toxic_comment_classification_Data_Analysis

July 1, 2023

DATA COLLECTION *KAGGLE*

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

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

[2]:
```
!kaggle -h
```

```
Traceback (most recent call last):
  File "/usr/local/bin/kaggle", line 5, in <module>
    from kaggle.cli import main
  File "/usr/local/lib/python3.10/dist-packages/kaggle/__init__.py", line 23, in
<module>
    api.authenticate()
  File "/usr/local/lib/python3.10/dist-
packages/kaggle/api/kaggle_api_extended.py", line 164, in authenticate
    raise IOError('Could not find {}. Make sure it\'s located in'
OSError: Could not find kaggle.json. Make sure it's located in /root/.kaggle. Or
use the environment method.
```

[3]:
```
!cp /content/drive/MyDrive/kaggle.json /root/.kaggle/kaggle.json
```

[4]:
```
!kaggle competitions download -c jigsaw-toxic-comment-classification-challenge
```

```
Downloading jigsaw-toxic-comment-classification-challenge.zip to /content
 99% 52.0M/52.6M [00:04<00:00, 18.5MB/s]
100% 52.6M/52.6M [00:04<00:00, 13.0MB/s]
```

[5]:
```
!unzip *.zip
```

```
Archive:  jigsaw-toxic-comment-classification-challenge.zip
  inflating: sample_submission.csv.zip
  inflating: test.csv.zip
  inflating: test_labels.csv.zip
  inflating: train.csv.zip
```

[6]:
```
!unzip train.csv.zip -d train
!unzip test.csv.zip -d test
```

```
!unzip test_labels.csv.zip -d testLabel
```

```
Archive:  train.csv.zip
  inflating: train/train.csv
Archive:  test.csv.zip
  inflating: test/test.csv
Archive:  test_labels.csv.zip
  inflating: testLabel/test_labels.csv
```

[7]:
```
import pandas as pd
dftrain=pd.read_csv('/content/train/train.csv')
dftrain
```

[7]:

	id	comment_text	\
0	0000997932d777bf	Explanation\nWhy the edits made under my usern…	
1	000103f0d9cfb60f	D'aww! He matches this background colour I'm s…	
2	000113f07ec002fd	Hey man, I'm really not trying to edit war. It…	
3	0001b41b1c6bb37e	"\nMore\nI can't make any real suggestions on …	
4	0001d958c54c6e35	You, sir, are my hero. Any chance you remember…	
…	…	…	
159566	ffe987279560d7ff	":::::And for the second time of asking, when …	
159567	ffea4adeee384e90	You should be ashamed of yourself \n\nThat is …	
159568	ffee36eab5c267c9	Spitzer \n\nUmm, theres no actual article for …	
159569	fff125370e4aaaf3	And it looks like it was actually you who put …	
159570	fff46fc426af1f9a	"\nAnd … I really don't think you understand…	

	toxic	severe_toxic	obscene	threat	insult	identity_hate
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
…	…	…	…	…	…	…
159566	0	0	0	0	0	0
159567	0	0	0	0	0	0
159568	0	0	0	0	0	0
159569	0	0	0	0	0	0
159570	0	0	0	0	0	0

[159571 rows x 8 columns]

The dataset is in csv format i am trying to use tensorflow and build my own neural network using **LSTM** layer.

Now data exploring

[8]:
```
#perform basic stats
dftrain.describe()
```

[8]:
```
                toxic   severe_toxic        obscene         threat  \
count  159571.000000  159571.000000  159571.000000  159571.000000
mean        0.095844       0.009996       0.052948       0.002996
std         0.294379       0.099477       0.223931       0.054650
min         0.000000       0.000000       0.000000       0.000000
25%         0.000000       0.000000       0.000000       0.000000
50%         0.000000       0.000000       0.000000       0.000000
75%         0.000000       0.000000       0.000000       0.000000
max         1.000000       1.000000       1.000000       1.000000

               insult  identity_hate
count  159571.000000  159571.000000
mean        0.049364       0.008805
std         0.216627       0.093420
min         0.000000       0.000000
25%         0.000000       0.000000
50%         0.000000       0.000000
75%         0.000000       0.000000
max         1.000000       1.000000
```

