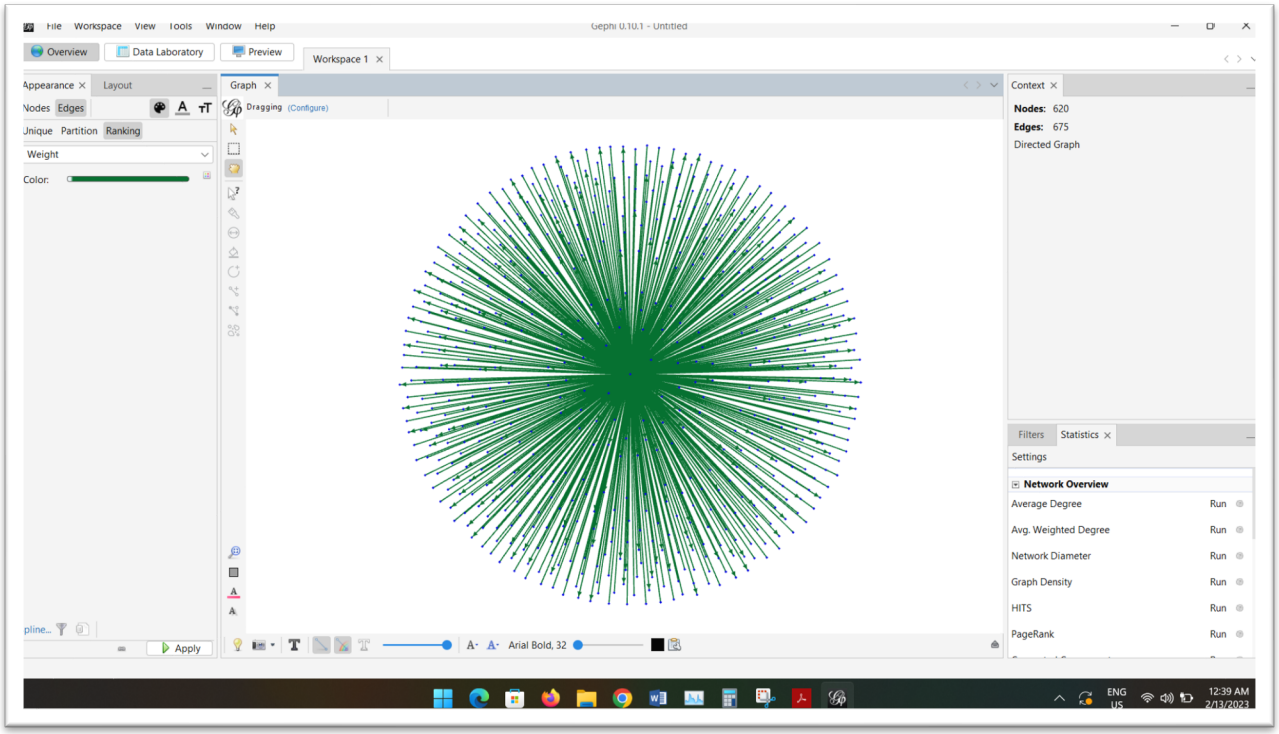
- In the below screenshot, The blue color represents the nodes, and the light black color represents the edges, here there are 620 unique nodes, here we used the user_id for representing the graph. It is showing the friendship network.



