EDOS Data Analysis

Reading the data

In [ ]:
```
import pandas as pd
pd.options.display.max_rows
pd.set_option('display.max_colwidth', None)

edos = pd.read_csv('../edos/data/edos_labelled_aggregated.csv')
edos.set_index('rewire_id', inplace=True)
edos
```

Out[ ]:

rewire_id	text	label_sexist	label_category	label_vector	split
sexism2022_english-9609	In Nigeria, if you rape a woman, the men rape you back! #NSFW "In Nigeria, if you rape a woman, guys rape you back!" by [USER] [URL]	not sexist	none	none	dev
sexism2022_english-16993	Then, she's a keeper. 😊	not sexist	none	none	train
sexism2022_english-13149	This is like the Metallica video where the poor mutilated bastard was saying "Please kill me" over and over again, only with emojis instead of Morse code.	not sexist	none	none	train
sexism2022_english-13021	woman?	not sexist	none	none	train
sexism2022_english-966	I bet she wished she had a gun	not sexist	none	none	dev
...	...	...	...	...	...
sexism2022_english-5228	girls really get fucked almost every weekend ?	not sexist	none	none	train
sexism2022_english-10140	The hatred for moslems are Reasonable and Justified. They openly call for our subjugation, the rapes of our women and children, our slavery, and our death. I'm not going to coexist with them.	not sexist	none	none	train
sexism2022_english-9726	Now this is a woman who gets it. 👆	not sexist	none	none	train
sexism2022_english-13365	“American Idol” finalist [USER] said nothing is going to stop her from performing at The [USER] on #IndependenceDay, calling the chance a once-in-a-lifetime opportunity. [URL] [URL]	not sexist	none	none	train
sexism2022_english-3523	this bi--th should be stoped she's the rapist	sexist	2. derogation	2.2 aggressive and emotive attacks	test

20000 rows × 5 columns

Labels Analysis

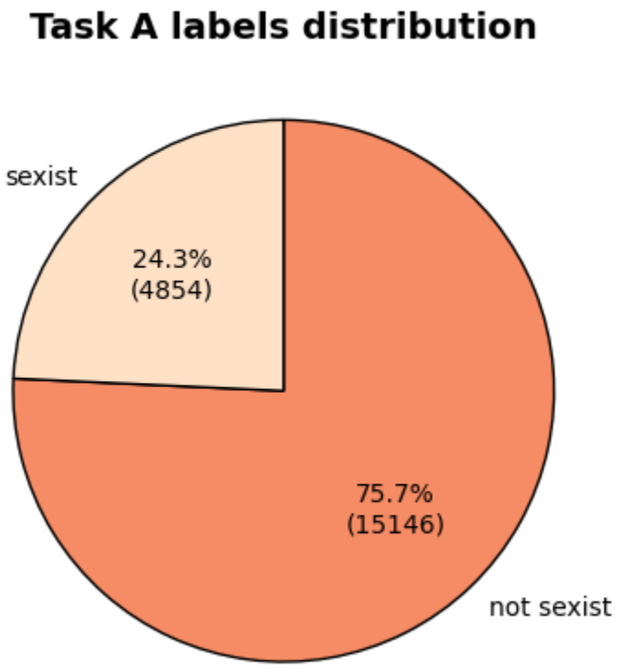
Setting up plot formatting

In [ ]:
```
import matplotlib.pyplot as plt

# set chart colors
colors = ['#f68c65', '#FFE1C6', '#FFF7AE', '#ABC4AE', '#BECBDA',
          '#fac7d3', '#E2D5CA', '#7DCE82', '#75E6E0', '#DAD4EF',
          '#F0B46A', '#FDAFB3']
plt.rcParams['axes.prop_cycle'] = plt.cycler(color=colors)
```

In [ ]:
```
def pie_autopct_format(values):
    def my_format(pct):
        total = sum(values)
        val = int(round(pct*total/100.0))
        return '{:.1f}%\n({v:d})'.format(pct, v=val)
    return my_format
```

Task A's labels distribution and counts

In [ ]:
```
# pie chart
plt.pie(edos['label_sexist'].value_counts(),
        labels=edos['label_sexist'].unique(),
        startangle=90,
        counterclock=False,
        wedgeprops=dict(edgecolor='black'),
        autopct=pie_autopct_format(edos['label_sexist'].value_counts()))
plt.title("Task A labels distribution", fontdict=dict(weight='bold', size=14))
plt.savefig('task_a_labels_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



5 random samples from the each label:

In [ ]:
```
# sexist samples:
sexist = edos[edos['label_sexist'] == 'sexist'].sample(5).reset_index(drop=True)
print('5 random sexist samples:')
print(sexist['text'].values, '\n')

# not-sexist samples:
not_sexist = edos[edos['label_sexist'] == 'not sexist'].sample(5).reset_index(drop=True)
print('5 random not sexist samples:')
print(not_sexist['text'].values)
```

```
5 random sexist samples:
['Ms...Fernandez killed her 8 year old son because she thought he was "gay" No words about a fathe
r being involved with the child. How about having something other than a female around to mentor a
nd direct a boy into manhood?'
 'AWALT. The guy had social status, so she attached to it instantly.'
 "Don't be sad - she is just a stupid 'ho."
 'When it pertains to women, the size of her tits is directly proportional to the length of the hu
g I give.'
 'yeah it sucks being a white man now. We see inferiors promoted above us our women going off with
savages, half breed children in tow. What do we have left to lose?']

5 random not sexist samples:
["they're all at chad's kegger tonight. they'll get back to LARPing tomorrow morning"
 'Better way to repay the debt to us Americans, kick those mother fucking Muslims out of England.
100% of them need to be deported. Islam is the new Nazi.'
 'Dude, i highly doubt i was better looking than you were at 15-20. i was a small acne ridden phag
got and still made out with girls. Whats you excuse ?'
 "This is what this sub should be about. Not complaining about your struggles or bragging about th
e girls you've been with."
 'A woman wiling to pay her share is a woman expecting a much larger payoff in the near future.']
```

Task B's labels distribution and counts

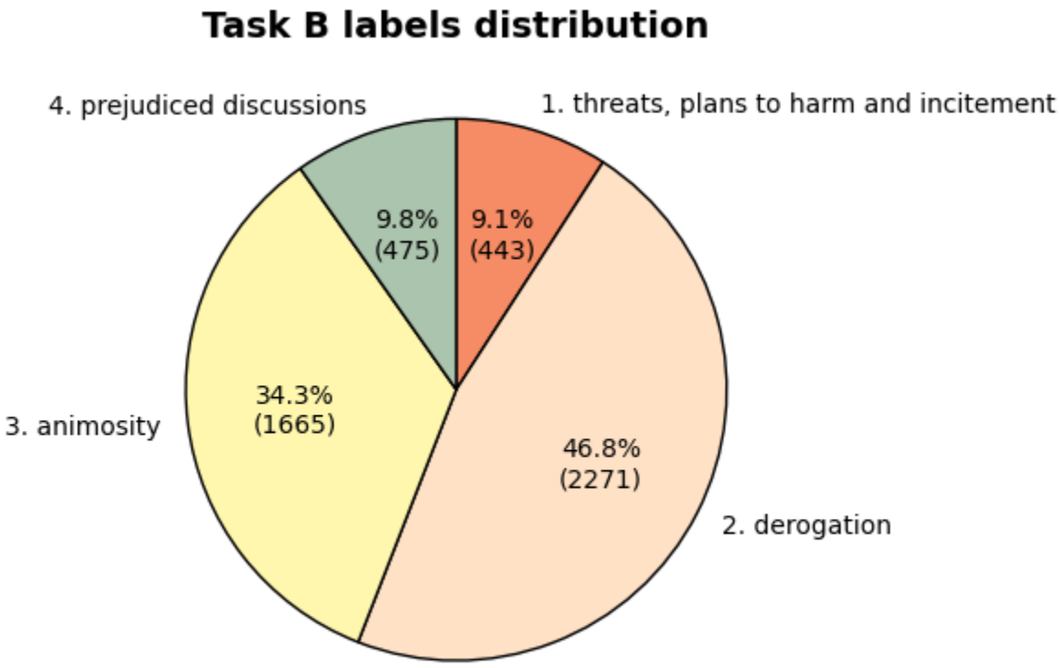
In [ ]:
```
edos_sexist = edos[edos['label_sexist'] == 'sexist']
edos_sexist
```

Out[ ]:

rewire_id	text	label_sexist	label_category	label_vector	split
sexism2022_english-7228	[USER] Leg day is easy. Hot girls who wear miniskirts get asked out.	sexist	3. animosity	3.3 backhanded gendered compliments	train
sexism2022_english-872	I get a new pussy every other week or whenever i want really. Didnt have to learn how to either from YouTube videos. Also PUAs dont get laid. At best they get 5/10 asian ladies after spending years pretending to be something they aren't. Its pathetic	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train
sexism2022_english-3553	I agree with that but at the same time I know myself well enough to say I can’t love a woman. The minute she begins to hit the wall and some hotter, younger women enters the picture, it’s time for impulse control because I’m going to want that.	sexist	2. derogation	2.1 descriptive attacks	dev
sexism2022_english-14992	O come on there's no way any men are attracted to her shes a pig 🙄	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train
sexism2022_english-13328	democrats from Minnesota (leftist muzzie shithole) are the dumbest anti-americans there are. KLobuchar, one of the reps. is a dumb bitch who has a moronic position on the tax bill. Fuck this stupid woman	sexist	2. derogation	2.2 aggressive and emotive attacks	dev
...	...	...	...	...	...
sexism2022_english-17659	This is easily the dumbest thing ever written. Hot pussy craves J. Todd Kincannon. It always has. It always will. I don't care if gross pussy doesn't like me. What do you think I am, some kind of psycho?	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train
sexism2022_english-13737	Recently some thots started advertizing their onlyfans on linkedin, i saw some posts of chat messages.	sexist	3. animosity	3.1 casual use of gendered slurs, profanities, and insults	train
sexism2022_english-8065	I wish yall understand what a burden it can be for a woman to get pregnant or to have sex. So keep your legs closed, you dirty slut. Nobody is forcing you to fuck unemployed men who don’t commit - that is 100% your choice.	sexist	2. derogation	2.2 aggressive and emotive attacks	train
sexism2022_english-12176	idiocracy always seems to be female. Best evidence just this chick.	sexist	2. derogation	2.1 descriptive attacks	train
sexism2022_english-3523	this bi--th should be stoped she's the rapist	sexist	2. derogation	2.2 aggressive and emotive attacks	test

4854 rows × 5 columns

In [ ]:
```
import numpy as np

