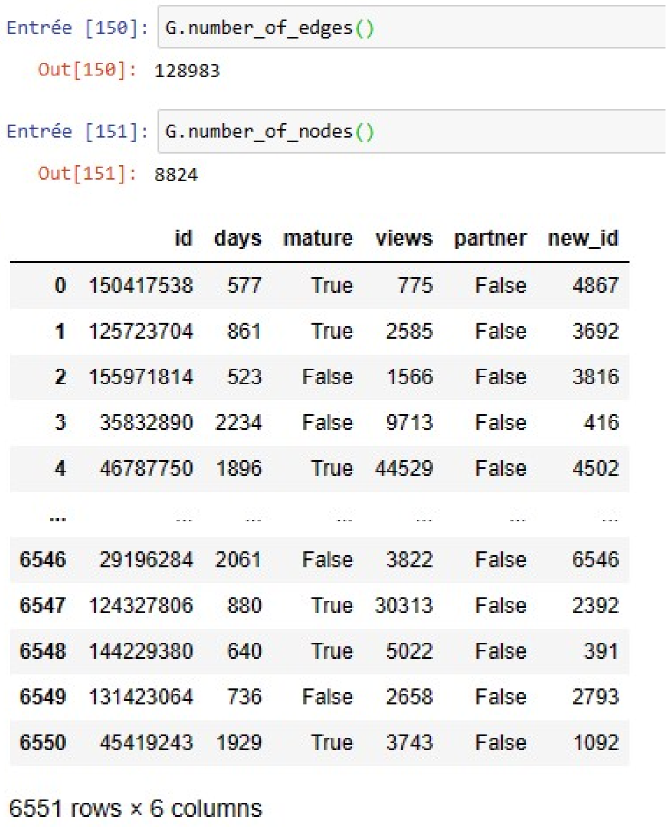
Projet Graph Mining partie Twitch

Etude des méthodes de Label Propagation sur le Twitch Dataset

Présentation du Dataset Twitch_FR



```
Entrée [150]: G.number_of_edges()
   Out[150]: 128983

Entrée [151]: G.number_of_nodes()
   Out[151]: 8824
```

	id	days	mature	views	partner	new_id
0	150417538	577	True	775	False	4867
1	125723704	861	True	2585	False	3692
2	155971814	523	False	1566	False	3816
3	35832890	2234	False	9713	False	416
4	46787750	1896	True	44529	False	4502
...	...	...	...	...	...	...
6546	29196284	2061	False	3822	False	6546
6547	124327806	880	True	30313	False	2392
6548	144229380	640	True	5022	False	391
6549	131423064	736	False	2658	False	2793
6550	45419243	1929	True	3743	False	1092

