ass2_model

February 17, 2020

```python
[1]: import numpy as np
     import re
     from collections import defaultdict
     import json
     import os
     from sklearn.preprocessing import MultiLabelBinarizer
     import pandas as pd
     from scipy import sparse
     from networkx import convert_matrix
     import networkx as nx
     import matplotlib.pyplot as plt
```

```python
[45]: apk_address='/datasets/dsc180a-wi20-public/Malware/testing/malware/
      ↪90b8b78626470c30c52ae86c508ca474/smali/android/support/v4/a'
      os.listdir(apk_address)
```

```
[45]: ['b.smali', 'a.smali']
```

```python
[46]: apk_address='/datasets/dsc180a-wi20-public/Malware/testing/malware/'
```

```python
[47]: output=extract_features_for_app(apk_address)
```

```
['/datasets/dsc180a-wi20-public/Malware/testing/malware/90b8b78626470c30c52ae86c
508ca474/smali']
90b8b78626470c30c52ae86c508ca474
['/datasets/dsc180a-wi20-public/Malware/testing/malware/ef5af624019d0864dec30560
139f75ea/smali']
ef5af624019d0864dec30560139f75ea
['/datasets/dsc180a-wi20-public/Malware/testing/malware/d16546eef921303a0cfaae6f
ea7a5800/smali']
d16546eef921303a0cfaae6fea7a5800
['/datasets/dsc180a-wi20-public/Malware/testing/malware/91530cf3db534f5b42ba2668
2788cb5c/smali']
91530cf3db534f5b42ba26682788cb5c
```

```python
[51]: ass2_mal_json='/home/sic100/ass2_mal_json'
```

```python
[52]: output_name=['API_package', 'API_invoke_methods', 'app_API', 'API_codeblocks',␣
      ↪'all_API']
      for i in range(len(output)):
          data=output[i]
          with open(ass2_mal_json+'/'+output_name[i]+'.json', 'w+') as f:
              json.dump(data, f)
              print(output_name[i], "->complete")
```

```
API_package ->complete
API_invoke_methods ->complete
app_API ->complete
API_codeblocks ->complete
all_API ->complete
```

```python
[59]: path='./ass2_mal_json/API_package'+'.json'
      with open(path, 'r') as inputfile:
          API_package_m=json.load(inputfile)
      path='./ass2_mal_json/API_invoke_methods'+'.json'
      with open(path, 'r') as inputfile:
          API_invoke_methods_m=json.load(inputfile)
      path='./ass2_mal_json/app_API'+'.json'
      with open(path, 'r') as inputfile:
          app_API_m=json.load(inputfile)
      path='./ass2_mal_json/API_codeblocks'+'.json'
      with open(path, 'r') as inputfile:
          API_codeblocks_m=json.load(inputfile)
      path='./ass2_mal_json/all_API'+'.json'
      with open(path, 'r') as inputfile:
          all_API_m=json.load(inputfile)
```

```python
[62]: path='./ass2_json/API_package'+'.json'
      with open(path, 'r') as inputfile:
          API_package_b=json.load(inputfile)
      path='./ass2_json/API_invoke_methods'+'.json'
      with open(path, 'r') as inputfile:
          API_invoke_methods_b=json.load(inputfile)
      path='./ass2_json/app_API'+'.json'
      with open(path, 'r') as inputfile:
          app_API_b=json.load(inputfile)
      path='./ass2_json/API_codeblocks'+'.json'
      with open(path, 'r') as inputfile:
          API_codeblocks_b=json.load(inputfile)
      path='./ass2_json/all_API'+'.json'
      with open(path, 'r') as inputfile:
          all_API_b=json.load(inputfile)
```

```python
[64]: all_API=np.unique(all_API_m+all_API_b)
```

```
[65]: len(all_API)
```

```
[65]: 115267
```

```
[67]: len(all_API_b)
```

```
[67]: 113589
```

```
[70]: def get_A(all_API, app_API):
          app_api_df=pd.DataFrame({'app': list(app_API.keys()), 'api list':␣
      ↪list(app_API.values())})
          mlb = MultiLabelBinarizer()
          mlb.fit([all_API])
          one_hot=mlb.transform(app_api_df['api list'])
          A=pd.DataFrame(index=list(app_API.keys()), columns=all_API, data=one_hot)
          return A
```

```
[ ]:
```

```
[ ]:
```

```
[163]: def get__smaller_A(app_API_m, app_API_b, all_API_m, all_API_b):
           m=pd.DataFrame(all_API_m)
           b=pd.DataFrame(all_API_b)
           smaller_api=pd.merge(b,m, how='outer')[0].tolist()
           app_api_df_m=pd.DataFrame({'app': list(app_API_m.keys()), 'api list':␣
       ↪list(app_API_m.values())})

           app_api_df_b=pd.DataFrame({'app': list(app_API_b.keys()), 'api list':␣
       ↪list(app_API_b.values())})

           app_api_df=pd.concat([app_api_df_m, app_api_df_b], axis=0)
           mlb = MultiLabelBinarizer()
           mlb.fit([smaller_api])
           one_hot=mlb.transform(app_api_df['api list'])
           smaller_A=pd.DataFrame(index=app_api_df['app'], columns=smaller_api,␣
       ↪data=one_hot)
           smaller_A['label']=[-1]*app_api_df_m.shape[0]+[1]*app_api_df_b.shape[0]
           return smaller_A
```

```
[164]: smaller_A=get__smaller_A(app_API_m, app_API_b, all_API_m, all_API_b)
```

```
[166]: smaller_A
```

```
[166]: Ljava/text/SimpleDateFormat;-><init>  \
       app
       90b8b78626470c30c52ae86c508ca474
```