b_labels, b_counts = np.unique(edos_sexist['label_category'], return_counts=True)
b_labels, b_counts = sorted(b_labels), b_counts[np.argsort(b_labels)]
plt.pie(b_counts,
        labels=b_labels,
        startangle=90,
        counterclock=False,
        wedgeprops=dict(edgecolor='black'),
        autopct=pie_autopct_format(edos_sexist['label_category'].value_counts()))
plt.title("Task B labels distribution", fontdict=dict(weight='bold', size=14))
plt.savefig('task_b_labels_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



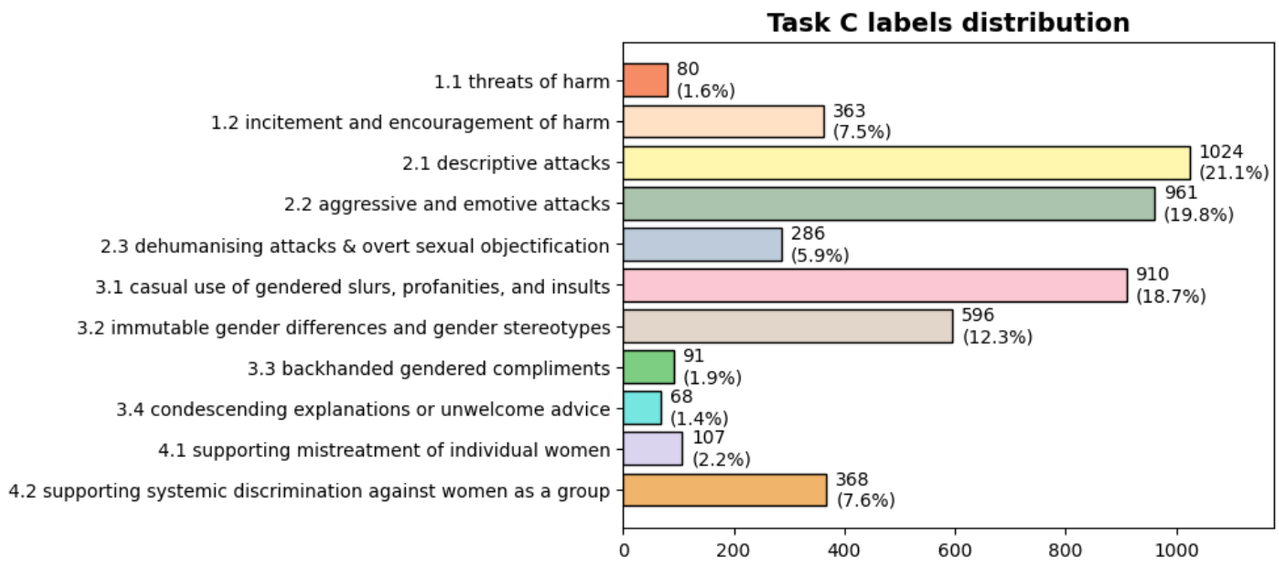
Sample for each label:

In [ ]:
```
for label in b_labels:
    print('Label:', label)
    print(edos_sexist[edos_sexist['label_category'] == label]['text'].sample(3).values, '\n')
```

```
Label: 1. threats, plans to harm and incitement
['Just convert to Islam and shout Allahu Akbar before you assault woman from now on. If your a muz
zie they will literally give you a medal and they keys to the city when you throw acid in a whores
face.'
 "If it was in where I live. You'd give her series of slaps to the cheek and still not get arreste
d because she hit you first. You had the right to self defence man!"
 'Next time a castrationista goes off on another men are dirt, men are trash, men are scum, men ar
e pigs rant, stuff that in her face.']

Label: 2. derogation
['Why is she in cadet uniform? TAKE HER ASS BACK TO THE KITCHEN!'
 'And every time I see a lib tart bitch with pink hair I wish INSANE ASYLUMS TO COME BACK!'
 'This true . Obese hideous women and stick thin men without an ounce of muscle or fat.']

Label: 3. animosity
["lol it's cool to bitch every now and then I'm a dude and I sometimes bitch more than a woman but
I know where I get it's from my Dad he bitches more than any human can possibly to bitch he will d
ie bitching and also be bitching in death"
 'Those guys couldnt care less for average and below average women. Why would they even bother wit
h ugly women when they can get 10/10 virgin models?'
 'ed sheeran no wonder they stole your nhs records it says born a she you are a bitch your hips do
nt lie UK is full of trans']

Label: 4. prejudiced discussions
["women's suffrage was a mistake" 'First and foremost, fire all women.'
 'Well, I learned something new today. Did she divorce rape him (resistance is futile)']
```

Task C's labels distribution and counts

In [ ]:
```
c_labels, c_counts = np.unique(edos_sexist['label_vector'], return_counts=True)
c_labels, c_counts = sorted(c_labels), c_counts[np.argsort(c_labels)]
c_sum = sum(c_counts)
fig, ax = plt.subplots()
bars = ax.barh(width=c_counts,
               y=c_labels,
               color=colors,
               edgecolor='black')
# format labels: value, percentage = value/sum
def bar_format(values):
    def my_format(value):
        val = int(round(value))
        return '{v:d}\n({p:.1f}%)'.format(v=val, p=val/c_sum*100)
    return my_format
ax.bar_label(bars, fmt=bar_format(c_counts),
             label_type='edge',
             padding=5)
ax.margins(x=0.15)
ax.invert_yaxis()
plt.title("Task C labels distribution", fontdict=dict(weight='bold', size=14))
plt.savefig('task_c_labels_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



Sample for each label:

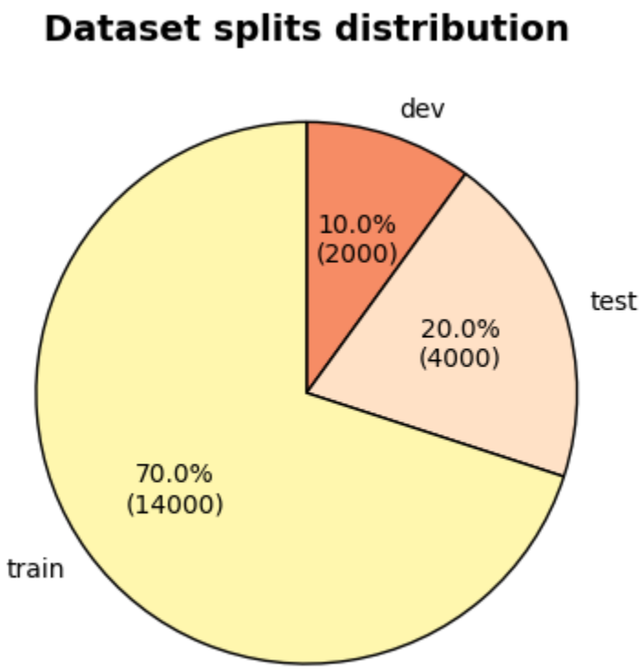
In [ ]:
```
for label in c_labels:
    print('Label:', label)
    print(edos_sexist[edos_sexist['label_vector'] == label]['text'].sample(1).values, '\n')
```

```
Label: 1.1 threats of harm
["As a kid, I grew up in my teen years on the streets. She wouldn't have succeed in hitting more t
han twice before I beat the living hell out of her."]

Label: 1.2 incitement and encouragement of harm
['There should be a cost to those who purposely lie about other politicians in order to defeat the
m. Old hag Feinstein should fry']

Label: 2.1 descriptive attacks
["This kind of protest makes sense to women because they spend their entire lives using their bodi
es to get whatever they want. It's all they know how to do. Logical arguments? Nah. I'll just take
my clothes off and shout."]

Label: 2.2 aggressive and emotive attacks
['she is a 24 carat cunt.']

Label: 2.3 dehumanising attacks & overt sexual objectification
["It's not his job to keep other guys away, it's her fucking job, and if she doesn't respect that
he gotta get the fuck out. A billion pussy in the sea"]

Label: 3.1 casual use of gendered slurs, profanities, and insults
['She’s either an attention whore or she had a better option come along. Don’t sweat it, there’s a
lways more.']

Label: 3.2 immutable gender differences and gender stereotypes
["Well I live at my gym, and women are the same everywhere, so it's almost as if I do live at your
gym."]

Label: 3.3 backhanded gendered compliments
['Thank you for all the women who are still sensible.']

Label: 3.4 condescending explanations or unwelcome advice
['little girl, youre really the boss--come back tomorrow and find out how']

Label: 4.1 supporting mistreatment of individual women
['Odin raped all those giant women and mortal women with their consent.']