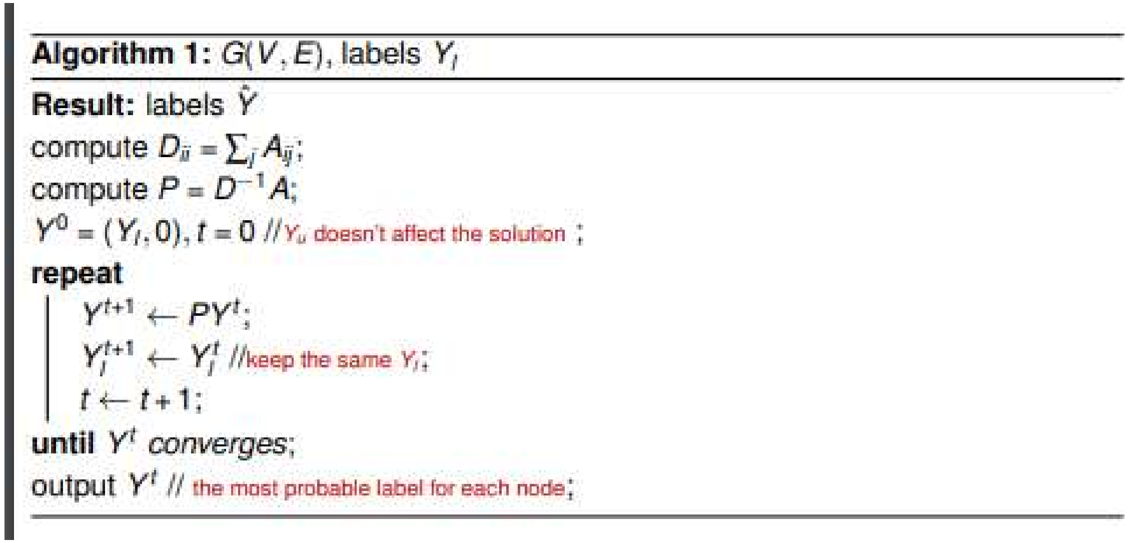
6551 rows × 6 columns

Tache de classification binaire

Prédire si un utilisateur utilise du langage « mature »

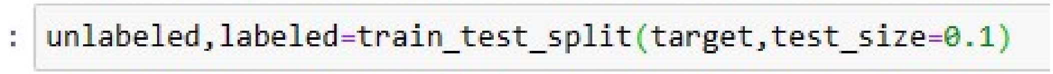
Au niveau du graph, 2 nœuds sont reliés par une arrête si les 2 utilisateur sont mutuellement abonnées l'un à l'autre

Première approche : sans ML

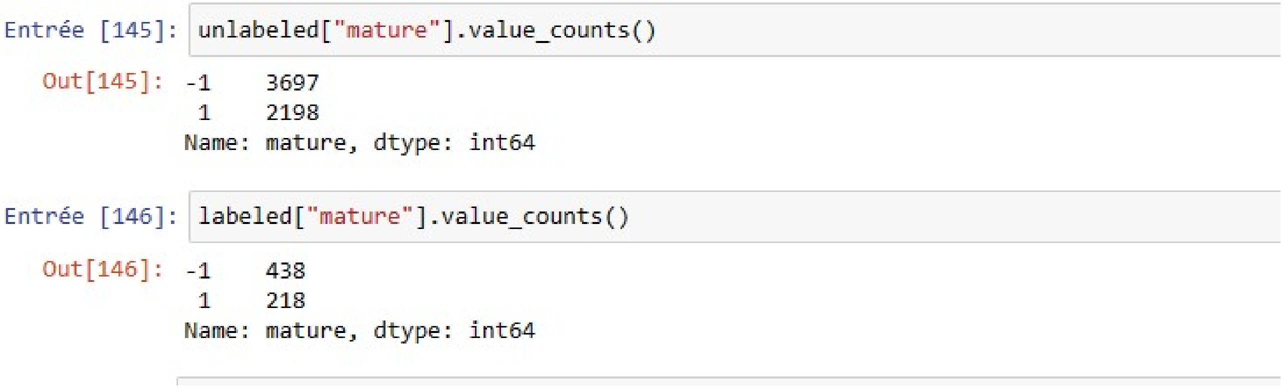


```
Algorithm 1: $G(V, E)$, labels $Y_l$
Result: labels $\hat{Y}$
compute $D_{ii} = \sum_j A_{ij}$;
compute $P = D^{-1}A$;
$Y^0 = (Y_l, 0), t = 0$ //$Y_u$ doesn't affect the solution ;
repeat
    $Y^{t+1} \leftarrow PY^t$;
    $Y_l^{t+1} \leftarrow Y_l^t$ //keep the same $Y_l$;
    $t \leftarrow t + 1$;
until $Y^t$ converges;
output $Y^t$ // the most probable label for each node;
```