3

```
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
0
91530cf3db534f5b42ba26682788cb5c
0
Microsoft Word Write Edit Share Docs on the Go_…
1
Worms Zone io Voracious Snake_v1.2.9_
1
Happy Glass_v1.0.47_
1
Subway Surfers_v1.114.0_
1
Instagram Lite_v67.0.0.0.51_
1

Ljava/lang/String;->startsWith  \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
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Happy Glass_v1.0.47_
0
Subway Surfers_v1.114.0_
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Instagram Lite_v67.0.0.0.51_
1

Ljava/lang/StringBuilder;-><init>  \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
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91530cf3db534f5b42ba26682788cb5c
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Happy Glass_v1.0.47_
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Subway Surfers_v1.114.0_
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Instagram Lite_v67.0.0.0.51_
0


Ljava/lang/StringBuilder;->append  \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
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91530cf3db534f5b42ba26682788cb5c
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Worms Zone io Voracious Snake_v1.2.9_
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Happy Glass_v1.0.47_
0
Subway Surfers_v1.114.0_
1
Instagram Lite_v67.0.0.0.51_
0


Ljava/lang/StringBuilder;->toString  \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
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91530cf3db534f5b42ba26682788cb5c
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Microsoft Word Write Edit Share Docs on the Go_…
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Worms Zone io Voracious Snake_v1.2.9_
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Happy Glass_v1.0.47_
1
Subway Surfers_v1.114.0_
1
Instagram Lite_v67.0.0.0.51_
1


Ljava/net/URLEncoder;->encode    \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
1
91530cf3db534f5b42ba26682788cb5c
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Worms Zone io Voracious Snake_v1.2.9_
1
Happy Glass_v1.0.47_
1
Subway Surfers_v1.114.0_
1
Instagram Lite_v67.0.0.0.51_
1
```

	Ljava/lang/String;->replace \
app	
90b8b78626470c30c52ae86c508ca474	0
ef5af624019d0864dec30560139f75ea	0
d16546eef921303a0cfaae6fea7a5800	0
91530cf3db534f5b42ba26682788cb5c	1
Microsoft Word Write Edit Share Docs on the Go_…	0
Worms Zone io Voracious Snake_v1.2.9_	0
Happy Glass_v1.0.47_	0
Subway Surfers_v1.114.0_	0
Instagram Lite_v67.0.0.0.51_	0