Label: 4.2 supporting systemic discrimination against women as a group
['Several women out there that got a lesser sentence for murder.']
```

Data Splitting Distribution

Train, Dev, Test split distribution:

In [ ]:
```
split_labels, split_counts = np.unique(edos['split'], return_counts=True)
plt.pie(split_counts,
        labels=split_labels,
        startangle=90,
        counterclock=False,
        wedgeprops=dict(edgecolor='black'),
        autopct=pie_autopct_format(edos['split'].value_counts()))
plt.title("Dataset splits distribution", fontdict=dict(weight='bold', size=14))
plt.savefig('dataset_splits_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



Sentence Length Analysis

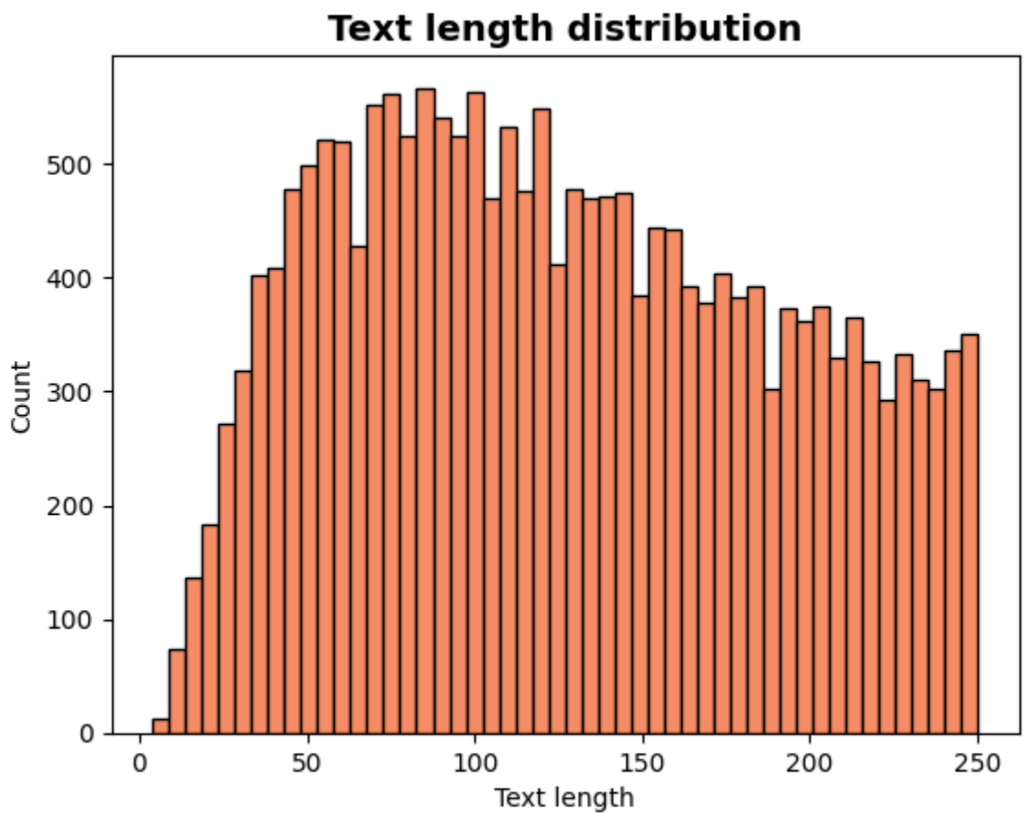
Max, min, mean, median, and standard deviation of sentence length of all data

In [ ]:
```
edos['text_len'] = edos['text'].apply(lambda x: len(x))
edos['text_len'].astype(int)

edos['text_len'].describe()
```

Out[ ]:
```
count    20000.000000
mean       126.996200
std         63.256474
min          4.000000
25%         74.000000
50%        121.000000
75%        178.250000
max        250.000000
Name: text_len, dtype: float64
```

Sentence length histogram:

In [ ]:
```
plt.hist(edos['text_len'], bins=50,
         edgecolor='black')
plt.title("Text length distribution", fontdict=dict(weight='bold', size=14))
plt.xlabel('Text length')
plt.ylabel('Count')
plt.savefig('text_length_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



In [ ]:
```
print('Number of samples with text length equal to min:', edos[edos['text_len']==edos['text_len'
print('Number of samples with text length < 10:', edos[edos['text_len'] < 10].shape[0])
print('Number of samples with text length > 125:', edos[edos['text_len'] > 125].shape[0])
print('Number of samples with text length equal to max:', edos[edos['text_len']==edos['text_len'
```

```
Number of samples with text length equal to min: 1
Number of samples with text length < 10: 23
Number of samples with text length > 125: 9568
Number of samples with text length equal to max: 63
```

Example of the longest sentence and the shortest sentence:

In [ ]:
```
print('Shortest text:')
print(edos[edos['text_len'] == edos['text_len'].min()]['text'].sample(1).values, '\n')
print('Longest text:')
print(edos[edos['text_len'] == edos['text_len'].max()]['text'].sample(1).values)
```

```
Shortest text:
['Zits']

Longest text:
['The assassination of Archduke Franz Ferdinand of Austria,(shown here) heir presumptive to the Au
stro-Hungarian throne, and his wife Sophie, Duchess of Hohenberg, occurred on 28 June 1914 in Sara
jevo. It was used as the pretext to start World War One.']
```

Sentence length by each split description

In [ ]:
```
edos.groupby('split')['text_len'].describe()
```

Out[ ]:

split	count	mean	std	min	25%	50%	75%	max
dev	2000.0	125.430000	63.477349	7.0	74.0	119.0	176.0	250.0
test	4000.0	125.442750	63.820910	5.0	72.0	120.0	177.0	250.0
train	14000.0	127.663786	63.055376	4.0	75.0	122.0	179.0	250.0

Sentence length by each task A label

In [ ]:
```
edos.groupby('label_sexist')['text_len'].describe()
```

Out[ ]:

label_sexist	count	mean	std	min	25%	50%	75%	max
not sexist	15146.0	124.394890	63.302372	4.0	71.0	118.0	175.0	250.0
sexist	4854.0	135.113103	62.426448	9.0	83.0	132.0	188.0	250.0

Extract 10 shortest sentences for 'not sexist' label:

In [ ]:
```
edos[edos['label_sexist'] == 'not sexist'].sort_values(by='text_len').head(10).to_csv('10 shorte
```

Sentence length by each task B label

In [ ]:
```
edos_sexist['text_len'] = edos_sexist['text'].apply(lambda x: len(x))
edos_sexist
```