Première approche

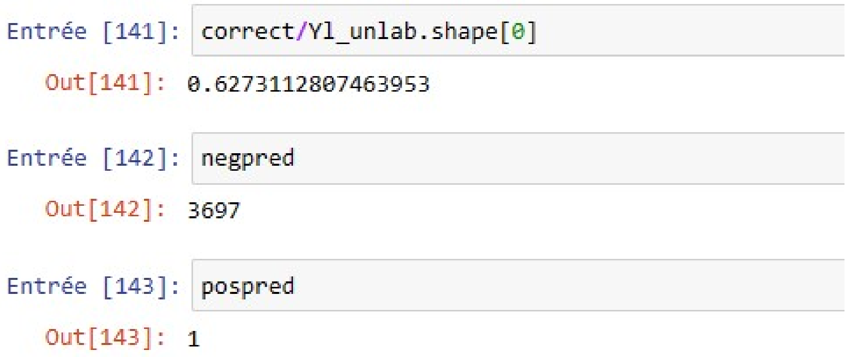


```
: unlabeled,labeled=train_test_split(target,test_size=0.1)
```



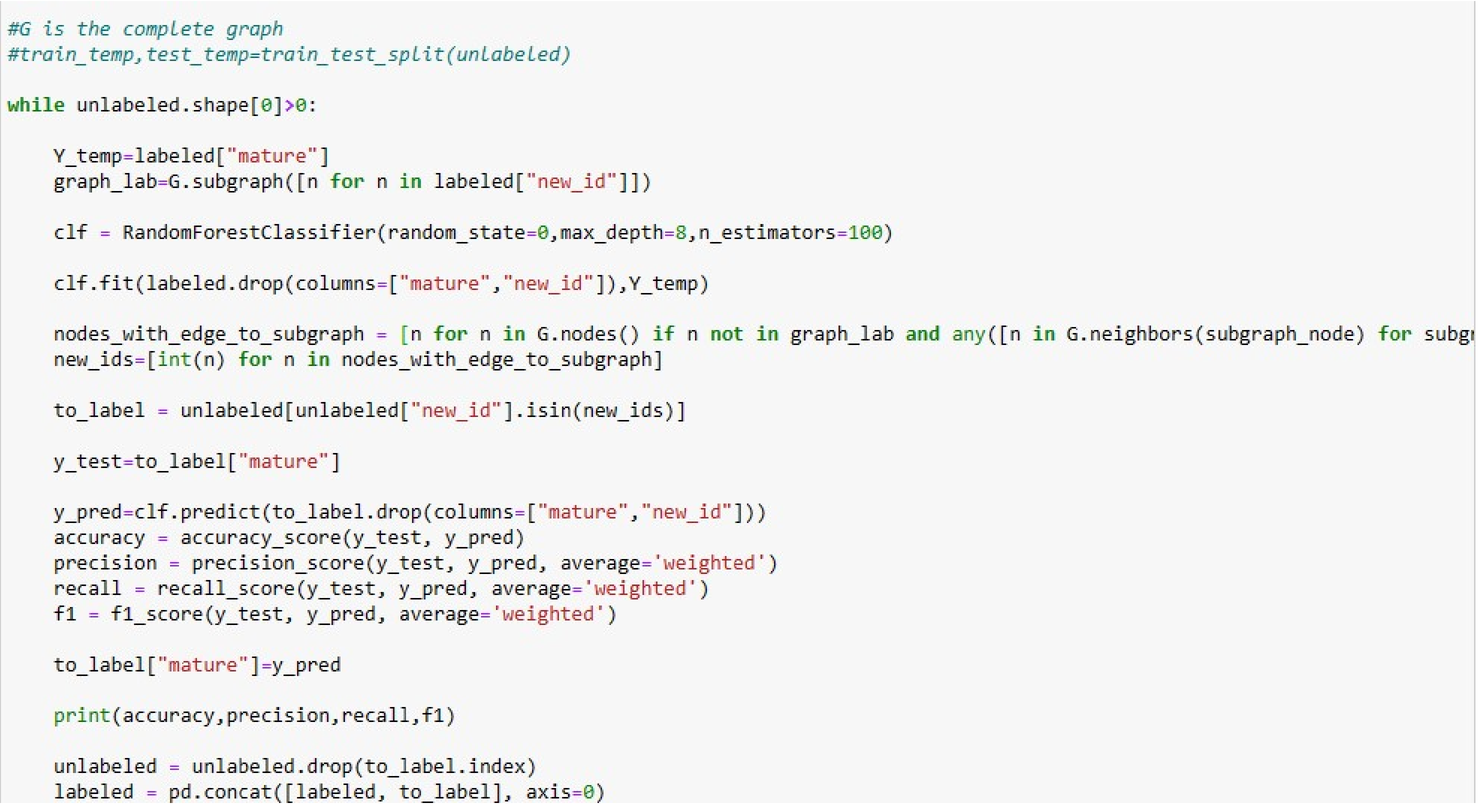
```
Entrée [145]: unlabeled["mature"].value_counts()

   Out[145]: -1    3697
              1    2198
             Name: mature, dtype: int64

Entrée [146]: labeled["mature"].value_counts()

   Out[146]: -1    438
              1    218
             Name: mature, dtype: int64
```

