In [1]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [2]:
```
!pip install cdlib
import sys
!{sys.executable} -m pip install python-igraph
!{sys.executable} -m pip install leidenalg
```

```
Collecting cdlib
  Downloading https://files.pythonhosted.org/packages/e7/df/2c52a76f23e6801a12f0b67ba1523a167f808629dbb0feb7bf491efb1
925/cdlib-0.2.0-py3-none-any.whl (152kB)
     |████████████████████████████████| 153kB 4.4MB/s
Requirement already satisfied: pooch in /usr/local/lib/python3.7/dist-packages (from cdlib) (1.3.0)
Requirement already satisfied: networkx>=2.4 in /usr/local/lib/python3.7/dist-packages (from cdlib) (2.5)
Collecting eva-lcd
  Downloading https://files.pythonhosted.org/packages/e2/a4/f1f79a5c964831e2d3864e159c433cab5a8f420017e3492d615415c4a
c24/eva_lcd-0.1.0-py3-none-any.whl
Requirement already satisfied: scipy>=1.3.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (1.4.1)
Requirement already satisfied: tqdm>=4.20.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (4.41.1)
Requirement already satisfied: seaborn>=0.9.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (0.11.1)
Collecting python-louvain==0.14
  Downloading https://files.pythonhosted.org/packages/31/d4/d244fa4ca96af747b9204ce500e8919ce72eab60de2129b22a45434f1
598/python-louvain-0.14.tar.gz
Collecting pquality==0.0.7
  Downloading https://files.pythonhosted.org/packages/12/f8/5357fd9dfe0f105fea5439fcb01a21b8550a71d0e0b702b2bc0372c95
3c4/pquality-0.0.7-py3-none-any.whl
Collecting dynetx
  Downloading https://files.pythonhosted.org/packages/a9/2d/ce4a7e812ac8a26ed7a1872b6974391dd91dbdfc8845baae038becbf6
6f3/dynetx-0.2.4-py3-none-any.whl
Collecting pulp>=2.1
  Downloading https://files.pythonhosted.org/packages/14/c4/0eec14a0123209c261de6ff154ef3be5cad3fd557c084f468356662e0
585/PuLP-2.4-py3-none-any.whl (40.6MB)
     |████████████████████████████████| 40.6MB 103kB/s
Collecting demon>=2.0.5
  Downloading https://files.pythonhosted.org/packages/87/21/e84965594c51885a2f3b5f6ff224ba58f932cc66241489e0d763b9ac5
31b/demon-2.0.5-py3-none-any.whl
Requirement already satisfied: pandas>=0.24 in /usr/local/lib/python3.7/dist-packages (from cdlib) (1.1.5)
Collecting karateclub>=1.0.0
  Downloading https://files.pythonhosted.org/packages/f1/89/bc10c72e8047c801b785642bf58317022b0ef48ecd3e7db3a78aa2383
5ea/karateclub-1.0.24.tar.gz (59kB)
     |████████████████████████████████| 61kB 7.5MB/s
Requirement already satisfied: matplotlib>=3.0.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (3.2.2)
Collecting nf1
  Downloading https://files.pythonhosted.org/packages/4c/41/18e9d6c802db1084c157a0d6c5b38be5878f925e1cf53d7eb03edc7ec
6ad/nf1-0.0.3-py3-none-any.whl
Collecting chinese-whispers
  Downloading https://files.pythonhosted.org/packages/c7/9e/f5055fbfd95fd9aab0510065aed2ae520dc639e0b8fde945ce3ce23de
21e/chinese_whispers-0.7.4-py3-none-any.whl
Requirement already satisfied: future>=0.16.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (0.16.0)
```

```
Collecting shuffle-graph==1.1.1
  Downloading https://files.pythonhosted.org/packages/18/14/22153a8d389370cae50bedd58239f640afe9717085a7a4e9bc5f80188
6aa/shuffle_graph-1.1.1-py3-none-any.whl
Collecting ASLPAw==2.0.0