```
C:\Users\Minh Ha\AppData\Local\Temp\ipykernel_18368\2283281652.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/inde
xing.html#returning-a-view-versus-a-copy
  edos_sexist['text_len'] = edos_sexist['text'].apply(lambda x: len(x))
```

Out[ ]:

rewire_id	text	label_sexist	label_category	label_vector	split	text_len
sexism2022_english-7228	[USER] Leg day is easy. Hot girls who wear miniskirts get asked out.	sexist	3. animosity	3.3 backhanded gendered compliments	train	68
sexism2022_english-872	I get a new pussy every other week or whenever i want really. Didnt have to learn how to either from YouTube videos. Also PUAs dont get laid. At best they get 5/10 asian ladies after spending years pretending to be something they aren't. Its pathetic	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train	250
sexism2022_english-3553	I agree with that but at the same time I know myself well enough to say I can’t love a woman. The minute she begins to hit the wall and some hotter, younger women enters the picture, it’s time for impulse control because I’m going to want that.	sexist	2. derogation	2.1 descriptive attacks	dev	244
sexism2022_english-14992	O come on there's no way any men are attracted to her shes a pig 🙄	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train	65
sexism2022_english-13328	democrats from Minnesota (leftist muzzie shithole) are the dumbest anti-americans there are. KLobuchar, one of the reps. is a dumb bitch who has a moronic position on the tax bill. Fuck this stupid woman	sexist	2. derogation	2.2 aggressive and emotive attacks	dev	203
...	...	...	...	...	...	...
sexism2022_english-17659	This is easily the dumbest thing ever written. Hot pussy craves J. Todd Kincannon. It always has. It always will. I don't care if gross pussy doesn't like me. What do you think I am, some kind of psycho?	sexist	2. derogation	2.3 dehumanising attacks & overt sexual objectification	train	203
sexism2022_english-13737	Recently some thots started advertizing their onlyfans on linkedin, i saw some posts of chat messages.	sexist	3. animosity	3.1 casual use of gendered slurs, profanities, and insults	train	102
sexism2022_english-8065	I wish yall understand what a burden it can be for a woman to get	sexist	2. derogation	2.2 aggressive and emotive attacks	train	222

rewire_id	text	label_sexist	label_category	label_vector	split	text_len
	pregnant or to have sex. So keep your legs closed, you dirty slut. Nobody is forcing you to fuck unemployed men who don't commit - that is 100% your choice.					
sexism2022_english-12176	idiocracy always seems to be female. Best evidence just this chick.	sexist	2. derogation	2.1 descriptive attacks	train	67
sexism2022_english-3523	this bi--th should be stoped she's the rapist	sexist	2. derogation	2.2 aggressive and emotive attacks	test	45

4854 rows × 6 columns

In [ ]:
```
edos_sexist.groupby('label_category')['text_len'].describe()
```

Out[ ]:

label_category	count	mean	std	min	25%	50%	75%	max
1. threats, plans to harm and incitement	443.0	120.234763	63.519114	9.0	66.0	110.0	173.0	250.0
2. derogation	2271.0	135.432849	61.410181	12.0	85.0	133.0	187.0	250.0
3. animosity	1665.0	132.958559	63.119850	10.0	80.0	130.0	185.0	250.0
4. prejudiced discussions	475.0	155.012632	58.906597	14.0	113.0	157.0	205.5	250.0

Sentence length by each task C label

In [ ]:
```
edos_sexist.groupby('label_vector')['text_len'].describe()
```

Out[ ]:

label_vector	count	mean	std	min	25%	50%	75%	max
1.1 threats of harm	80.0	125.037500	55.474123	32.0	80.75	118.5	168.50	249.0
1.2 incitement and encouragement of harm	363.0	119.176309	65.180640	9.0	64.50	108.0	176.50	250.0
2.1 descriptive attacks	1024.0	144.484375	61.121770	21.0	93.75	143.0	197.00	249.0
2.2 aggressive and emotive attacks	961.0	127.940687	60.686744	12.0	78.00	123.0	174.00	250.0
2.3 dehumanising attacks & overt sexual objectification	286.0	128.199301	60.711617	27.0	78.00	119.5	178.75	250.0
3.1 casual use of gendered slurs, profanities, and insults	910.0	127.373626	65.088963	10.0	72.00	122.5	182.00	250.0
3.2 immutable gender differences and gender stereotypes	596.0	140.612416	59.675333	20.0	92.00	135.0	191.00	250.0
3.3 backhanded gendered compliments	91.0	128.615385	59.243522	22.0	86.00	125.0	177.00	248.0
3.4 condescending explanations or unwelcome advice	68.0	146.426471	63.057736	29.0	95.75	152.0	194.00	250.0
4.1 supporting mistreatment of individual women	107.0	164.046729	56.526231	50.0	120.00	161.0	208.50	249.0
4.2 supporting systemic discrimination against women as a group	368.0	152.385870	59.397731	14.0	108.75	155.5	205.00	250.0

Extract 10 shortest sentences for each label:

In [ ]:
```
shortest_df = edos_sexist.groupby('label_vector').apply(lambda x: x.sort_values(by='text_len')[[
shortest_df.to_csv('10 shortest samples each task C label.csv')
shortest_df
```

Out[ ]:

label_vector	rewire_id	text	label_sexist	label_category	split
1.1 threats of harm	**sexism2022_english-7329**	I'd love to fucking kick her ass	sexist	1. threats, plans to harm and incitement	train
	sexism2022_english-18782	No poppy? You deserve an acid attack.	sexist	1. threats, plans to harm and incitement	train
	sexism2022_english-13254	This woman needs a rope around her neck	sexist	1. threats, plans to harm and incitement	train
	sexism2022_english-3313	I would kill your mother to get a shot at you.	sexist	1. threats, plans to harm and incitement	train
	sexism2022_english-9066	Stupid bitch.. I would've slapped tf out of her	sexist	1. threats, plans to harm and incitement	train
...	**...**	...	...	...	...
4.2 supporting systemic discrimination against women as a group	**sexism2022_english-2034**	First and foremost, fire all women.	sexist	4. prejudiced discussions	train
	sexism2022_english-16219	Don't pay attention to what women say.	sexist	4. prejudiced discussions	test
	sexism2022_english-8735	She got her equal rights... And lefts 😂	sexist	4. prejudiced discussions	train
	sexism2022_english-19085	This is why women should have no rights.	sexist	4. prejudiced discussions	dev
	sexism2022_english-10350	To female Bishops stop making fun of religion.	sexist	4. prejudiced discussions	test

110 rows × 4 columns

Word Count Analysis

Word count of all data description

In [ ]:
```
import preprocess
```

Import English dictionary

In [ ]:
```
english_words = set()
with open('../wiki_dict.txt', 'r', encoding='utf-8') as f:
    for line in f:
        english_words.add(line.strip())
len(english_words)
```

Out[ ]:
```
2518927
```

In [ ]:
```
def tokenize(text):
    return preprocess.tokenize(text, vocab_set=english_words)

print(edos['text'][539])
print(tokenize(edos['text'][539]))
```

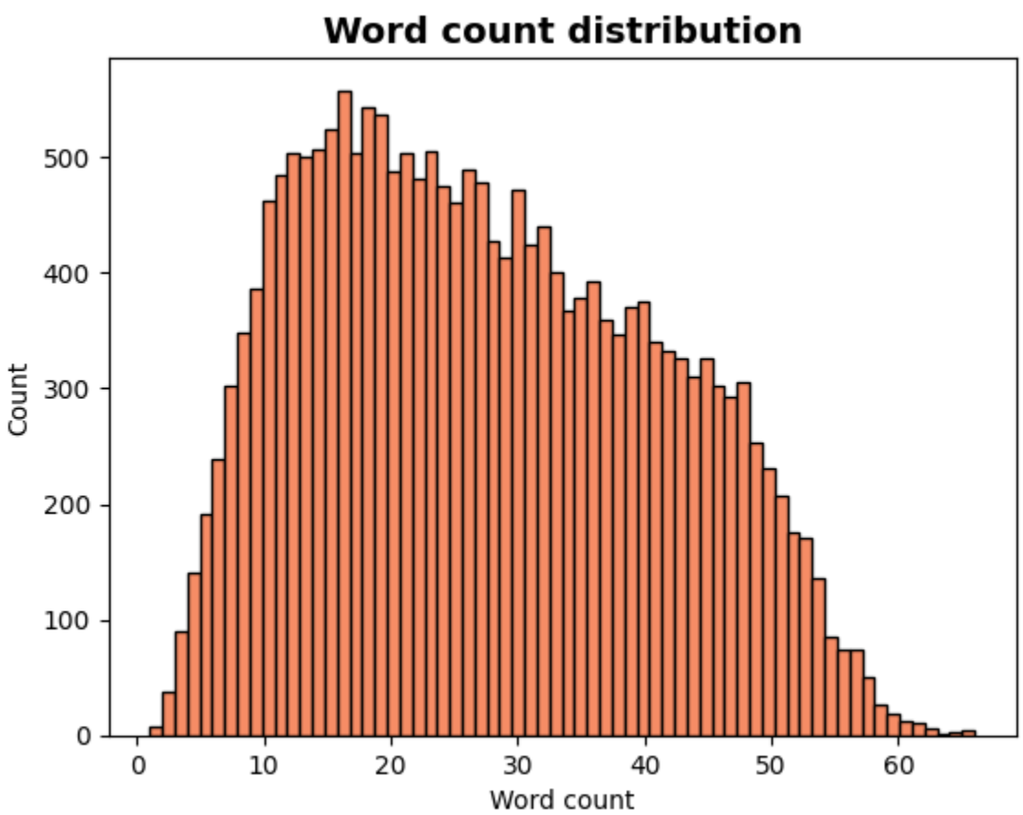
```
▶Anonymous 06/20/18 (Wed) 14:05:56 0f806a (15) No.1831793 =NEWS= World Cup reporter sexually assa
ulted during live broadcast www.foxnews.com/entertainment/2018/06/20/female-world-cup-reporter-sex
ually-assaulted-during-live-broadcast.html
['▶', 'anonymous', '06/20', '/', '18', '(', 'wed', ')', '14:05', '56', '0f806a', '(', '15', ')',
'no', '.', '1831793', 'news', 'world', 'cup', 'reporter', 'sexually', 'assaulted', 'during', 'liv
e', 'broadcast', 'url']
['▶', 'anonymous', '06/20', '/', '18', '(', 'wed', ')', '14:05', '56', '0f806a', '(', '15', ')',
'no', '.', '1831793', 'news', 'world', 'cup', 'reporter', 'sexually', 'assaulted', 'during', 'liv
e', 'broadcast', 'url']
```

In [ ]:
```
edos['word_count'] = edos['text'].apply(lambda x: len(tokenize(x)))
edos['word_count'].astype(int)

edos['word_count'].describe()
```

Out[ ]:
```
count    20000.000000
mean        27.296200
std         13.666726
min          1.000000
25%         16.000000
50%         26.000000
75%         38.000000
max         66.000000
Name: word_count, dtype: float64
```

Histogram of word count:

In [ ]:
```
plt.hist(edos['word_count'], bins=edos['word_count'].max(),
         edgecolor='black')
plt.title("Word count distribution", fontdict=dict(weight='bold', size=14))
plt.xlabel('Word count')
plt.ylabel('Count')
plt.savefig('word_count_distribution.png')
plt.show()
```



Word count by each split description

In [ ]:
```
edos.groupby('split')['word_count'].describe()
```

Out[ ]:

split	count	mean	std	min	25%	50%	75%	max
dev	2000.0	26.977500	13.741885	1.0	16.0	25.0	37.0	63.0
test	4000.0	27.009500	13.789868	1.0	16.0	25.0	38.0	66.0
train	14000.0	27.423643	13.619539	1.0	16.0	26.0	38.0	66.0

Word count by each task A label

In [ ]:
```
edos.groupby('label_sexist')['word_count'].describe()
```

Out[ ]:

label_sexist	count	mean	std	min	25%	50%	75%	max
not sexist	15146.0	26.743563	13.672744	1.0	15.0	25.0	37.0	66.0
sexist	4854.0	29.020602	13.504706	2.0	18.0	28.0	40.0	66.0

In [ ]:
```
# shortest and longest texts for each label
for label in edos['label_sexist'].unique():
    print('Label:', label)
    print('Shortest text:', edos[edos['label_sexist'] == label].sort_values(by='word_count').hea
    print('Longest text:', edos[edos['label_sexist'] == label].sort_values(by='word_count', asce
```