[9]:
```
dftrain.isnull().sum()
```

[9]:
```
id               0
comment_text     0
toxic            0
severe_toxic     0
obscene          0
threat           0
insult           0
identity_hate    0
dtype: int64
```

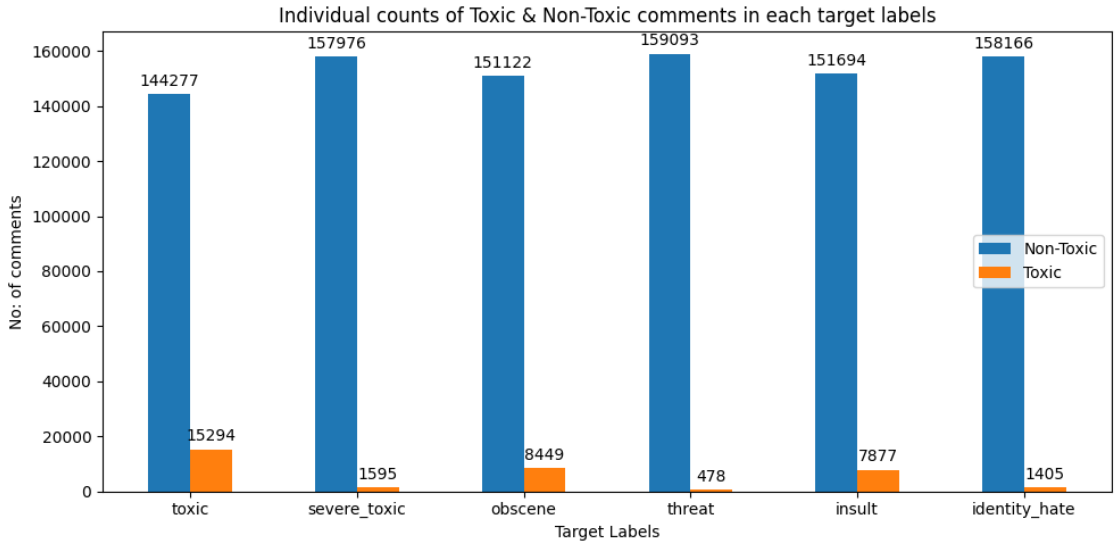
[10]:
```
# checking the value counts for each targets individually
for i in dftrain.columns.values[2:]:#skipping id and comment text columns
    print(dftrain[i].value_counts())
    print("-"*50)
```

```
0    144277
1     15294
Name: toxic, dtype: int64
--------------------------------------------------
0    157976
1      1595
Name: severe_toxic, dtype: int64
--------------------------------------------------
0    151122
1      8449
```

```
Name: obscene, dtype: int64
--------------------------------------------------
0    159093
1       478
Name: threat, dtype: int64
--------------------------------------------------
0    151694
1      7877
Name: insult, dtype: int64
--------------------------------------------------
0    158166
1      1405
Name: identity_hate, dtype: int64
--------------------------------------------------
```

[11]:
```
import matplotlib.pyplot as plt
import numpy as np

labels = dftrain.columns.values[2:]
class_0=[]
class_1=[]

for i in dftrain.columns.values[2:]:
    vc=dftrain[i].value_counts()
    class_0.append(vc[0])
    class_1.append(vc[1])

x = np.arange(len(labels))  # the label locations
width = 0.25  # the width of the bars

fig, ax = plt.subplots(figsize=(10,5))
rects1 = ax.bar(x - width/2, class_0, width, label='Non-Toxic')
rects2 = ax.bar(x + width/2, class_1, width, label='Toxic')

# Add some text for labels, title and custom x-axis tick labels, etc.
ax.set_ylabel('No: of comments')
ax.set_xlabel("Target Labels")
ax.set_title('Individual counts of Toxic & Non-Toxic comments in each target␣
 ↪labels')
ax.set_xticks(x)
ax.set_xticklabels(labels)
ax.legend(loc=7)

ax.bar_label(rects1, padding=3)
ax.bar_label(rects2, padding=3)

ax.bar
```

```
fig.tight_layout()

plt.show()
```