	Lcom/dropbox/client2/a;->a \
app	
90b8b78626470c30c52ae86c508ca474	0
ef5af624019d0864dec30560139f75ea	0

d16546eef921303a0cfaae6fea7a5800	0
91530cf3db534f5b42ba26682788cb5c	1
Microsoft Word Write Edit Share Docs on the Go_…	0
Worms Zone io Voracious Snake_v1.2.9_	0
Happy Glass_v1.0.47_	0
Subway Surfers_v1.114.0_	0
Instagram Lite_v67.0.0.0.51_	0

Ljava/lang/IllegalArgumentException;-><init> \
```
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
0
91530cf3db534f5b42ba26682788cb5c
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Microsoft Word Write Edit Share Docs on the Go_…
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Worms Zone io Voracious Snake_v1.2.9_
0
Happy Glass_v1.0.47_
0
Subway Surfers_v1.114.0_
0
Instagram Lite_v67.0.0.0.51_
0
```

Ljava/lang/Object;-><init> \

app	
90b8b78626470c30c52ae86c508ca474	0
ef5af624019d0864dec30560139f75ea	0
d16546eef921303a0cfaae6fea7a5800	0
91530cf3db534f5b42ba26682788cb5c	1
Microsoft Word Write Edit Share Docs on the Go_…	0
Worms Zone io Voracious Snake_v1.2.9_	0
Happy Glass_v1.0.47_	0
Subway Surfers_v1.114.0_	0
Instagram Lite_v67.0.0.0.51_	0

… L ;->loadData \

app	…	
90b8b78626470c30c52ae86c508ca474	…	0
ef5af624019d0864dec30560139f75ea	…	0
d16546eef921303a0cfaae6fea7a5800	…	0

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91530cf3db534f5b42ba26682788cb5c                        …                    1
Microsoft Word Write Edit Share Docs on the Go_…  …                0
Worms Zone io Voracious Snake_v1.2.9_                   …                0
Happy Glass_v1.0.47_                                    …                0
Subway Surfers_v1.114.0_                                …                0
Instagram Lite_v67.0.0.0.51_                            …                0


                                                  L ;-><init>  LiF;-><init>  \
app
90b8b78626470c30c52ae86c508ca474                            0             0
ef5af624019d0864dec30560139f75ea                            0             0
d16546eef921303a0cfaae6fea7a5800                            0             0
91530cf3db534f5b42ba26682788cb5c                            1             1
Microsoft Word Write Edit Share Docs on the Go_…      0                0
Worms Zone io Voracious Snake_v1.2.9_                       0             0
Happy Glass_v1.0.47_                                        0             0
Subway Surfers_v1.114.0_                                    0             0
Instagram Lite_v67.0.0.0.51_                                0             0


Landroid/app/AlertDialog;->cancel  \
app
90b8b78626470c30c52ae86c508ca474
0
ef5af624019d0864dec30560139f75ea
0
d16546eef921303a0cfaae6fea7a5800
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91530cf3db534f5b42ba26682788cb5c
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Microsoft Word Write Edit Share Docs on the Go_…
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Worms Zone io Voracious Snake_v1.2.9_
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Happy Glass_v1.0.47_
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Subway Surfers_v1.114.0_
0
Instagram Lite_v67.0.0.0.51_
0


                                                  L ;->onResume  \
app
90b8b78626470c30c52ae86c508ca474                             0
ef5af624019d0864dec30560139f75ea                             0
d16546eef921303a0cfaae6fea7a5800                             0
91530cf3db534f5b42ba26682788cb5c                             1
Microsoft Word Write Edit Share Docs on the Go_…       0
```

```
Worms Zone io Voracious Snake_v1.2.9_                          0
Happy Glass_v1.0.47_                                          0
Subway Surfers_v1.114.0_                                     0
Instagram Lite_v67.0.0.0.51_                                 0