```
Label: not sexist
Shortest text: ['wabbits']
Longest text: ['"Nit(s) is a common name of a head lice (louse) egg. A female louse can lay up to
10 nits per day, and it usually takes about 7-10 days for them to hatch. If left untreated in a 30
-day lifespan a louse can lay up to 100 eggs in her lifetime." [URL]']

Label: sexist
Shortest text: ['Hoochie mama']
Longest text: ["Gjdm, I need to stop being a bitch and talk to woman I like during the day. Heck,
there's a girl at my gym who I've been dying to strike up a conversation with but I always make an
excuse in my head not to. F that . Even it's just 'hi' I'm doing it."]
```

Word count by each task B label

In [ ]:
```
edos_sexist['word_count'] = edos_sexist['text'].apply(lambda x: len(tokenize(x)))
```

```
C:\Users\Minh Ha\AppData\Local\Temp\ipykernel_18368\3223232917.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/inde
xing.html#returning-a-view-versus-a-copy
  edos_sexist['word_count'] = edos_sexist['text'].apply(lambda x: len(tokenize(x)))
```

In [ ]:
```
edos_sexist.groupby('label_category')['word_count'].describe()
```

Out[ ]:

label_category	count	mean	std	min	25%	50%	75%	max
1. threats, plans to harm and incitement	443.0	26.510158	13.848951	3.0	15.0	25.0	38.0	66.0
2. derogation	2271.0	29.021136	13.259540	2.0	18.0	28.0	39.0	65.0
3. animosity	1665.0	28.763363	13.841930	2.0	17.0	27.0	40.0	66.0
4. prejudiced discussions	475.0	32.261053	12.536161	3.0	23.0	32.0	42.0	62.0

In [ ]:
```
# shortest and longest texts for each label
for label in sorted(edos_sexist['label_category'].unique()):
    print('Label:', label)
    print('Shortest text:', edos_sexist[edos_sexist['label_category'] == label].sort_values(by='
    print('Longest text:', edos_sexist[edos_sexist['label_category'] == label].sort_values(by='w
```

```
Label: 1. threats, plans to harm and incitement
Shortest text: ['Hang her.']
Longest text: ["I would just start fucking her!! What's your problem, bro? You don't ask, you just
do it!! In my 42 years on this earth I've never had a female that wasn't a relative sleep over at
my crib/pad and not give me some pussy!! You are simping big time!!"]

Label: 2. derogation
Shortest text: ['Hoochie mama']
Longest text: ["ITT: 1. She's not that hot. I would not bang her. I know hotter women. 2. She's a
bitch. I would not bang her, out of principle. Because I only bang girls with *inner beauty*. 3. O
f course, she get's hit on. She's just saying that she doesn't."]

Label: 3. animosity
Shortest text: ['Worthless bitch']
Longest text: ["Gjdm, I need to stop being a bitch and talk to woman I like during the day. Heck,
there's a girl at my gym who I've been dying to strike up a conversation with but I always make an
excuse in my head not to. F that . Even it's just 'hi' I'm doing it."]

Label: 4. prejudiced discussions
Shortest text: ['We ban females']
Longest text: ['All depends on the divorce agreement, or if you go to court, depends on the state
you live in, and the judge you get. And by "depends," I mean "how bad it will be for YOU, the man.
It WILL be bad, but just how bad depends on several factors.']
```

Word count by each task C label

In [ ]:
```
edos_sexist.groupby('label_vector')['word_count'].describe()
```

Out[ ]:

label_vector	count	mean	std	min	25%	50%	75%	max
1.1 threats of harm	80.0	28.762500	12.471988	8.0	19.00	27.0	38.00	57.0
1.2 incitement and encouragement of harm	363.0	26.013774	14.101931	3.0	14.00	24.0	37.00	66.0
2.1 descriptive attacks	1024.0	30.511719	13.210450	4.0	20.00	30.0	41.00	63.0
2.2 aggressive and emotive attacks	961.0	27.718002	13.200481	2.0	17.00	27.0	38.00	65.0
2.3 dehumanising attacks & overt sexual objectification	286.0	28.062937	13.128096	5.0	17.25	26.0	38.00	58.0
3.1 casual use of gendered slurs, profanities, and insults	910.0	27.582418	14.171095	2.0	15.25	27.0	40.00	66.0
3.2 immutable gender differences and gender stereotypes	596.0	30.380872	13.124135	3.0	20.00	29.5	40.00	60.0
3.3 backhanded gendered compliments	91.0	28.241758	13.514881	5.0	18.00	26.0	38.00	57.0
3.4 condescending explanations or unwelcome advice	68.0	31.088235	14.522998	5.0	18.75	29.5	42.00	66.0
4.1 supporting mistreatment of individual women	107.0	34.691589	12.378779	11.0	26.00	34.0	44.50	62.0
4.2 supporting systemic discrimination against women as a group	368.0	31.554348	12.509714	3.0	22.00	32.0	41.25	62.0

In [ ]:
```
# shortest and longest texts for each label
for label in sorted(edos_sexist['label_vector'].unique()):
    print('Label:', label)
    print('Shortest text:', edos_sexist[edos_sexist['label_vector'] == label].sort_values(by='wo
    print('Longest text:', edos_sexist[edos_sexist['label_vector'] == label].sort_values(by='wor
```

```
Label: 1.1 threats of harm
Shortest text: ["I'd love to fucking kick her ass"]
Longest text: ['Got no response to that. Oh great the French view is what exactly? hes a black guy too. Holy shit there is nothing about this post that doesnt want me to punch her fat American fac e. Yes i assume shes fat, thats what you get from stupid assumptions.']

Label: 1.2 incitement and encouragement of harm
Shortest text: ['Hang her.']
Longest text: ["I would just start fucking her!! What's your problem, bro? You don't ask, you just do it!! In my 42 years on this earth I've never had a female that wasn't a relative sleep over at my crib/pad and not give me some pussy!! You are simping big time!!"]

Label: 2.1 descriptive attacks
Shortest text: ['Israeli women fuck donkeys']
Longest text: ['1. They’re looking to see if other women want you (social proof) so they don’t see m weird if they want you. 2. If you’re a virgin, lie. Fake it till you make it. The girl who I los t my virginity to thought I had slept with 7 women (LOL).']

Label: 2.2 aggressive and emotive attacks
Shortest text: ['Hoochie mama']
Longest text: ["ITT: 1. She's not that hot. I would not bang her. I know hotter women. 2. She's a bitch. I would not bang her, out of principle. Because I only bang girls with *inner beauty*. 3. O f course, she get's hit on. She's just saying that she doesn't."]

Label: 2.3 dehumanising attacks & overt sexual objectification
Shortest text: ['Chad is every foids soulmate']
Longest text: ['Are these people retarded? 16 y/o girls are cock-ready. It can be 30 y/o cock of a respectable, responsible prosecutor who wants to marry them or it can be 18 y/o cock attached to a n irresponsible guy who may be a mechanic or something one day. [URL]']

Label: 3.1 casual use of gendered slurs, profanities, and insults
Shortest text: ['Worthless bitch']
Longest text: ["Gjdm, I need to stop being a bitch and talk to woman I like during the day. Heck, there's a girl at my gym who I've been dying to strike up a conversation with but I always make an excuse in my head not to. F that . Even it's just 'hi' I'm doing it."]

Label: 3.2 immutable gender differences and gender stereotypes
Shortest text: ['typical female nature']
Longest text: ['I\'m a 5\'6 latino with a 5" dick. Would I be able to get a low-end (1-3/10) white woman in the US if I careermaxx? Also, is it easier for latinos to integrate and be accpeted by wh ite locals than other races like blacks or asians?']

Label: 3.3 backhanded gendered compliments
Shortest text: ['Strong women scare me.']
Longest text: ["Exactly. 70's bush was just wild. No one is saying it has to be shaved... but extr emely hairy and unmanaged isn't a great thing to most men. If it were true, that would mean basic hygiene wouldn't be an issue and we would be cool with ugly women."]

Label: 3.4 condescending explanations or unwelcome advice
Shortest text: ['Ladies.... never get tattoos.']
Longest text: ['Well if you have a penis you have to wear skinny jeans and be a beta, if you own a vagina, don\'t wash it for a week and bow up and act tough BUT be sure to scream "you hit a girl" if you\'re punched. Oh and if you see a car coming MOVE OUT OF THE WAY!']