[12]:
```
!pip install venn
```

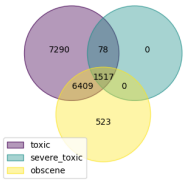
```
Collecting venn
  Downloading venn-0.1.3.tar.gz (19 kB)
  Preparing metadata (setup.py) … done
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-
packages (from venn) (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (1.1.0)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-
packages (from matplotlib->venn) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (4.40.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (1.4.4)
Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.10/dist-
packages (from matplotlib->venn) (1.22.4)
Requirement already satisfied: packaging>=20.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (23.1)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.10/dist-
packages (from matplotlib->venn) (8.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (3.1.0)
Requirement already satisfied: python-dateutil>=2.7 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->venn) (2.8.2)
```

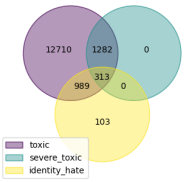
```
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-
packages (from python-dateutil>=2.7->matplotlib->venn) (1.16.0)
Building wheels for collected packages: venn
  Building wheel for venn (setup.py) … done
  Created wheel for venn: filename=venn-0.1.3-py3-none-any.whl size=19699
sha256=5197ec5233950681fe62c7f2694677a7f4d91ed8bfbb502210cbf4a4256c425f
  Stored in directory: /root/.cache/pip/wheels/9c/ce/43/705b4a04cd822891d1d7a4c4
3fc444b4798978e72c79528c5f
Successfully built venn
Installing collected packages: venn
Successfully installed venn-0.1.3
```

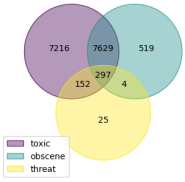
[13]:
```
import venn
from itertools import combinations
no_of_labels= np.arange(2,6)
rows_col=[(5,3),(5,4),(5,3),(2,3)] #The variable rows_col is a list of tuples␣
 ↪specifying the number of rows and columns for each subplot.

for i,rc in zip(no_of_labels,rows_col):
    comb = combinations(dftrain.columns.values[2:], i)
    fig, top_axs = plt.subplots(ncols=rc[1], nrows=rc[0],figsize=(20, 20))
    fig.suptitle("Venn diagram - considering "+str(i)+" Target␣
 ↪Labels",fontsize=24)
    fig.subplots_adjust(top=0.88)
    fig.tight_layout()
    top_axs=top_axs.flatten()
    for j,ax in zip(list(comb),top_axs):
        data_set=dict()
        for k in j:
            data_set[k]=set(dftrain[(dftrain[k]==1)].index)
        venn_dgrm=venn.venn(data_set,legend_loc="best",alpha=0.
 ↪4,fontsize=10,ax=ax)
```

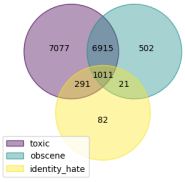
Venn diagram - considering 2 Target Labels

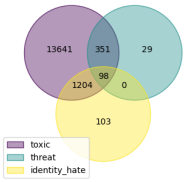
Venn diagram - considering 3 Target Labels