Résultats de la première approche



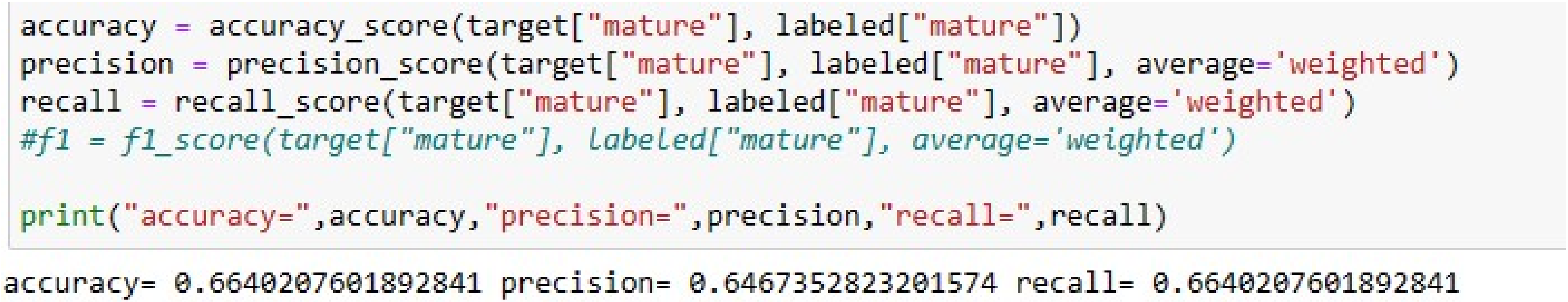
```
Entrée [141]: correct/Yl_unlab.shape[0]

   Out[141]: 0.6273112807463953

Entrée [142]: negpred

   Out[142]: 3697

Entrée [143]: pospred

   Out[143]: 1
```

Seconde approche : Iterative classification



```python
#G is the complete graph
#train_temp,test_temp=train_test_split(unlabeled)

while unlabeled.shape[0]>0:

    Y_temp=labeled["mature"]
    graph_lab=G.subgraph([n for n in labeled["new_id"]])

    clf = RandomForestClassifier(random_state=0,max_depth=8,n_estimators=100)

    clf.fit(labeled.drop(columns=["mature","new_id"]),Y_temp)

    nodes_with_edge_to_subgraph = [n for n in G.nodes() if n not in graph_lab and any([n in G.neighbors(subgraph_node) for subgr
    new_ids=[int(n) for n in nodes_with_edge_to_subgraph]

    to_label = unlabeled[unlabeled["new_id"].isin(new_ids)]

    y_test=to_label["mature"]

    y_pred=clf.predict(to_label.drop(columns=["mature","new_id"]))
    accuracy = accuracy_score(y_test, y_pred)
    precision = precision_score(y_test, y_pred, average='weighted')
    recall = recall_score(y_test, y_pred, average='weighted')
    f1 = f1_score(y_test, y_pred, average='weighted')

    to_label["mature"]=y_pred

    print(accuracy,precision,recall,f1)

    unlabeled = unlabeled.drop(to_label.index)
    labeled = pd.concat([labeled, to_label], axis=0)
```