                                              LIF;-><init>  L ;-><init>  \
app
90b8b78626470c30c52ae86c508ca474                          0            0
ef5af624019d0864dec30560139f75ea                          0            0
d16546eef921303a0cfaae6fea7a5800                          0            0
91530cf3db534f5b42ba26682788cb5c                          1            1
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Worms Zone io Voracious Snake_v1.2.9_                     0            0
Happy Glass_v1.0.47_                                      0            0
Subway Surfers_v1.114.0_                                  0            0
Instagram Lite_v67.0.0.0.51_                              0            0


                                               L ;-><init>  L ;-><init>  \
app
90b8b78626470c30c52ae86c508ca474                          0            0
ef5af624019d0864dec30560139f75ea                          0            0
d16546eef921303a0cfaae6fea7a5800                          0            0
91530cf3db534f5b42ba26682788cb5c                          1            0
Microsoft Word Write Edit Share Docs on the Go_…        0            1
Worms Zone io Voracious Snake_v1.2.9_                     0            1
Happy Glass_v1.0.47_                                      0            0
Subway Surfers_v1.114.0_                                  0            1
Instagram Lite_v67.0.0.0.51_                              0            0


                                              label
app
90b8b78626470c30c52ae86c508ca474                -1
ef5af624019d0864dec30560139f75ea                -1
d16546eef921303a0cfaae6fea7a5800                -1
91530cf3db534f5b42ba26682788cb5c                -1
Microsoft Word Write Edit Share Docs on the Go_…     1
Worms Zone io Voracious Snake_v1.2.9_                1
Happy Glass_v1.0.47_                                 1
Subway Surfers_v1.114.0_                             1
Instagram Lite_v67.0.0.0.51_                         1

[9 rows x 115268 columns]
```

[129]: `A_m=get_A(all_API, app_API_m)`

[130]: `A_m['label']=[-1]*A_m.shape[0]`

```
[131]: A_m
```

```
[131]:                                   B->clone  C->clone  D->clone  F->clone  \
       90b8b78626470c30c52ae86c508ca474         0         0         0         0
       ef5af624019d0864dec30560139f75ea         0         0         0         0
       d16546eef921303a0cfaae6fea7a5800         0         0         0         0
       91530cf3db534f5b42ba26682788cb5c         0         0         0         0

                                         I->clone  J->clone  LAUX;-><init>  \
       90b8b78626470c30c52ae86c508ca474         0         0              0
       ef5af624019d0864dec30560139f75ea         0         0              0
       d16546eef921303a0cfaae6fea7a5800         0         1              0
       91530cf3db534f5b42ba26682788cb5c         0         0              1

                                         LAUx$If;-><init>  LAUx$iF;-><init>  \
       90b8b78626470c30c52ae86c508ca474                 0                 0
       ef5af624019d0864dec30560139f75ea                 0                 0
       d16546eef921303a0cfaae6fea7a5800                 0                 0
       91530cf3db534f5b42ba26682788cb5c                 1                 1

                                         LAUx$if;-><init>  …  L ;->  L ;->  \
       90b8b78626470c30c52ae86c508ca474                 0  …      0      0
       ef5af624019d0864dec30560139f75ea                 0  …      0      0
       d16546eef921303a0cfaae6fea7a5800                 0  …      0      0
       91530cf3db534f5b42ba26682788cb5c                 1  …      1      1

                                         L ;->  L ;-><init>  L ;->  L ;-><init>  \
       90b8b78626470c30c52ae86c508ca474      0              0      0              0
       ef5af624019d0864dec30560139f75ea      0              0      0              0
       d16546eef921303a0cfaae6fea7a5800      0              0      0              0
       91530cf3db534f5b42ba26682788cb5c      1              1      1              1

                                         L ;->  L ;-><init>  Z->clone  label
       90b8b78626470c30c52ae86c508ca474      0              0         0     -1
       ef5af624019d0864dec30560139f75ea      0              0         0     -1
       d16546eef921303a0cfaae6fea7a5800      0              0         0     -1
       91530cf3db534f5b42ba26682788cb5c      1              1         0     -1