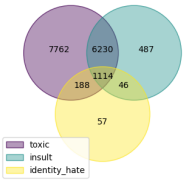


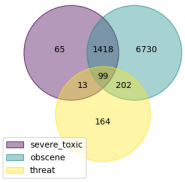


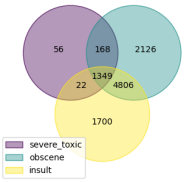


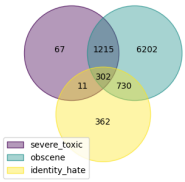


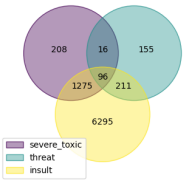


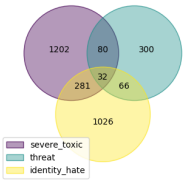


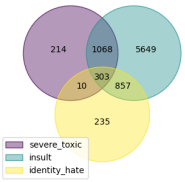


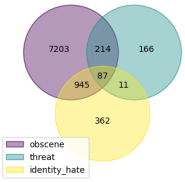


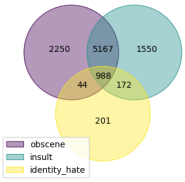




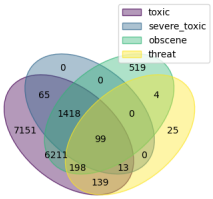


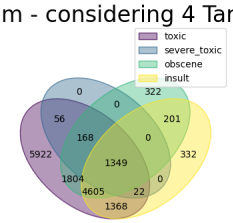


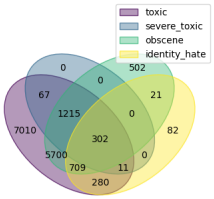


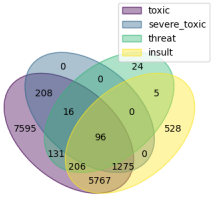


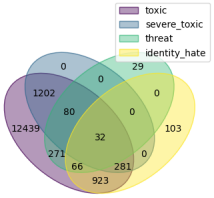
Venn diagram - considering 4 Target Labels