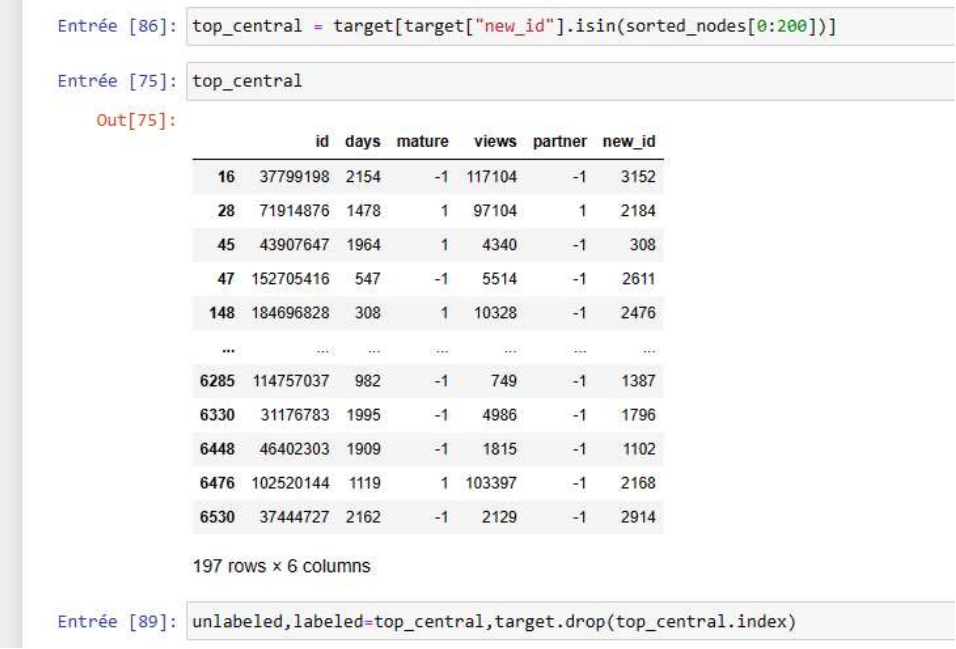
Résultats de la seconde approche



```
accuracy = accuracy_score(target["mature"], labeled["mature"])
precision = precision_score(target["mature"], labeled["mature"], average='weighted')
recall = recall_score(target["mature"], labeled["mature"], average='weighted')
#f1 = f1_score(target["mature"], labeled["mature"], average='weighted')

print("accuracy=",accuracy,"precision=",precision,"recall=",recall)
```

```
accuracy= 0.6640207601892841 precision= 0.6467352823201574 recall= 0.6640207601892841
```

Troisième approche : Choix optimal des nœuds labélisés de départ



```
Entrée [86]: top_central = target[target["new_id"].isin(sorted_nodes[0:200])]
```

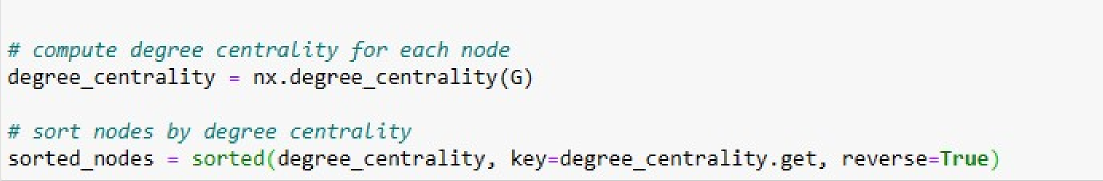
```
Entrée [75]: top_central
```

Out[75]:

	id	days	mature	views	partner	new_id
16	37799198	2154	-1	117104	-1	3152
28	71914876	1478	1	97104	1	2184
45	43907647	1964	1	4340	-1	308
47	152705416	547	-1	5514	-1	2611
148	184696828	308	1	10328	-1	2476
...	...	...	...	...	...	...
6285	114757037	982	-1	749	-1	1387
6330	31176783	1995	-1	4986	-1	1796
6448	46402303	1909	-1	1815	-1	1102
6476	102520144	1119	1	103397	-1	2168
6530	37444727	2162	-1	2129	-1	2914