Label: 4.1 supporting mistreatment of individual women
Shortest text: ['She disobeyed her male keeper. She knew the rules.']
Longest text: ["Sell it to who pays more man. chicks come and go cash is forever. plus it'll tell her you arent a simp who will do anything for the pussy. side note, i dont know how you put up wit h chicks that talk in slang or like a dude, bugs the shit out of me"]

Label: 4.2 supporting systemic discrimination against women as a group
Shortest text: ['We ban females']
Longest text: ['All depends on the divorce agreement, or if you go to court, depends on the state you live in, and the judge you get. And by "depends," I mean "how bad it will be for YOU, the man. It WILL be bad, but just how bad depends on several factors.']
```

Word Analysis

Get word frequency of all data

Get all words

In [ ]:
```
# get all texts id for every text that contains word
def get_text_ids(word):
    return edos[edos['tokenized_text'].apply(lambda x: word in x)].index.values
```

In [ ]:
```
words = pd.DataFrame(columns=['word'])

edos['tokenized_text'] = edos['text'].apply(lambda x: tokenize(x))
words['word'] = edos['tokenized_text'].explode().unique()

words
```

Out[ ]:

	word
0	in
1	nigeria
2	,
3	if
4	you
...	...
25316	selflessly
25317	👆
25318	idol
25319	finalist
25320	stoped

25321 rows × 1 columns

In [ ]:
```
words.sort_values(by='word', ascending=True).reset_index(drop=True)
```

Out[ ]:

	word
0	!
1	"
2	#
3	##if
4	#cw2
...	...
25316	
25317	
25318	
25319	
25320	

25321 rows × 1 columns

Get word frequency

In [ ]:
```
from nltk import FreqDist

word_freq = FreqDist(edos['tokenized_text'].explode())
words['freq'] = words['word'].apply(lambda x: word_freq.get(x))
```

In [ ]:
```
# most frequent words including stopwords
words.sort_values(by='freq', ascending=False).reset_index(drop=True).head(20)
```

Out[ ]:

	word	freq
0	.	27033
1	the	14220
2	,	14208
3	a	12455
4	to	12197
5	is	11284
6	i	9557
7	and	9194
8	you	8490
9	not	7507
10	of	6732
11	she	6161
12	that	6152
13	her	5966
14	it	5690
15	are	5293
16	in	5004
17	women	4334
18	"	4257
19	?	4237

In [ ]:

```
# most frequent words excluding stopwords
from nltk.corpus import stopwords
from string import punctuation

stop_words_punct = set(stopwords.words('english'))
stop_words_punct.update(punctuation)

# remove stopwords and punctuation
words['word'] = words['word'].apply(lambda x: x if (x not in stop_words_punct) and (not str(x).i
words.dropna(inplace=True)
words['freq'] = words['word'].apply(lambda x: word_freq.get(x))

words.sort_values(by='freq', ascending=False).reset_index(drop=True).head(20)
```

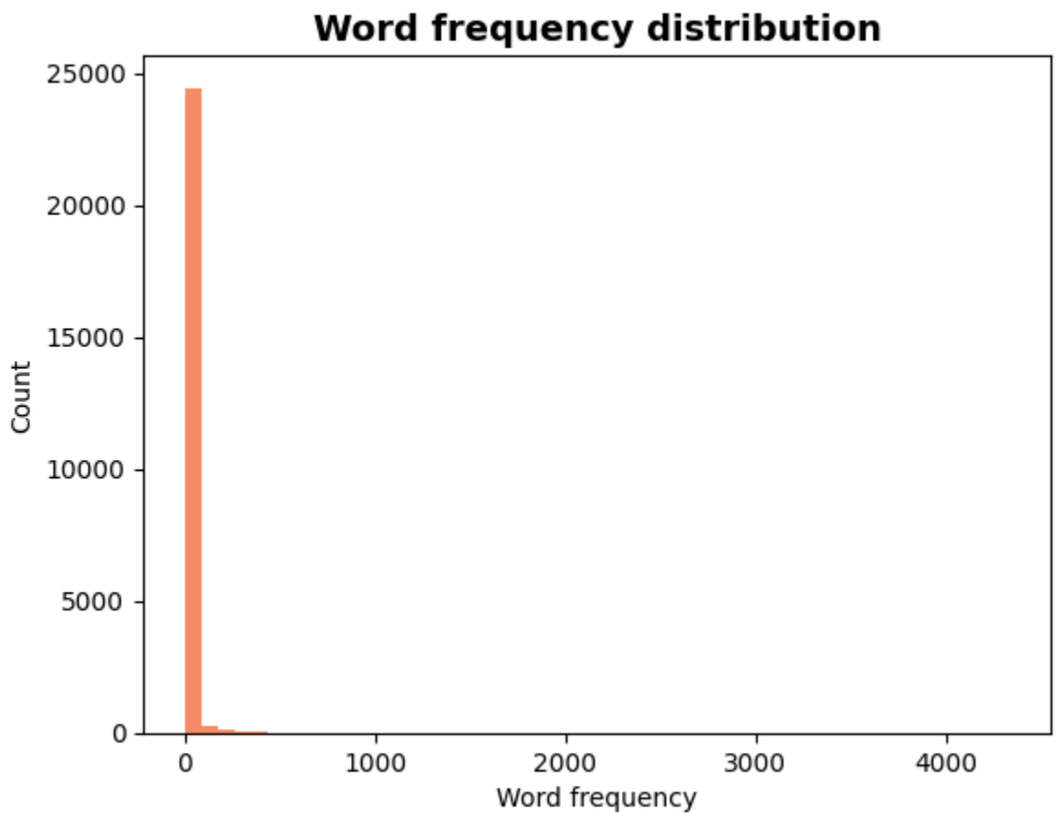
Out[ ]:

	word	freq
0	women	4334
1	url	3414
2	like	2429
3	would	2063
4	get	1707
5	woman	1643
6	men	1464
7	user	1363
8	one	1145
9	girls	1135
10	girl	1078
11	fuck	1073
12	want	1062
13	know	979
14	white	965
15	shit	957
16	think	954
17	people	953
18	female	951
19	even	909

In [ ]:
```
words['freq'].describe()
```

Out[ ]:
```
count    24902.000000
mean         9.806401
std         60.593327
min          1.000000
25%          1.000000
50%          2.000000
75%          4.000000
max       4334.000000
Name: freq, dtype: float64
```

In [ ]:
```
plt.hist(words['freq'], bins=50)
plt.title("Word frequency distribution", fontdict=dict(weight='bold', size=14))
plt.xlabel('Word frequency')
plt.ylabel('Count')
plt.savefig('word_frequency_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



In [ ]:
```
print("Number of words with frequency = 1:", words[words['freq'] == 1].shape[0])
print("Number of words with frequency < 10:", words[words['freq'] < 10].shape[0])
print("Number of words with frequency > 100:", words[words['freq'] > 100].shape[0])
print("Number of words with frequency > 1000:", words[words['freq'] > 1000].shape[0])
```

```
Number of words with frequency = 1: 12408
Number of words with frequency < 10: 21462
Number of words with frequency > 100: 388
Number of words with frequency > 1000: 13
```

Get word frequency of each label

In [ ]:
```
edos_sexist['tokenized_text'] = edos_sexist['text'].apply(lambda x: tokenize(x))
word_freq_sexist = FreqDist(edos_sexist['tokenized_text'].explode())

words['freq_sexist'] = words['word'].apply(lambda x: word_freq_sexist.get(x)).fillna(0)
words['freq_sexist'] = words['freq_sexist'].astype(int)
words['freq_not_sexist'] = words['freq'] - words['freq_sexist']
```

```
C:\Users\Minh Ha\AppData\Local\Temp\ipykernel_18368\1519064831.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/inde
xing.html#returning-a-view-versus-a-copy
  edos_sexist['tokenized_text'] = edos_sexist['text'].apply(lambda x: tokenize(x))
```

In [ ]:
```
words.sort_values(by='freq_sexist', ascending=False).reset_index(drop=True).head(20)
```

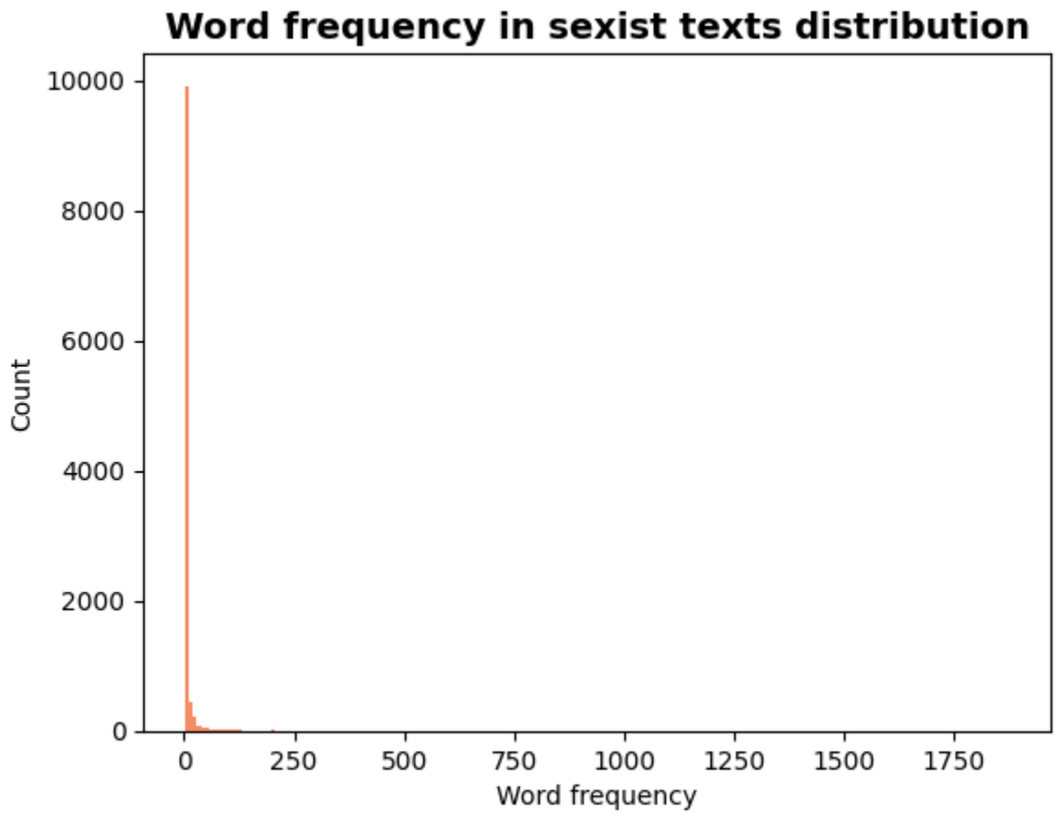
Out[ ]:

	word	freq	freq_sexist	freq_not_sexist
0	women	4334	1877	2457
1	like	2429	697	1732
2	men	1464	658	806
3	bitch	591	577	14
4	get	1707	537	1170
5	woman	1643	535	1108
6	would	2063	529	1534
7	url	3414	507	2907
8	female	951	326	625
9	fuck	1073	326	747
10	want	1062	306	756
11	fucking	860	291	569
12	man	876	289	587
13	girls	1135	272	863
14	shit	957	269	688
15	one	1145	267	878
16	know	979	265	714
17	even	909	244	665
18	pussy	250	224	26
19	white	965	221	744