  Downloading https://files.pythonhosted.org/packages/af/a4/67dcbe51833c044c60a892e4ab5ca90a73e77317f0dcf377e2f9c6451
922/ASLPAw-2.0.0-py3-none-any.whl
Collecting markov-clustering
  Downloading https://files.pythonhosted.org/packages/76/42/19e11a42fa952d35116b90577e2cde31c541ce78364a52167f852864b
a29/markov_clustering-0.0.6.dev0-py3-none-any.whl
Collecting bimlpa
  Downloading https://files.pythonhosted.org/packages/11/8c/7d409d7e7bcbd261c7f19737feaa1ef66514512c7f7d6b9a776d7aac7
c33/bimlpa-0.1.2-py3-none-any.whl
Requirement already satisfied: numpy>=1.15.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (1.19.5)
Requirement already satisfied: scikit-learn<0.24,>=0.21.* in /usr/local/lib/python3.7/dist-packages (from cdlib) (0.2
2.2.post1)
Collecting omega-index-py3
  Downloading https://files.pythonhosted.org/packages/fb/57/ab48f801af9ef0ce273fe1969df825a99f52a73ff18767c7084f60471
028/omega_index_py3-0.3-py3-none-any.whl
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from pooch->cdlib) (20.9)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from pooch->cdlib) (2.23.0)
Requirement already satisfied: appdirs in /usr/local/lib/python3.7/dist-packages (from pooch->cdlib) (1.4.4)
Requirement already satisfied: decorator>=4.3.0 in /usr/local/lib/python3.7/dist-packages (from networkx>=2.4->cdlib)
(4.4.2)
Collecting amply>=0.1.2
  Downloading https://files.pythonhosted.org/packages/f3/c5/dfa09dd2595a2ab2ab4e6fa7bebef9565812722e1980d04b0edce5032
066/amply-0.1.4-py3-none-any.whl
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.7/dist-packages (from pandas>=0.24->cdlib) (201
8.9)
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dist-packages (from pandas>=0.24->c
dlib) (2.8.1)
Collecting pygsp
  Downloading https://files.pythonhosted.org/packages/d4/89/2f4aa73cccf12bec5179ac5d52a68b508120c838b7e5d456f5ea0c8be
ade/PyGSP-0.5.1-py2.py3-none-any.whl (1.8MB)
     |████████████████████████████████| 1.8MB 31.4MB/s
Collecting gensim==3.8.3
  Downloading https://files.pythonhosted.org/packages/5c/4e/afe2315e08a38967f8a3036bbe7e38b428e9b7a90e823a83d0d49df1a
df5/gensim-3.8.3-cp37-cp37m-manylinux1_x86_64.whl (24.2MB)
     |████████████████████████████████| 24.2MB 1.3MB/s
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from karateclub>=1.0.0->cdlib) (1.15.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.0.*->c
dlib) (1.3.1)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (fr
```

```
om matplotlib>=3.0.*->cdlib) (2.4.7)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.0.*->cdlib)
(0.10.0)
Collecting count-dict>=1.0.1
  Downloading https://files.pythonhosted.org/packages/b4/99/e46091f8f5f09ec4346e9b59da4f31838345878b54da0c102ac0be9c6
757/count_dict-1.1.1-py3-none-any.whl
Collecting multivalued-dict>=1.7.1
  Downloading https://files.pythonhosted.org/packages/38/d9/60639ea482acbf0d2defec1d2ab0f58f42bed65985a9e0beb5b9c6a70
887/multivalued_dict-2.0.1-py3-none-any.whl
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.7/dist-packages (from scikit-learn<0.24,>=0.21.
*->cdlib) (1.0.1)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (fro
m requests->pooch->cdlib) (1.24.3)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests->pooch->cd