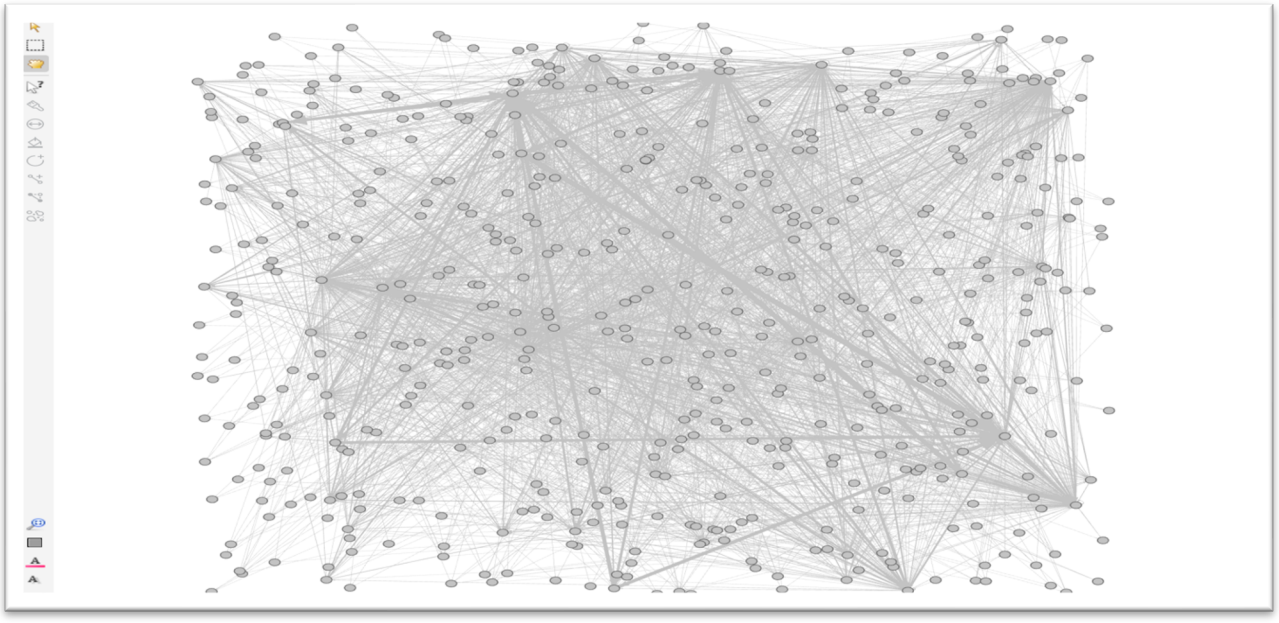
- The below graph showed the initial visualization of the nodes and edges graph, the followers that following the IITComputing.