       [4 rows x 115268 columns]
```

```
[132]: A_b=get_A(all_API, app_API_b)
```

```
[133]: A_b['label']=[1]*A_b.shape[0]
```

```
[134]: A_b
```

```
                                             B->clone  C->clone  \
Microsoft Word Write Edit Share Docs on the Go_…    1         0
Worms Zone io Voracious Snake_v1.2.9_               1         0
Happy Glass_v1.0.47_                                1         0
Subway Surfers_v1.114.0_                            1         0
Instagram Lite_v67.0.0.0.51_                        1         1

                                             D->clone  F->clone  \
Microsoft Word Write Edit Share Docs on the Go_…    1         1
Worms Zone io Voracious Snake_v1.2.9_               1         1
Happy Glass_v1.0.47_                                0         0
Subway Surfers_v1.114.0_                            1         1
Instagram Lite_v67.0.0.0.51_                        0         0

                                             I->clone  J->clone  \
Microsoft Word Write Edit Share Docs on the Go_…    1         1
Worms Zone io Voracious Snake_v1.2.9_               1         1
Happy Glass_v1.0.47_                                1         1
Subway Surfers_v1.114.0_                            1         1
Instagram Lite_v67.0.0.0.51_                        1         1

                                             LAUX;-><init>  \
Microsoft Word Write Edit Share Docs on the Go_…       0
Worms Zone io Voracious Snake_v1.2.9_                  0
Happy Glass_v1.0.47_                                   0
Subway Surfers_v1.114.0_                               0
Instagram Lite_v67.0.0.0.51_                           0

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Microsoft Word Write Edit Share Docs on the Go_…       0
Worms Zone io Voracious Snake_v1.2.9_                  0
Happy Glass_v1.0.47_                                   0
Subway Surfers_v1.114.0_                               0
Instagram Lite_v67.0.0.0.51_                           0

                                             LAUx$iF;-><init>  \
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Worms Zone io Voracious Snake_v1.2.9_                  0
Happy Glass_v1.0.47_                                   0
Subway Surfers_v1.114.0_                               0
Instagram Lite_v67.0.0.0.51_                           0

                                             LAUx$if;-><init>  …  \
Microsoft Word Write Edit Share Docs on the Go_…       0  …
Worms Zone io Voracious Snake_v1.2.9_                  0  …
Happy Glass_v1.0.47_                                   0  …
Subway Surfers_v1.114.0_                               0  …
```

```
        Instagram Lite_v67.0.0.0.51_                                    0   …

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        Happy Glass_v1.0.47_                                     0        0        0
        Subway Surfers_v1.114.0_                                 0        0        0
        Instagram Lite_v67.0.0.0.51_                             0        0        0

                                                L ;-><init>  L ;->   \
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        Happy Glass_v1.0.47_                                     0        0
        Subway Surfers_v1.114.0_                                 0        0
        Instagram Lite_v67.0.0.0.51_                             0        0

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        Worms Zone io Voracious Snake_v1.2.9_                    0        0
        Happy Glass_v1.0.47_                                     0        0
        Subway Surfers_v1.114.0_                                 0        0
        Instagram Lite_v67.0.0.0.51_                             0        0

                                                L ;-><init>  Z->clone  \
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        Worms Zone io Voracious Snake_v1.2.9_                    0        1
        Happy Glass_v1.0.47_                                     0        0
        Subway Surfers_v1.114.0_                                 0        1
        Instagram Lite_v67.0.0.0.51_                             0        0

                                                label
        Microsoft Word Write Edit Share Docs on the Go_…  1
        Worms Zone io Voracious Snake_v1.2.9_                 1
        Happy Glass_v1.0.47_                                  1
        Subway Surfers_v1.114.0_                              1
        Instagram Lite_v67.0.0.0.51_                          1

        [5 rows x 115268 columns]
```

```python
[135]: from sklearn.svm import SVC
       from sklearn.model_selection import train_test_split
```