lib) (2020.12.5)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests->pooch->cdl
ib) (3.0.4)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests->pooch->cdlib)
(2.10)
Requirement already satisfied: docutils>=0.3 in /usr/local/lib/python3.7/dist-packages (from amply>=0.1.2->pulp>=2.1-
>cdlib) (0.16)
Requirement already satisfied: smart-open>=1.8.1 in /usr/local/lib/python3.7/dist-packages (from gensim==3.8.3->karat
eclub>=1.0.0->cdlib) (4.2.0)
Building wheels for collected packages: python-louvain, karateclub
  Building wheel for python-louvain (setup.py) ... done
  Created wheel for python-louvain: filename=python_louvain-0.14-cp37-none-any.whl size=9292 sha256=1b540414e0664113c
a23650f013469d5c2e407858cb78baf8352a0412fc21335
  Stored in directory: /root/.cache/pip/wheels/e7/8d/24/6b3a464bb23e96ecba3f68868e85721534fd8158a9cd7b426b
  Building wheel for karateclub (setup.py) ... done
  Created wheel for karateclub: filename=karateclub-1.0.24-cp37-none-any.whl size=94202 sha256=81a3ea43c99cdbe2f805c3
da9a921201b3d825075f2afc6afbe53bc2156dd716
  Stored in directory: /root/.cache/pip/wheels/ab/a4/81/a2761ff51bb1caa318e69e4a30f5d7d39c14f10efe73365279
Successfully built python-louvain karateclub
Installing collected packages: eva-lcd, python-louvain, pquality, dynetx, amply, pulp, demon, pygsp, gensim, karatecl
ub, nf1, chinese-whispers, shuffle-graph, count-dict, multivalued-dict, ASLPAw, markov-clustering, bimlpa, omega-inde
x-py3, cdlib
  Found existing installation: python-louvain 0.15
    Uninstalling python-louvain-0.15:
      Successfully uninstalled python-louvain-0.15
  Found existing installation: gensim 3.6.0
    Uninstalling gensim-3.6.0:
      Successfully uninstalled gensim-3.6.0
```

```
Successfully installed ASLPAw-2.0.0 amply-0.1.4 bimlpa-0.1.2 cdlib-0.2.0 chinese-whispers-0.7.4 count-dict-1.1.1 demo
n-2.0.5 dynetx-0.2.4 eva-lcd-0.1.0 gensim-3.8.3 karateclub-1.0.24 markov-clustering-0.0.6.dev0 multivalued-dict-2.0.1
nf1-0.0.3 omega-index-py3-0.3 pquality-0.0.7 pulp-2.4 pygsp-0.5.1 python-louvain-0.14 shuffle-graph-1.1.1
Collecting python-igraph
  Downloading https://files.pythonhosted.org/packages/ae/12/1fbdb491d89fad8abb7aca0189978655cfdc984a380b846478f2ccdfd
ad8/python_igraph-0.9.1-cp37-cp37m-manylinux2010_x86_64.whl (3.2MB)
     |████████████████████████████████| 3.2MB 4.5MB/s
Collecting texttable>=1.6.2
  Downloading https://files.pythonhosted.org/packages/06/f5/46201c428aebe0eecfa83df66bf3e6caa29659dbac5a56ddfd83cae0d
4a4/texttable-1.6.3-py2.py3-none-any.whl
Installing collected packages: texttable, python-igraph
Successfully installed python-igraph-0.9.1 texttable-1.6.3
Collecting leidenalg
  Downloading https://files.pythonhosted.org/packages/70/68/3f7c56da3e7ac576e5e090f2a7e8637f96e4a790688dbee63b938530e
f15/leidenalg-0.8.3-cp37-cp37m-manylinux2010_x86_64.whl (2.4MB)
     |████████████████████████████████| 2.4MB 4.4MB/s
Requirement already satisfied: python-igraph>=0.8.0 in /usr/local/lib/python3.7/dist-packages (from leidenalg) (0.9.
1)
Requirement already satisfied: texttable>=1.6.2 in /usr/local/lib/python3.7/dist-packages (from python-igraph>=0.8.0-
>leidenalg) (1.6.3)
Installing collected packages: leidenalg
Successfully installed leidenalg-0.8.3
```