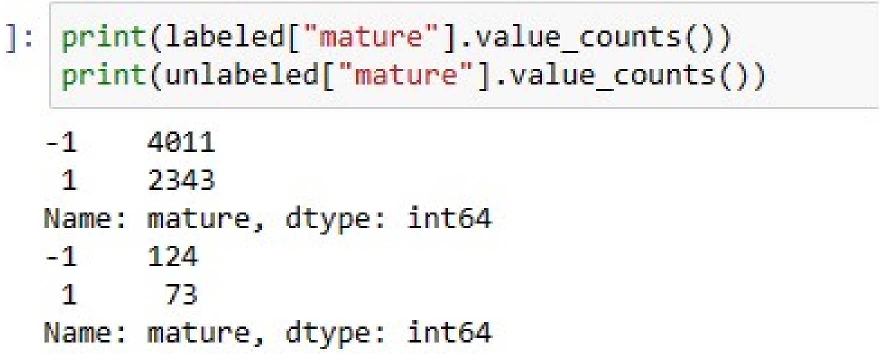
197 rows × 6 columns

```
Entrée [89]: unlabeled,labeled=top_central,target.drop(top_central.index)
```

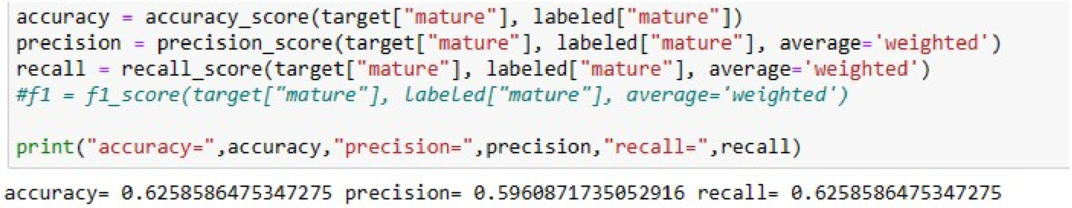


```
# compute degree centrality for each node
degree_centrality = nx.degree_centrality(G)

# sort nodes by degree centrality
sorted_nodes = sorted(degree_centrality, key=degree_centrality.get, reverse=True)
```