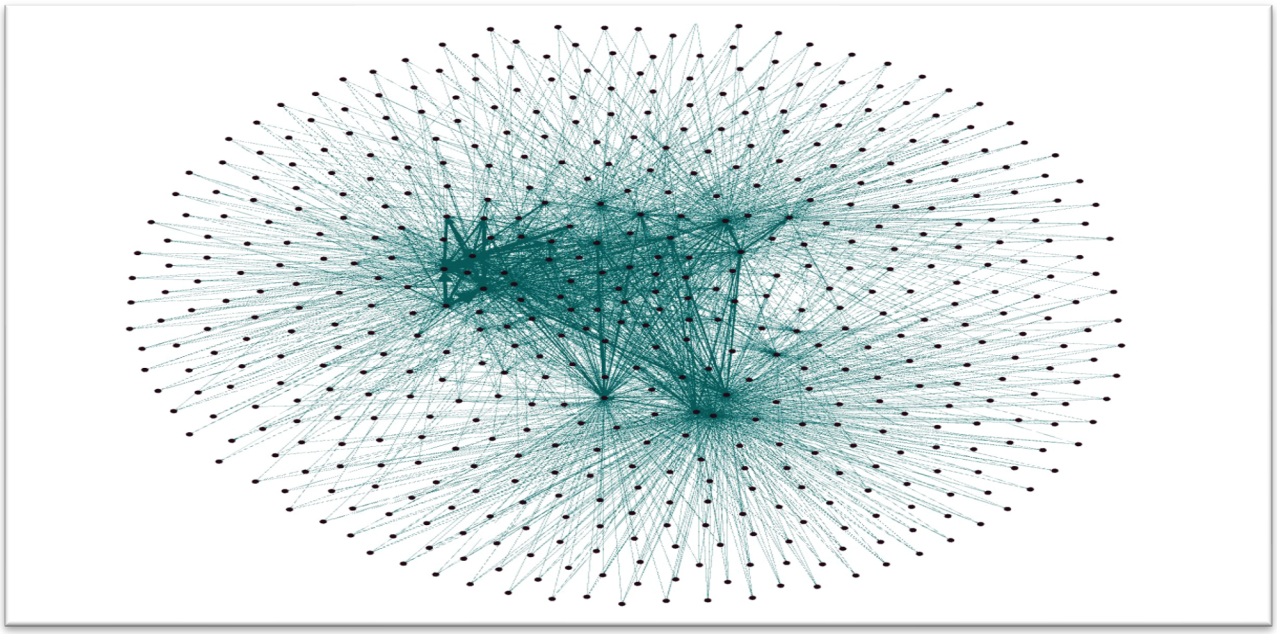


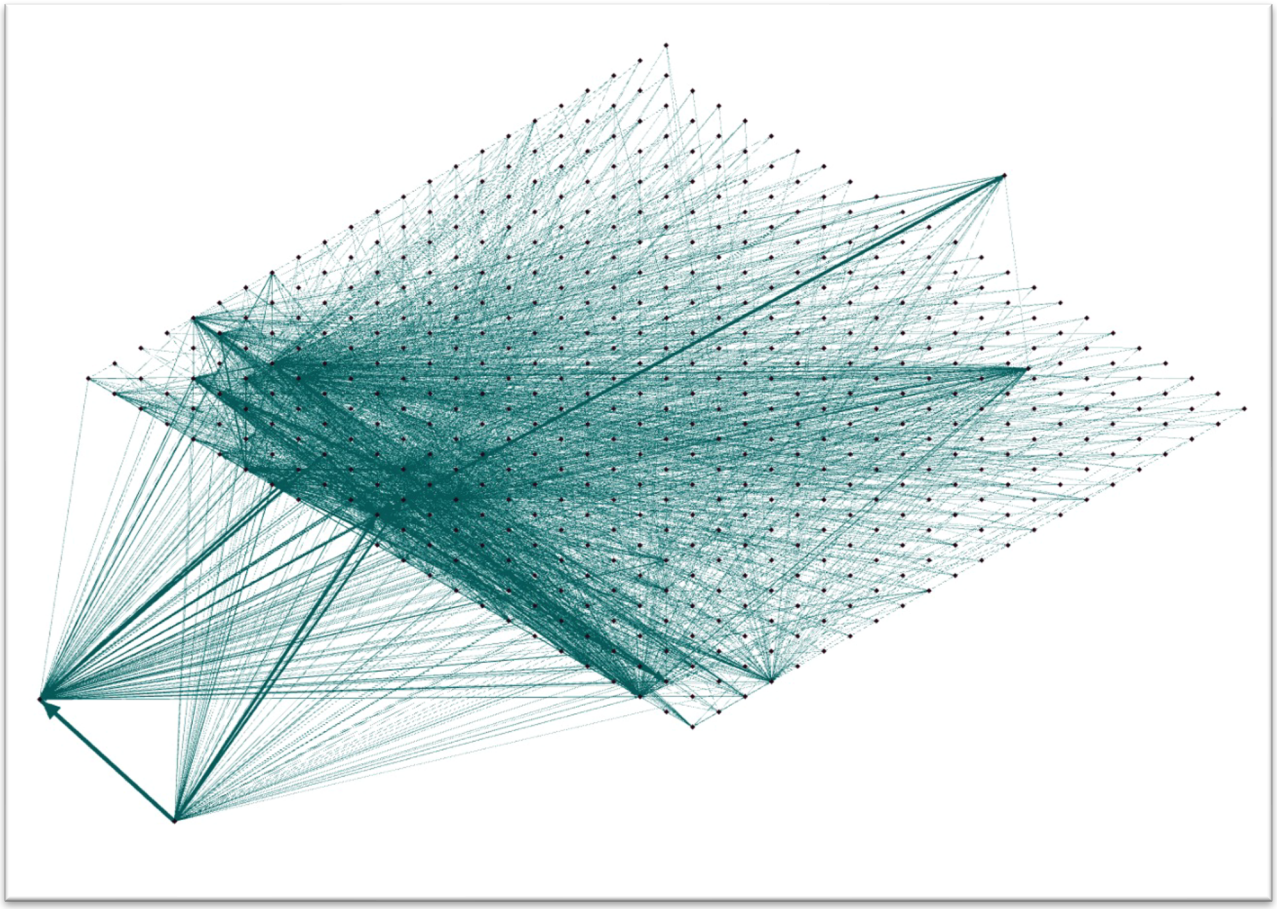
- The below graph represents the data visualization after applying appearance properties like the colors, size, label size and label colors. (This graph is only for the followers and following data sets).[9]



- In the below graph, the followers are nodes, and the edges show the connection between the followers and their followers, it is called the friendship network.