In [ ]:
```
words[words['freq_sexist'] > 0]['freq_sexist'].describe()
```

Out[ ]:
```
count    10914.000000
mean         5.781473
std         28.312850
min          1.000000
25%          1.000000
50%          1.000000
75%          3.000000
max       1877.000000
Name: freq_sexist, dtype: float64
```

In [ ]:
```
plt.hist(words[words['freq_sexist'] > 0]['freq_sexist'], bins=200)
plt.title("Word frequency in sexist texts distribution", fontdict=dict(weight='bold', size=14))
plt.xlabel('Word frequency')
plt.ylabel('Count')
plt.savefig('word_frequency_sexist_distribution.png', dpi=300, bbox_inches='tight')
plt.show()
```



In [ ]:
```
print("Number of words in sexist text with frequency = 1:", words[words['freq_sexist'] == 1].sha
print("Number of words in sexist text with frequency < 10:", words[words['freq_sexist'] < 10].sh
print("Number of words in sexist text with frequency > 100:", words[words['freq_sexist'] > 100].
print("Number of words in sexist text with frequency > 1000:", words[words['freq_sexist'] > 1000
```

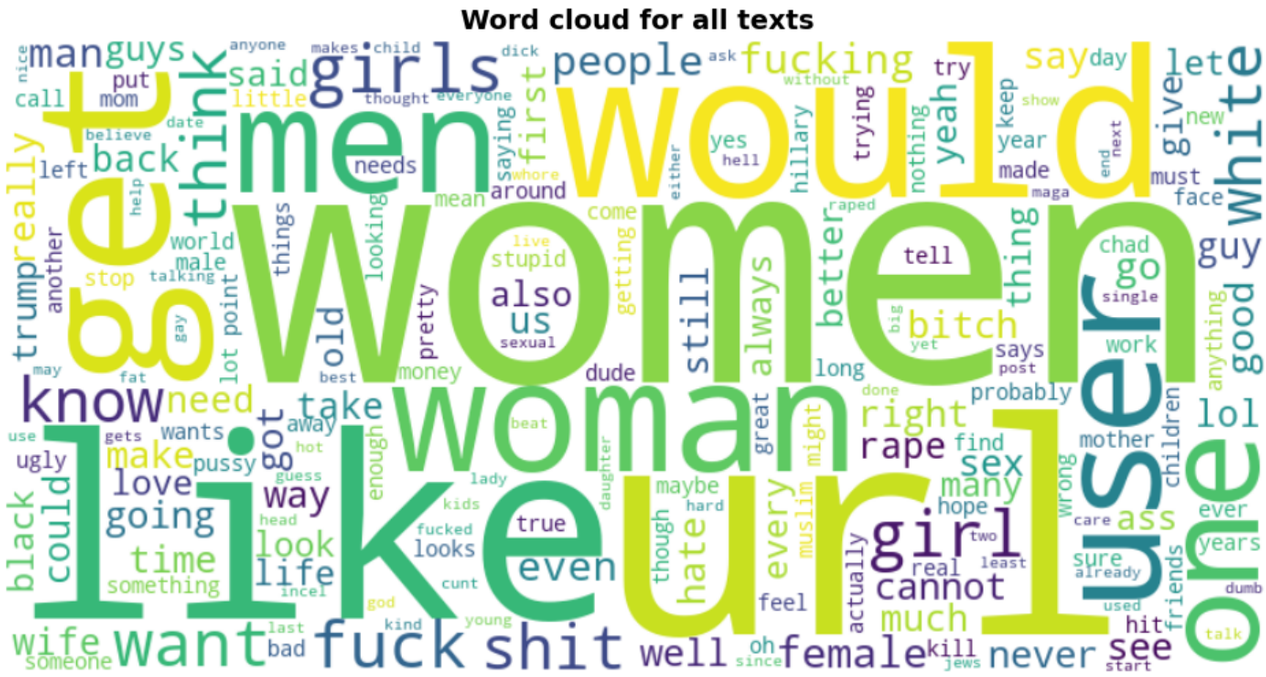
```
Number of words in sexist text with frequency = 1: 5844
Number of words in sexist text with frequency < 10: 23817
Number of words in sexist text with frequency > 100: 76
Number of words in sexist text with frequency > 1000: 1
```

Create word cloud

In [ ]:
```
from wordcloud import WordCloud

def show_word_cloud(text: any, freq: any, title: str):
    text = np.array(text, dtype=str)
    freq = np.array(freq, dtype=int)
    wordcloud = WordCloud(width=800,
                          height=400,
                          background_color='white',
                          collocations=False,
                          relative_scaling=0.5,
                          max_words=200,
                          ).generate_from_frequencies(dict(zip(text, freq)))
    plt.figure(figsize=(12, 6))
    plt.imshow(wordcloud, interpolation='bilinear')
    plt.axis('off')
    plt.title(title, fontdict=dict(weight='bold', size=14))
    plt.savefig(title.replace(' ', '_').lower() + '.png', dpi=300, bbox_inches='tight') # lower
    plt.show()
```

Word cloud of all data

In [ ]:
```
words = words.sort_values(by='freq', ascending=False)
show_word_cloud(words['word'], words['freq'], 'Word cloud for all texts')
```



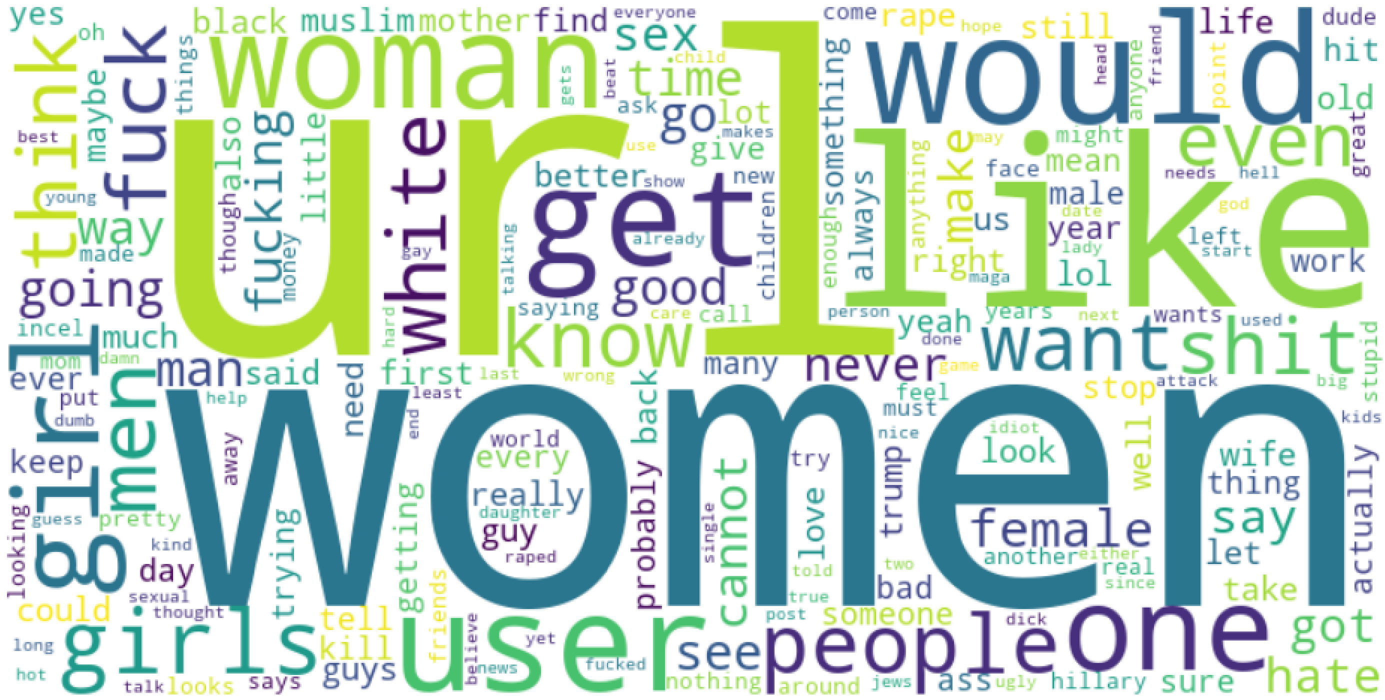
Word cloud of most frequent words of sexist label

In [ ]:
```
words = words.sort_values(by='freq_sexist', ascending=False)
show_word_cloud(words['word'], words['freq_sexist'], 'Word cloud for sexist texts')
```

Word cloud of most frequent words of not sexist label

In [ ]:
```
words = words.sort_values(by='freq_not_sexist', ascending=True)
show_word_cloud(words['word'], words['freq_not_sexist'], 'Word cloud for not sexist texts')
```