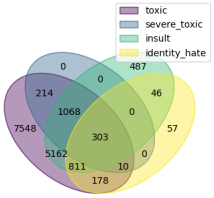


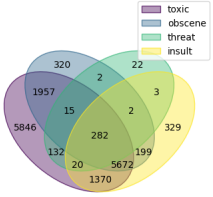


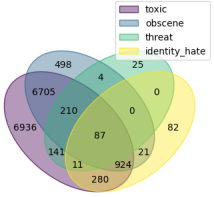


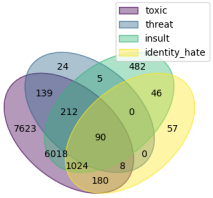


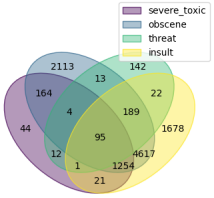


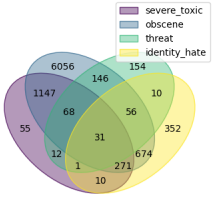


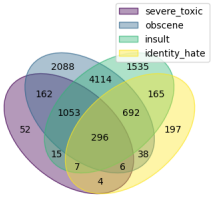


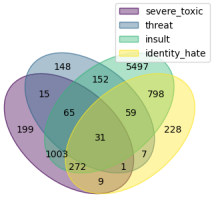


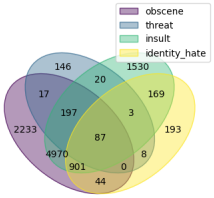




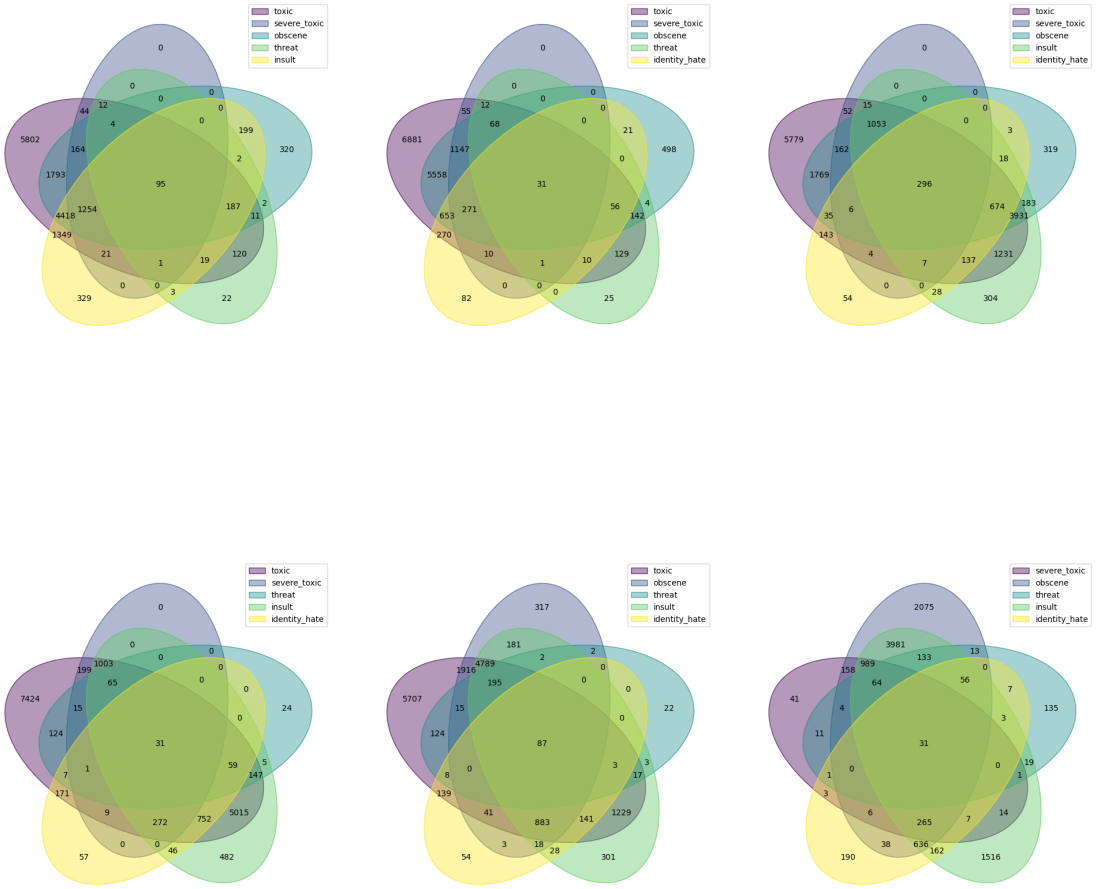






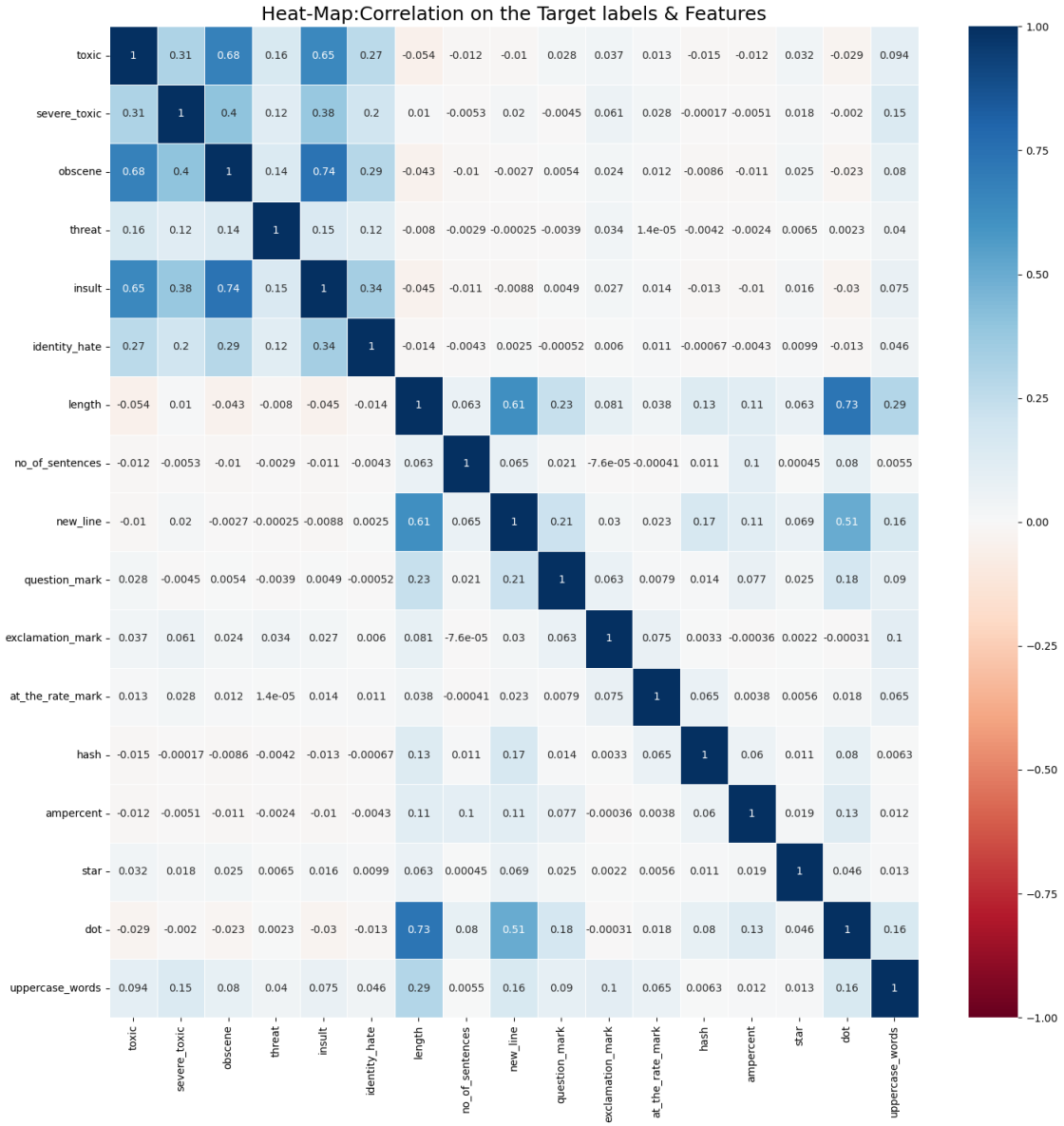


Venn diagram - considering 5 Target Labels



[14]:
```
import seaborn as sns
corr_df=dftrain.drop(columns=["id","comment_text"])
corr_df['length']=dftrain['comment_text'].str.len()
corr_df['no_of_sentences']=dftrain['comment_text'].str.split("/n").apply(len)
corr_df['new_line'] = dftrain['comment_text'].str.count('\n')