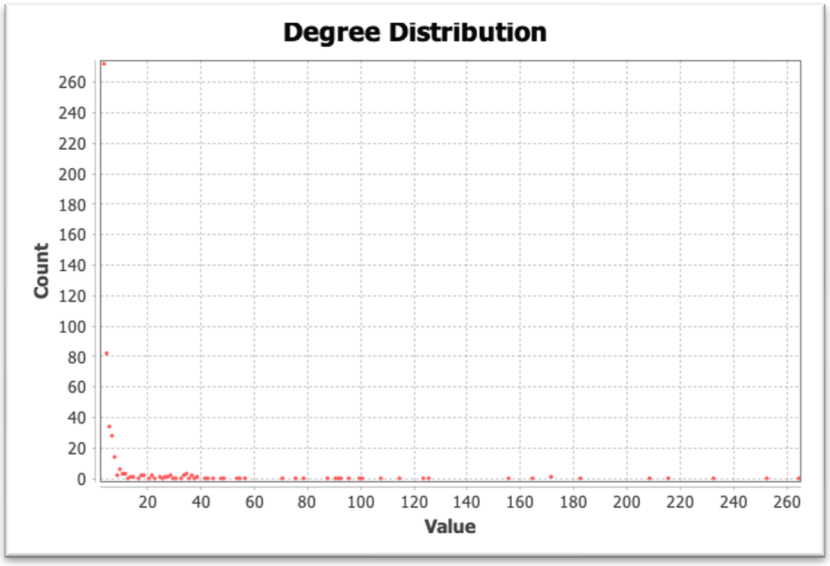




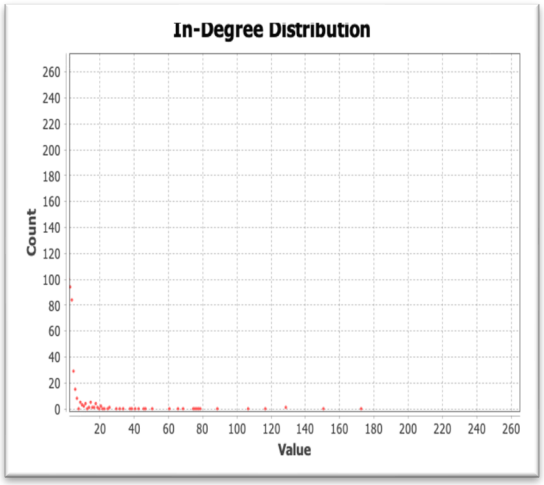
2.4 Network Measures:

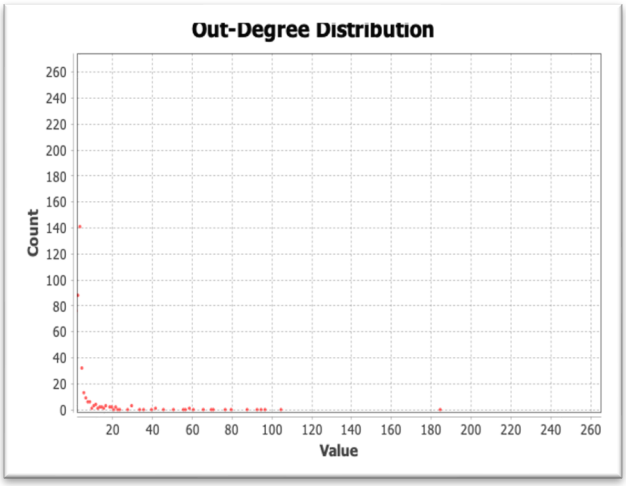
Degree Distribution: The degree of distribution of a graph is the probability distribution of the over the entire network.
Degree : The number of connections that node has with other nodes.

- In the below graph, the x axis represents the value(degree), and the y axis represent the count.
- The average distribution is 6.293, it means that one follower has connect with the average 6 peoples.[13]
- For the degree 1, there are above 260 followers connect with each other's.



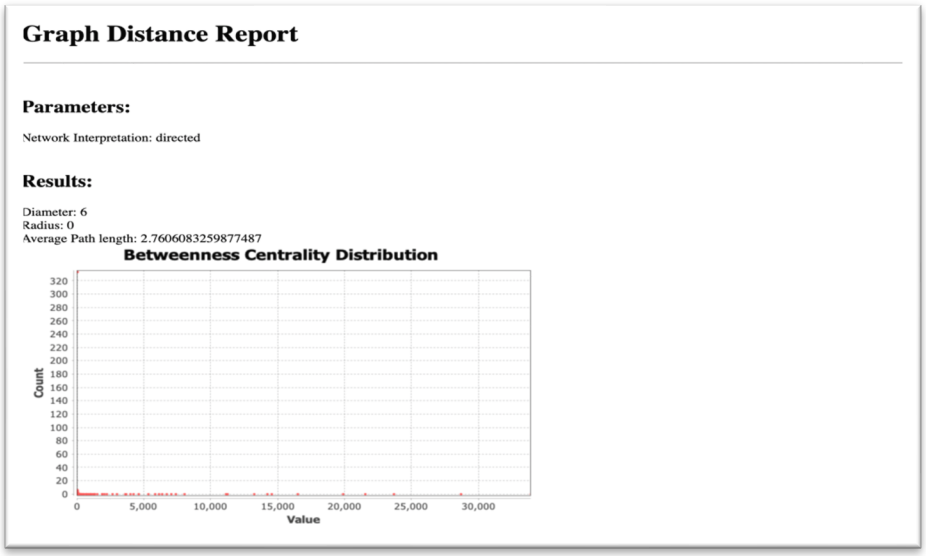
- The below graphs represent the In and Out Degree distribution.