In [3]:

```
import pandas as pd
import networkx as nx
from networkx.algorithms.community.centrality import girvan_newman
from cdlib import algorithms
import numpy as np
import pickle
from networkx.algorithms.link_analysis.pagerank_alg import pagerank
from tqdm.autonotebook import tqdm
import pickle
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: TqdmExperimentalWarning: Using `tqdm.autonotebook.tqd
m` in notebook mode. Use `tqdm.tqdm` instead to force console mode (e.g. in jupyter console)
```

In [4]:
```
import tweepy
from PIL import Image
import requests
from io import BytesIO
consumer_key = "CtmrTSUsnIRHKSgj4ktqK4NKb"
consumer_secret = "1MNfKmptTsrJcq7WMYxOoVwEgFCK5DNMQeC43IZDkPucPObCnZ"
access_key = "1231240089600057344-rqYnkeVvMaB1XwfvrERfI7aF38r69L"
access_secret = "KmRfAoexHxfkHKJaC3hwB0sgtfocyz58IqdzYiWeaXSGO"
```

In [5]:
```
path = "/content/drive/My Drive/"
project_name="2_TwitterFollowGraph"
dataframe = pd.read_csv(path+project_name+"/Datasets/Twitter/twitter-final.csv")
columns=list(dataframe.columns)
```

In [6]:
```
dataset = pd.read_csv(path+project_name+"/Datasets/Twitter/twitter-2010-ids.csv")
node_id_list = dataset['node_id'].to_list()
twitter_id_list = dataset['twitter_id'].to_list()
node_id_twitter_id = {node_id_list[i]: twitter_id_list[i] for i in range(len(node_id_list))}
```

In [7]:
```
def createGraph(dataframe,columns):
  edgelist = dataframe[columns].values.tolist()
  graph = nx.Graph()
  graph.add_edges_from(edgelist)
  return graph
```

In [8]:
```
graph = createGraph(dataframe,columns)
```

In [ ]:
```
def sortedCommunities(communities):
  communitiesSorted = sorted(communities,key=lambda x:len(x),reverse=True)
  return communitiesSorted
```

In [ ]:
```
def topDegreeNodeCommunities(communities,graph,size):
  degree = graph.degree()
  newCommunityList = []
  for community in communities:
    newCommunity = sorted(community,key=lambda x:degree[x],reverse=True)
    newCommunityList.append(newCommunity[:size])
  return newCommunityList
```

In [ ]:
```
def generateCommunities(graph,method):
  if method == "leiden":
    communities = algorithms.leiden(graph)
  elif method == "walktrap":
    communities = algorithms.walktrap(graph)
  elif method == "surprise_communities":
    communities = algorithms.surprise_communities(graph)
  communitiesSorted = sortedCommunities(communities.communities)[:20]
  topNodeCommunities = topDegreeNodeCommunities(communitiesSorted,graph,15) # Set third parameter to get required size
  return topNodeCommunities
```

In [15]:
```
# Function to extract usernames
def get_username(twitter_id):
    auth = tweepy.OAuthHandler(consumer_key, consumer_secret)
    auth.set_access_token(access_key, access_secret)
    api = tweepy.API(auth)
    try:
      username = api.get_user(id=twitter_id)
      user_dict = username.__getattribute__("_json")
      return user_dict
    except Exception:
      pass
```

In [ ]:
```
def filter_communities(communities_list):
  infile = open(path+project_name+"/PickleFiles/node_info_pickle.pkl",'rb')
  node_map_dict = pickle.load(infile)
  infile.close()
  community_names_list=[[('NA',False)]*len(communities_list[0]) for i in range(len(communities_list))]
  for i,community in enumerate(communities_list):
    for j,member in enumerate(community):
      if member in set(list(node_map_dict)) and node_map_dict[member] is not None:
        community_names_list[i][j]=(node_map_dict[member]['name'],node_map_dict[member]['verified'],node_map_dict[memb
er]['followers_count'])
      else:
        profile_dict=get_username(node_id_twitter_id[member])
        if profile_dict is not None:
          community_names_list[i][j]=(profile_dict['name'],profile_dict['verified'],profile_dict['followers_count'])

  final_community_list=[]
  for community in community_names_list:
    temp_list=[]
    for member in community:
      if member[1] is True:
        temp_list.append((member[0],member[2]))
    if len(temp_list)!=0:
      final_community_list.append(temp_list)
  return final_community_list
```