```python
[136]: A=pd.concat([A_m,A_b], axis=0)
```

```python
[137]: A
```

	B->clone	C->clone
90b8b78626470c30c52ae86c508ca474	0	0
ef5af624019d0864dec30560139f75ea	0	0
d16546eef921303a0cfaae6fea7a5800	0	0
91530cf3db534f5b42ba26682788cb5c	0	0
Microsoft Word Write Edit Share Docs on the Go_…	1	0
Worms Zone io Voracious Snake_v1.2.9_	1	0
Happy Glass_v1.0.47_	1	0
Subway Surfers_v1.114.0_	1	0
Instagram Lite_v67.0.0.0.51_	1	1

	D->clone	F->clone
90b8b78626470c30c52ae86c508ca474	0	0
ef5af624019d0864dec30560139f75ea	0	0
d16546eef921303a0cfaae6fea7a5800	0	0
91530cf3db534f5b42ba26682788cb5c	0	0
Microsoft Word Write Edit Share Docs on the Go_…	1	1
Worms Zone io Voracious Snake_v1.2.9_	1	1
Happy Glass_v1.0.47_	0	0
Subway Surfers_v1.114.0_	1	1
Instagram Lite_v67.0.0.0.51_	0	0

	I->clone	J->clone
90b8b78626470c30c52ae86c508ca474	0	0
ef5af624019d0864dec30560139f75ea	0	0
d16546eef921303a0cfaae6fea7a5800	0	1
91530cf3db534f5b42ba26682788cb5c	0	0
Microsoft Word Write Edit Share Docs on the Go_…	1	1
Worms Zone io Voracious Snake_v1.2.9_	1	1
Happy Glass_v1.0.47_	1	1
Subway Surfers_v1.114.0_	1	1
Instagram Lite_v67.0.0.0.51_	1	1

	LAUX;-><init>
90b8b78626470c30c52ae86c508ca474	0
ef5af624019d0864dec30560139f75ea	0
d16546eef921303a0cfaae6fea7a5800	0
91530cf3db534f5b42ba26682788cb5c	1
Microsoft Word Write Edit Share Docs on the Go_…	0
Worms Zone io Voracious Snake_v1.2.9_	0
Happy Glass_v1.0.47_	0
Subway Surfers_v1.114.0_	0
Instagram Lite_v67.0.0.0.51_	0

	LAUx$If;-><init>
90b8b78626470c30c52ae86c508ca474	0
ef5af624019d0864dec30560139f75ea	0

```
d16546eef921303a0cfaae6fea7a5800                                    0
91530cf3db534f5b42ba26682788cb5c                                    1
Microsoft Word Write Edit Share Docs on the Go_…              0
Worms Zone io Voracious Snake_v1.2.9_                             0
Happy Glass_v1.0.47_                                             0
Subway Surfers_v1.114.0_                                         0
Instagram Lite_v67.0.0.0.51_                                     0


                                               LAUx$iF;-><init>  \
90b8b78626470c30c52ae86c508ca474                                0
ef5af624019d0864dec30560139f75ea                                0
d16546eef921303a0cfaae6fea7a5800                                0
91530cf3db534f5b42ba26682788cb5c                                1
Microsoft Word Write Edit Share Docs on the Go_…             0
Worms Zone io Voracious Snake_v1.2.9_                            0
Happy Glass_v1.0.47_                                            0
Subway Surfers_v1.114.0_                                        0
Instagram Lite_v67.0.0.0.51_                                    0


                                               LAUx$if;-><init>  …  \
90b8b78626470c30c52ae86c508ca474                                0  …
ef5af624019d0864dec30560139f75ea                                0  …
d16546eef921303a0cfaae6fea7a5800                                0  …
91530cf3db534f5b42ba26682788cb5c                                1  …
Microsoft Word Write Edit Share Docs on the Go_…             0  …
Worms Zone io Voracious Snake_v1.2.9_                            0  …
Happy Glass_v1.0.47_                                            0  …
Subway Surfers_v1.114.0_                                        0  …
Instagram Lite_v67.0.0.0.51_                                    0  …