Trosième approche : scoring

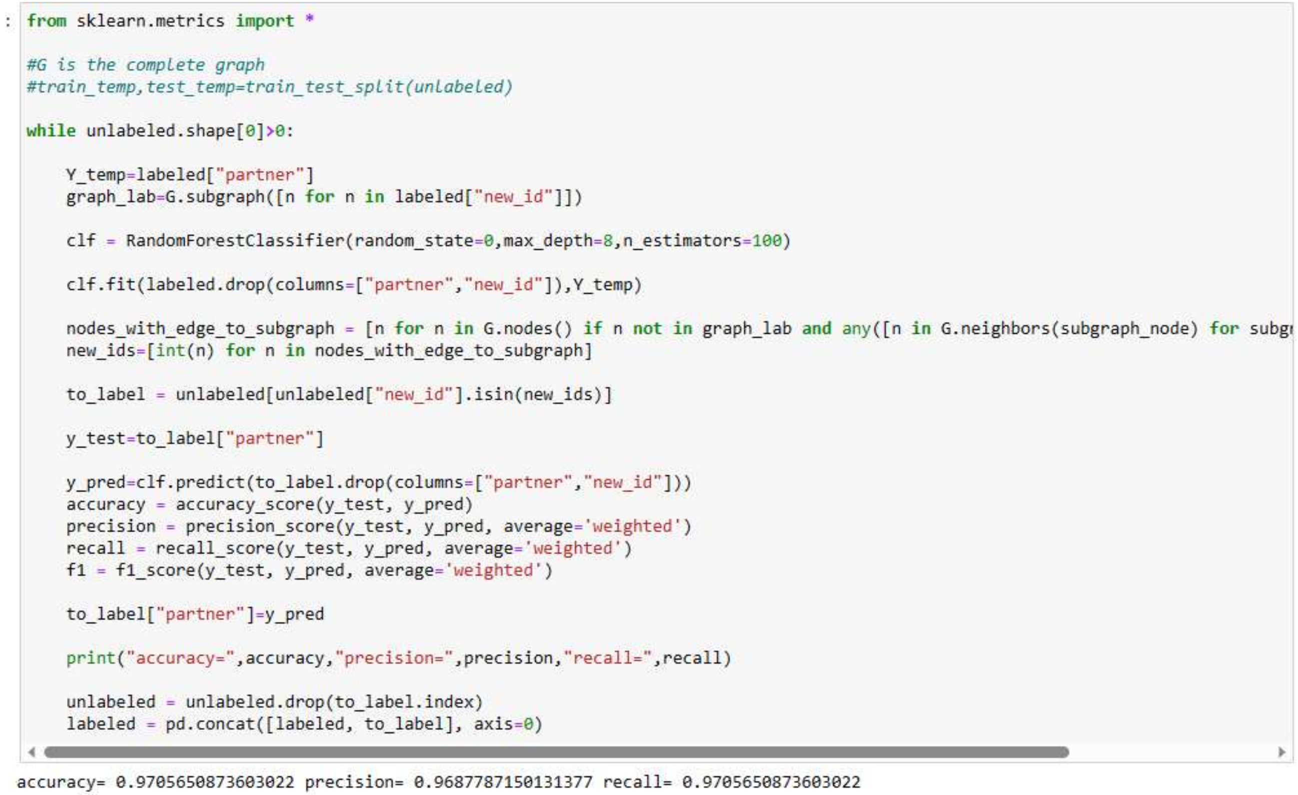


```
]: print(labeled["mature"].value_counts())
   print(unlabeled["mature"].value_counts())

 -1    4011
  1    2343
 Name: mature, dtype: int64
 -1    124
  1     73
 Name: mature, dtype: int64
```



```
accuracy = accuracy_score(target["mature"], labeled["mature"])
precision = precision_score(target["mature"], labeled["mature"], average='weighted')
recall = recall_score(target["mature"], labeled["mature"], average='weighted')
#f1 = f1_score(target["mature"], labeled["mature"], average='weighted')

print("accuracy=",accuracy,"precision=",precision,"recall=",recall)

accuracy= 0.6258586475347275 precision= 0.5960871735052916 recall= 0.6258586475347275
```

Quatrième approche : prédiction d’une autre variable : la variable partner



```
:  from sklearn.metrics import *

   #G is the complete graph
   #train_temp,test_temp=train_test_split(unlabeled)

   while unlabeled.shape[0]>0:

       Y_temp=labeled["partner"]
       graph_lab=G.subgraph([n for n in labeled["new_id"]])

       clf = RandomForestClassifier(random_state=0,max_depth=8,n_estimators=100)

       clf.fit(labeled.drop(columns=["partner","new_id"]),Y_temp)

       nodes_with_edge_to_subgraph = [n for n in G.nodes() if n not in graph_lab and any([n in G.neighbors(subgraph_node) for subgr
       new_ids=[int(n) for n in nodes_with_edge_to_subgraph]

       to_label = unlabeled[unlabeled["new_id"].isin(new_ids)]

       y_test=to_label["partner"]

       y_pred=clf.predict(to_label.drop(columns=["partner","new_id"]))
       accuracy = accuracy_score(y_test, y_pred)
       precision = precision_score(y_test, y_pred, average='weighted')
       recall = recall_score(y_test, y_pred, average='weighted')
       f1 = f1_score(y_test, y_pred, average='weighted')

       to_label["partner"]=y_pred

       print("accuracy=",accuracy,"precision=",precision,"recall=",recall)

       unlabeled = unlabeled.drop(to_label.index)
       labeled = pd.concat([labeled, to_label], axis=0)
```

```
accuracy= 0.9705650873603022 precision= 0.9687787150131377 recall= 0.9705650873603022
```