In [9]:
```
# Function to extract usernames
def profile_pic_fetcher(twitter_id):
    auth = tweepy.OAuthHandler(consumer_key, consumer_secret)
    auth.set_access_token(access_key, access_secret)
    api = tweepy.API(auth)
    try:
      username = api.get_user(id=twitter_id)
      user_dict = username.__getattribute__("_json")
      user_name = user_dict["name"]
      profile_pic_url=user_dict["profile_image_url_https"]
      if "default_profile_normal" not in profile_pic_url:
        profile_pic_url=profile_pic_url.replace("_normal","")
      response = requests.get(profile_pic_url)
      profile_pic = Image.open(BytesIO(response.content))
      return profile_pic,user_name
    except Exception:
      pass
```

In [10]:
```
communities_dict={}
page_rank_dict={}
```

In [ ]:
```
#Leiden community algorithm
communities_list=generateCommunities(graph,"leiden")
final_communities_list=filter_communities(communities_list)
communities_dict["leiden"]=final_communities_list
print(final_communities_list)
```

```
[[('CNN Breaking News', 61190864), ('ashton kutcher', 17622863), ('Ellen DeGeneres', 79150582), ('Britney Spears', 56
074625), ('Twitter', 59475201), ('Barack Obama', 130091376), ('Lance Armstrong', 3225007), ('Oprah Winfrey', 4364633
7), ('Ryan Seacrest', 15390398), ('Demi Moore', 4565235), ('SHAQ', 15628657), ('The New York Times', 49711344), ('jim
my fallon', 51868620), ('Al Gore', 3054622)], [('Leo Laporte, Chief TWiT and The Tech Guy', 532306)], [('Stephen Fr
y', 12634103), ('Jonathan Ross', 5044515), ('Russell Brand', 11206944), ('Phillip Schofield', 4564965), ('Chris Moyle
s', 3600198)], [('Selena Gomez', 64958647), ('Demi Lovato', 55285517), ('Jonas Brothers', 4827694)], [('Josh Olin', 1
03247)], [('Luciano Huck', 13283352)], [('Stocktwits', 877136)], [('little farma', 564661), ('Superinteressante', 403
8373), ('Radio-Canada Techno', 15129)], [('Glenn Beck', 1312959), ('Brad Paisley', 4367501)]]
```

In [ ]:
```
#Surprise communities algorithm
communities_list=generateCommunities(graph,"surprise_communities")
final_communities_list=filter_communities(communities_list)
communities_dict["surprise_communities"]=final_communities_list
print(final_communities_list)
```

```
[[('CNN Breaking News', 61190864), ('ashton kutcher', 17622863), ('Ellen DeGeneres', 79150582), ('Britney Spears', 56
074625), ('Twitter', 59475201), ('Lance Armstrong', 3225007), ('Oprah Winfrey', 43646337), ('Ryan Seacrest', 1539039
8), ('Demi Moore', 4565235), ('SHAQ', 15628657), ('The New York Times', 49711344), ('jimmy fallon', 51868620), ('Al G
ore', 3054622), ('Coldplay', 23301988)], [('Stephen Fry', 12634103), ('Jonathan Ross', 5044515), ('Russell Brand', 11
206944), ('Phillip Schofield', 4564965), ('Chris Moyles', 3600198), ('The Unnamed Artist', 5762042), ('Jimmy Carr', 6
737846), ('fearne cotton', 6890318), ('Jamie Oliver', 6516271)], [('George Mason University', 27191)], [('buten un bi
nnen', 39868)], [('elizabeth', 4383)]]
```