                                               L ;->   L ;->   L ;->  \
90b8b78626470c30c52ae86c508ca474                 0       0       0
ef5af624019d0864dec30560139f75ea                 0       0       0
d16546eef921303a0cfaae6fea7a5800                 0       0       0
91530cf3db534f5b42ba26682788cb5c                 1       1       1
Microsoft Word Write Edit Share Docs on the Go_…    0       0       0
Worms Zone io Voracious Snake_v1.2.9_            0       0       0
Happy Glass_v1.0.47_                             0       0       0
Subway Surfers_v1.114.0_                         0       0       0
Instagram Lite_v67.0.0.0.51_                     0       0       0


                                               L ;-><init>  L ;->  \
90b8b78626470c30c52ae86c508ca474                   0          0
ef5af624019d0864dec30560139f75ea                   0          0
d16546eef921303a0cfaae6fea7a5800                   0          0
91530cf3db534f5b42ba26682788cb5c                   1          1
Microsoft Word Write Edit Share Docs on the Go_…      0          0
```

```
Worms Zone io Voracious Snake_v1.2.9_                          0         0
Happy Glass_v1.0.47_                                           0         0
Subway Surfers_v1.114.0_                                       0         0
Instagram Lite_v67.0.0.0.51_                                   0         0


                                            L ;-><init>  L ;->   \
90b8b78626470c30c52ae86c508ca474                      0         0
ef5af624019d0864dec30560139f75ea                      0         0
d16546eef921303a0cfaae6fea7a5800                      0         0
91530cf3db534f5b42ba26682788cb5c                      1         1
Microsoft Word Write Edit Share Docs on the Go_…          0         0
Worms Zone io Voracious Snake_v1.2.9_                      0         0
Happy Glass_v1.0.47_                                       0         0
Subway Surfers_v1.114.0_                                   0         0
Instagram Lite_v67.0.0.0.51_                              0         0


                                            L ;-><init>  Z->clone  \
90b8b78626470c30c52ae86c508ca474                      0         0
ef5af624019d0864dec30560139f75ea                      0         0
d16546eef921303a0cfaae6fea7a5800                      0         0
91530cf3db534f5b42ba26682788cb5c                      1         0
Microsoft Word Write Edit Share Docs on the Go_…          0         1
Worms Zone io Voracious Snake_v1.2.9_                      0         1
Happy Glass_v1.0.47_                                       0         0
Subway Surfers_v1.114.0_                                   0         1
Instagram Lite_v67.0.0.0.51_                              0         0


                                            label
90b8b78626470c30c52ae86c508ca474             -1
ef5af624019d0864dec30560139f75ea             -1
d16546eef921303a0cfaae6fea7a5800             -1
91530cf3db534f5b42ba26682788cb5c             -1
Microsoft Word Write Edit Share Docs on the Go_…     1
Worms Zone io Voracious Snake_v1.2.9_             1
Happy Glass_v1.0.47_                             1
Subway Surfers_v1.114.0_                         1
Instagram Lite_v67.0.0.0.51_                     1

[9 rows x 115268 columns]
```

[167]:
```python
train, test = train_test_split(smaller_A, test_size=0.333)
```

[168]:
```python
clf = SVC()
clf.fit(X=train.drop(columns=['label']), y=train['label'])
```

```
/opt/conda/lib/python3.7/site-packages/sklearn/svm/base.py:193: FutureWarning:
The default value of gamma will change from 'auto' to 'scale' in version 0.22 to
```

account better for unscaled features. Set gamma explicitly to 'auto' or 'scale'
to avoid this warning.
  "avoid this warning.", FutureWarning)

```
[168]: SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,
          decision_function_shape='ovr', degree=3, gamma='auto_deprecated',
          kernel='rbf', max_iter=-1, probability=False, random_state=None,
          shrinking=True, tol=0.001, verbose=False)
```

```
[172]: prediction=clf.predict(test.drop(columns=['label']))
```

```
[173]: score=sum([1 if prediction[i]==test['label'][i] else 0 for i in␣
       ↪range(len(prediction))])/len(prediction)
```

```
[175]: score
```

```
[175]: 0.6666666666666666
```

```
[ ]:
```