corr_df['question_mark'] = dftrain['comment_text'].str.count('\?')
corr_df['exclamation_mark'] = dftrain['comment_text'].str.count('!')
corr_df['at_the_rate_mark'] = dftrain['comment_text'].str.count('@')
corr_df['hash'] = dftrain['comment_text'].str.count('#')
corr_df['ampercent'] = dftrain['comment_text'].str.count('&')
corr_df['star']= dftrain['comment_text'].str.count('\*')
corr_df['dot'] = dftrain['comment_text'].str.count('\.')
corr_df['uppercase_words'] = dftrain['comment_text'].str.split().apply(lambda x:
 ↪ sum(map(str.isupper, x)))
```

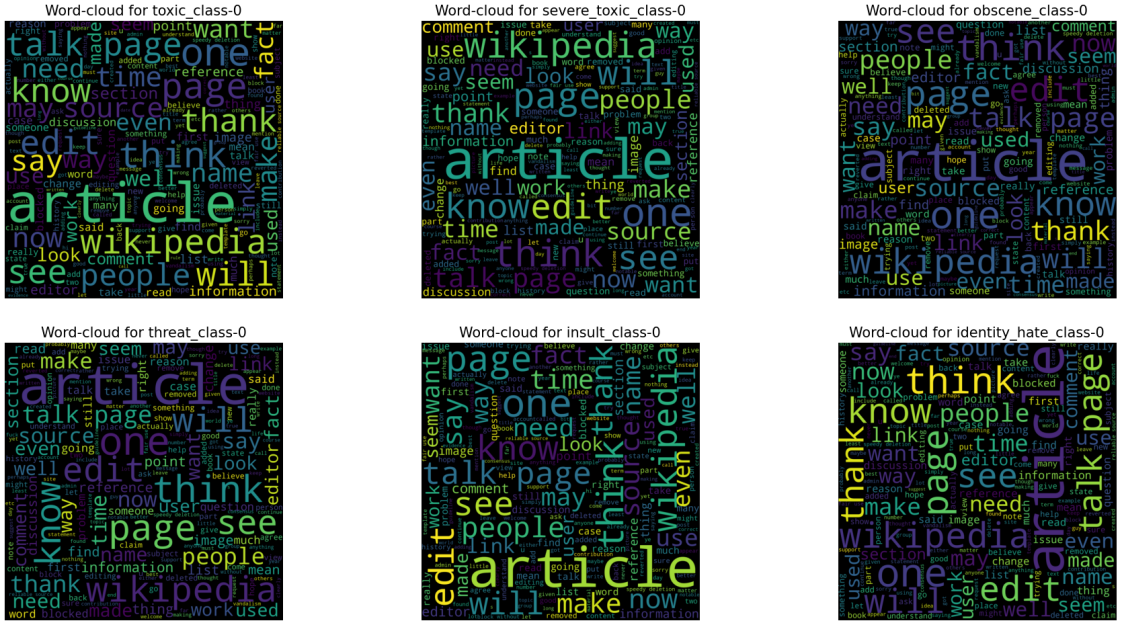
```
correlation=corr_df.corr()

plt.figure(figsize=(15,15))
sns.heatmap(correlation,vmin=-1,cmap='RdBu',annot=True,linewidths=.5)
plt.title("Heat-Map:Correlation on the Target labels & Features",fontsize=18)
plt.tight_layout()
```