In [ ]:
```
#Walktrap communites algorithm
communities_list=generateCommunities(graph,"walktrap")
final_communities_list=filter_communities(communities_list)
communities_dict["walktrap"]=final_communities_list
print(final_communities_list)
```

```
[[('CNN Breaking News', 61190864), ('Britney Spears', 56074625), ('Twitter', 59475201)], [('ashton kutcher', 1762286
3), ('Ellen DeGeneres', 79150582), ('Lance Armstrong', 3225007), ('Oprah Winfrey', 43646337), ('Demi Moore', 456523
5), ('The New York Times', 49711344), ('jimmy fallon', 51868620), ('Al Gore', 3054622), ('@bbcclick', 2152173), ('Pen
n Jillette', 1777615)], [('Selena Gomez', 64958647), ('Demi Lovato', 55285517)], [('Leo Laporte, Chief TWiT and The T
ech Guy', 532306), ('John C. Dvorak', 99736), ('Alex Albrecht', 77584), ('Adam Savage', 1473338)], [('Phillip Schofie
ld', 4564965), ('Jimmy Carr', 6737846), ('fearne cotton', 6890318)], [('Fox News', 20146730), ('Glenn Beck', 131296
1)], [('Deepak Chopra', 3257759)], [('Jan Willem Alphenaar', 18699), ('buten un binnen', 39865)], [('Smashing Magazin
e', 963478), ('Google AdSense', 565352)]]
```

In [11]:
```
def rank_on_page_rank(graph):
  pagerank_result = dict(pagerank(graph))
  pagerank_result = sorted(pagerank_result.items(),key = lambda x:x[1],reverse=True)
  return pagerank_result
```

In [12]:
```
pagerank_result=rank_on_page_rank(graph)
```

In [13]:
```
def filter_pagerank(pagerank_result,size):
  final_pagerank_result=[]
  for entity in tqdm(pagerank_result[:size]):
    profile_dict=get_username(node_id_twitter_id[entity[0]])
    if profile_dict is not None and profile_dict['verified']==True:
        final_pagerank_result.append((profile_dict['name'],profile_dict['followers_count'],node_id_twitter_id[entity[0
]]))
  return final_pagerank_result
```

In [16]:
```
final_pagerank_result=filter_pagerank(pagerank_result.copy(),100)
page_rank_dict["pagerank"]=final_pagerank_result
```

In [17]:
```
final_pagerank_result
```

Out[17]:
```
[('CNN Breaking News', 61257398, 428333),
 ('ashton kutcher', 17609356, 19058681),
 ('Ellen DeGeneres', 79110794, 15846407),
 ('Barack Obama', 130198925, 813286),
 ('Britney Spears', 56081171, 16409683),
 ('Twitter', 59529056, 783214),
 ('Oprah Winfrey', 43657140, 19397785),
 ('Lance Armstrong', 3222482, 16727535),
 ('Ryan Seacrest', 15379296, 16190898),
 ('SHAQ', 15647369, 17461978),
 ('Al Gore', 3052245, 17220934),
 ('The New York Times', 49806056, 807095),
 ('Demi Moore', 4561994, 19554706),
 ('Coldplay', 23294661, 18863815),
 ('jimmy fallon', 51870114, 15485441),
 ('NPR Politics', 3077586, 5741722),
 ('Stephen Fry', 12632770, 15439395),
 ('Google', 22958396, 20536157)]
```

In [ ]:
```
filename = open(path+project_name+"/PickleFiles/communities.pkl","wb")
pickle.dump(communities_dict, filename)
filename.close()
```

In [18]:
```
filename = open(path+project_name+"/PickleFiles/pagerank.pkl","wb")
pickle.dump(page_rank_dict, filename)
filename.close()
```

In [19]:
```
for pagerankResult in final_pagerank_result:
  profile_pic,username=profile_pic_fetcher(pagerankResult[2])
  profile_pic.save(path+project_name+"/PageRankImages/Twitter/{}.png".format(username))
```