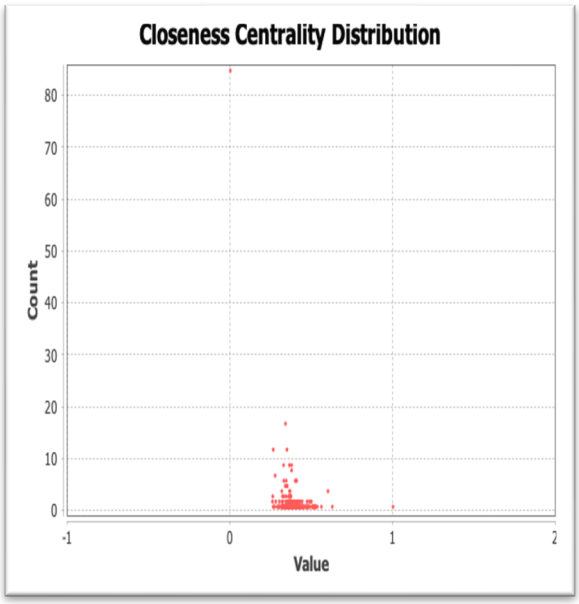
Diameter : The diameter of a graph is largest distance between the any pair of nodes.

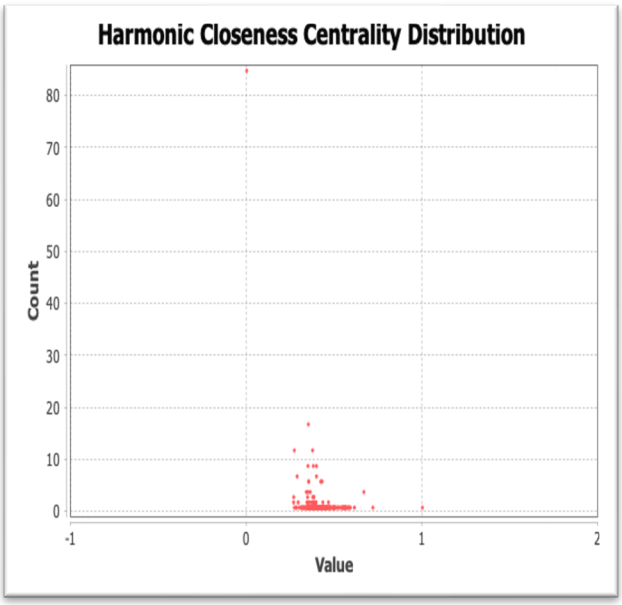
- For the below graph, the largest distance for the any follower's node is six.[10]



Betweenness : The number of these shortest paths that cross through that vertex is the betweenness centrality for that vertex.[11]

Closeness : The closeness centrality of network is the inverse calculated sum of the length of the shortest paths between the node and all other nodes in the graph.(class notes)





Graph Density : The number of edges in directed graph divide by the maximum number of edges present into the graph. [12]

- The maximum edges are calculated using the number of nodes * (number of nodes – 1).
- Here the graph density for the directed graph is 0.012.

Section III: Team Efforts:

1) Social Network Selection and Background Researchers by Harsh and Henil
2) Coding for the followers and their followers by Harsh and Henil
3) Gephi Visualization by Harsh
4) Documentation by Henil

Section IV: References:

[1] Setting up Twitter Developer Account: https://developer.twitter.com/en/support/twitter-api/developer-account

[2] Twitter Developer Platform Documentation: https://developer.twitter.com/en/support/twitter-api/developer-account

[3] Tweepy: https://www.tweepy.org/

[4] Article on getting data from Twitter using API: https://towardsdatascience.com/downloading-data-from-twitter-using-the-rest-api-24becf413875

[5] NetworkX: https://networkx.org/

[6] Gephi: https://gephi.org/

[7] Gephi Tutorial: https://gephi.org/users/quick-start/

[8] Tweepy Function: https://www.jcchouinard.com/tweepy-basic-functions/

[9] Gephi Layout : https://www.linkedin.com/pulse/visualization-graph-techniques-different-layouts-kinjal-ami/

[10] Graph Diameter : https://transportgeography.org/contents/methods/graph-theory-measures-indices/diametergraph/#:~:text=The%20diameter%20of%20a%20graph,of%20this%20graph%20is%204.

[11] Betweenness Centrality : https://www.geeksforgeeks.org/betweenness-centrality-centrality-measure/

[12] Graph Density : https://www.baeldung.com/cs/graph-density

[13] Graph Distribution : https://youtu.be/UJgPTnBmAZM