[15]:
```
from wordcloud import WordCloud, STOPWORDS
```

[16]:
```
#doc: https://amueller.github.io/word_cloud/generated/wordcloud.WordCloud.
↪html#wordcloud.WordCloud
```

```
plt.figure(figsize=(20,10))
count=1
for col in dftrain.columns[2:]:
    toxic_class_0 = dftrain[dftrain[col]==0]['comment_text'].str.lower().values
    wordcloud = WordCloud(width=2000, height=2000,
                          background_color ='black', margin=1,
                          stopwords = STOPWORDS,
                          ).generate(" ".join(toxic_class_0))

    plt.subplot(2,3,count)
    plt.axis("off")
    plt.title("Word-cloud for "+col+"_class-0",fontsize=15)
    plt.tight_layout(pad=3)
    plt.imshow(wordcloud,interpolation='bilinear')
    count=count+1
plt.show()
```



[17]:
```
#doc: https://amueller.github.io/word_cloud/generated/wordcloud.WordCloud.
 ↪html#wordcloud.WordCloud
plt.figure(figsize=(20,10))
count=1
for col in dftrain.columns[2:]:
    toxic_class_0 = dftrain[dftrain[col]==1]['comment_text'].str.lower().values
    wordcloud = WordCloud(width=2000, height=2000,
                          background_color ='black', margin=1,
                          stopwords = STOPWORDS,
```

```
                        ).generate(" ".join(toxic_class_0))

    plt.subplot(2,3,count)
    plt.axis("off")
    plt.title("Word-cloud for "+col+"_class-1",fontsize=15)
    plt.tight_layout(pad=3)
    plt.imshow(wordcloud,interpolation='bilinear')
    count=count+1
plt.show()
```

[18]:
```
#now preprocessing the text
#text contains hyperlinks,emoji,ip address,html&css and extra punctuations and␣
 ↪special characters

dftrain['comment_text'].sample(10)
```

[18]:
```
52883    Hi Awadewit! As a new Wikipedian, it is reassu…
12367    have rich edit histories containing thousands …
98172    ":I just took a look at my user page on March …
14816                    Thank you for your encouragement.
5232     greatstory==                                   …
5972     "\n\nI concur ""tyrann"" ""terrible"" and ""ma…
59705    Note: It would not appear to be appropriate to…
37970                       ll fix eventually if you don't
95625    "\nSeveral things it says that it is the inter…
1296     Fuck you both, I'm not interested in what eith…
```

```
Name: comment_text, dtype: object
```

[19]:
```
dftrain.drop(['id'],axis=1,inplace=True)
dftrain
```

[19]:

	comment_text	toxic	severe_toxic	obscene	threat	insult	identity_hate
0	Explanation\nWhy the edits made under my usern…	0	0	0	0	0	0
1	D'aww! He matches this background colour I'm s…	0	0	0	0	0	0
2	Hey man, I'm really not trying to edit war. It…	0	0	0	0	0	0
3	"\nMore\nI can't make any real suggestions on …	0	0	0	0	0	0
4	You, sir, are my hero. Any chance you remember…	0	0	0	0	0	0
…	…	…	…	…	…	…	…
159566	":::::And for the second time of asking, when …	0	0	0	0	0	0
159567	You should be ashamed of yourself \n\nThat is …	0	0	0	0	0	0
159568	Spitzer \n\nUmm, theres no actual article for …	0	0	0	0	0	0
159569	And it looks like it was actually you who put …	0	0	0	0	0	0
159570	"\nAnd … I really don't think you understand…	0	0	0	0	0	0

```
[159571 rows x 7 columns]
```