Word cloud for not sexist texts



Emoji count

In [ ]:
```
import emoji

words['is_emoji'] = words['word'].apply(lambda x: emoji.is_emoji(x))
emoji_all_data = words[words['is_emoji'] == True].sort_values(by='freq', ascending=False)[['word
emoji_all_data
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist
0	😂	174	46	128
1	🤣	38	14	24
2	🤔	37	5	32
3	😁	22	5	17
4	😊	19	0	19
...	...	...	...	...
178	🤯	1	0	1
179	✅	1	0	1
180	😩	1	0	1
181	😧	1	0	1
182	🤦	1	0	1

183 rows × 4 columns

In [ ]:
```
words[(words['is_emoji'] == True) & (words['freq_sexist'] > 0)].sort_values(by='freq_sexist', as
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji
0	😂	174	46	128	True
1	🤣	38	14	24	True
2	♥	8	5	3	True
3	🤔	37	5	32	True
4	😁	22	5	17	True
5	🙄	15	5	10	True
6	🤡	5	4	1	True
7	😜	5	3	2	True
8	🖕	5	3	2	True
9	😀	8	3	5	True

In [ ]:
```
emoji_all_data['text_ids'] = emoji_all_data['word'].apply(lambda x: get_text_ids(x))
emoji_all_data['example_text'] = emoji_all_data['text_ids'].apply(lambda x: edos.loc[x[0], 'text
emoji_all_data[['word', 'freq', 'freq_sexist', 'freq_not_sexist', 'example_text']].head(10)
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	example_text
0	😂	174	46	128	i don't wanna suck any beef curtain flaps 😂
1	🤣	38	14	24	Aw, what's wrong nigger? You don't like your sheboon exposed for the savage she is? 🤣
2	🤔	37	5	32	Why does she have to be white? Do blackcels hate black females or something ? 🤔
3	😁	22	5	17	He sure took her for a ride. 😁
4	😊	19	0	19	My mom does 😊
5	😄	17	2	15	Lol sounds like me. I don't normally play the lottery but one yr my mom bought us all each 5 tickets for Christmas. I got nothing until my last ticket and it was a $5 prize 😄 😄 😄
6	ᴜs	16	0	16	Pray AlwaysusɪL [USER] Or we'll rape your women and children? Migrant Urges Germans, Austrians To Give Refugees "Their Homes and Money" | Zero Hedge [URL] ...
7	👍	16	1	15	👍 YES she needs to and she won't shy away form it , more power to her , i like her spunk !! 🌺 💐 🤗 😘 ❤️
8	🙄	15	5	10	O come on there's no way any men are attracted to her shes a pig 🙄
9	👌	14	0	14	Will be mentioning this to her next time we meet! Thanks twitter one can always find something good out of a bad situation eh 👌

In [ ]:
```
print('Most frequent emoji and example text:')
emoji_all_data.sort_values(by='freq', ascending=False)[['word', 'freq', 'example_text']].reset_i
```

```
Most frequent emoji and example text:
```

Out[ ]:

	word	freq	example_text
0	😂	174	i don't wanna suck any beef curtain flaps 😂
1	🤣	38	Aw, what's wrong nigger? You don't like your sheboon exposed for the savage she is? 🤣
2	🤔	37	Why does she have to be white? Do blackcels hate black females or something ? 🤔
3	😁	22	He sure took her for a ride. 😁
4	😊	19	My mom does 😊
5	😄	17	Lol sounds like me. I don't normally play the lottery but one yr my mom bought us all each 5 tickets for Christmas. I got nothing until my last ticket and it was a $5 prize 😊 😄 😄
6	ᴜs	16	Pray AlwaysusɪL [USER] Or we'll rape your women and children? Migrant Urges Germans, Austrians To Give Refugees "Their Homes and Money" | Zero Hedge [URL] ...
7	👍	16	👍 YES she needs to and she won't shy away form it , more power to her , i like her spunk !! 🌺 💐 🤗 😘 ❤️
8	🙄	15	O come on there's no way any men are attracted to her shes a pig 🙄
9	✌	14	Will be mentioning this to her next time we meet! Thanks twitter one can always find something good out of a bad situation eh ✌

In [ ]:
```
print("Most frequent emoji in sexist texts and example text:")
emoji_all_data.sort_values(by='freq_sexist', ascending=False)[['word', 'freq_sexist', 'example_t
```

```
Most frequent emoji in sexist texts and example text:
```

Out[ ]:

	word	freq_sexist	example_text
0	😂	46	i don't wanna suck any beef curtain flaps 😂
1	🤣	14	Aw, what's wrong nigger? You don't like your sheboon exposed for the savage she is? 🤣
2	🤔	5	Why does she have to be white? Do blackcels hate black females or something ? 🤔
3	😁	5	He sure took her for a ride. 😁
4	♥	5	[USER] I am in love with her coat, such a beautiful colour - fun & modern cut, whilst staying classically elegant ♥
5	🙄	5	O come on there's no way any men are attracted to her shes a pig 🙄
6	🤡	4	Cardi b aint shit she should be in jail smh clown lookin ass bitch 🤡
7	😆	3	layin pipe lmfao, 😆 😆 😆 that pussy looking, milk toast mother fucker coudln't lay pipe if his name was Roto Rooter
8	🖕	3	"for unknown reasons" Lol I solved this one, the reason is because she was WHITE. Ok, another white targeted based on race, nothing to see here. Now get back on twitter and search for people telling the truth on islam 🖕
9	😀	3	[USER] well, as there's no #finance tag.. I would leave it open.. if not, I'd pick #lifestyle...> Money makes the world go round, so? 😀 Btw: we prefer #Brzz instead of BruXeLles 😋

In [ ]:
```
print("Most frequent emoji in not sexist texts and example text:")
emoji_all_data.sort_values(by='freq_not_sexist', ascending=False)[['word', 'freq_not_sexist', 'e
```

```
Most frequent emoji in not sexist texts and example text:
```

Out[ ]:

	word	freq_not_sexist	example_text
0	😂	128	i don't wanna suck any beef curtain flaps 😂
1	🤔	32	Why does she have to be white? Do blackcels hate black females or something ? 🤔
2	🤣	24	Aw, what's wrong nigger? You don't like your sheboon exposed for the savage she is? 🤣
3	😊	19	My mom does 😊
4	😁	17	He sure took her for a ride. 😁
5	ᴜs	16	Pray AlwaysusɪL [USER] Or we'll rape your women and children? Migrant Urges Germans, Austrians To Give Refugees "Their Homes and Money" | Zero Hedge [URL] ...
6	😄	15	Lol sounds like me. I don't normally play the lottery but one yr my mom bought us all each 5 tickets for Christmas. I got nothing until my last ticket and it was a $5 prize 😄😄😄
7	👍	15	👍 YES she needs to and she won't shy away form it , more power to her , i like her spunk !! 🌺💐🤗😘❤️
8	👌	14	Will be mentioning this to her next time we meet! Thanks twitter one can always find something good out of a bad situation eh 👌
9	😡	11	I despise the woman who wrote this article bashing Ivanka Trump. Please read this and send her a message via Twitter telling her how you hate it too. [URL] Amanda Carpenter [URL] 😨😈😡

Save emoji dataframe to csv file

In [ ]:
```
emoji_all_data.to_csv('emoji_all_data.csv', index=False)
```

CountVectorizer and `chi2` score

CountVectorizer

In [ ]:
```
from sklearn.feature_extraction.text import CountVectorizer

vectorizer = CountVectorizer(
    ngram_range=(1, 1), # trigram
    analyzer='word', # features made of words
    stop_words=list(stop_words_punct),
    lowercase=False,
    tokenizer=tokenize,
)
X = vectorizer.fit_transform(edos['text'])
vectorizer.get_feature_names_out()
```

```
c:\Users\Minh Ha\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\feature_extract
ion\text.py:528: UserWarning: The parameter 'token_pattern' will not be used since 'tokenizer' is
not None'
  warnings.warn(
c:\Users\Minh Ha\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\feature_extract
ion\text.py:409: UserWarning: Your stop_words may be inconsistent with your preprocessing. Tokeniz
ing the stop words generated tokens ['could', 'might', 'must', 'need', 'shall', 'would'] not in st
op_words.
  warnings.warn(
```

Out[ ]:
```
array(['##if', '#cw2', '(516)', ..., '🕵\u200d♀', '🕵\u200d♂', '🧠'],
      dtype=object)
```

In [ ]:
```
X
```

Out[ ]:
```
<20000x25155 sparse matrix of type '<class 'numpy.int64'>'
        with 235423 stored elements in Compressed Sparse Row format>
```

`chi2` score

In [ ]:
```
from sklearn.feature_selection import chi2

chi2_scores = chi2(X, np.array(edos['label_sexist']))
```

```
features = pd.DataFrame(columns=['word', 'chi2_score'])
features['word'] = vectorizer.get_feature_names_out()
features['chi2_score'] = chi2_scores[0]
features
```

Out[ ]:

	word	chi2_score
0	##if	0.320481
1	#cw2	0.320481
2	(516)	0.320481
3	(8	3.120313
4	/8	0.320481
...	...	...
25150	🪶	0.320481
25151	🦊	0.320481
25152	🦹	0.640961
25153	🦹‍♂️	0.640961
25154	🧠	0.640961

25155 rows × 2 columns

In [ ]:
```
features.shape, words.shape
```

Out[ ]:
```
((25155, 2), (24902, 5))
```

Merge 2 dataframes

In [ ]:
```
# words.drop(columns=['chi2_scores'], inplace=True)
words = words.merge(features, on='word', how='outer')
words
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score
0	pur	1.0	1.0	0.0	False	3.120313
1	dismemberment	1.0	1.0	0.0	False	3.120313
2	betabucks	1.0	1.0	0.0	False	3.120313
3	proverb	1.0	1.0	0.0	False	3.120313
4	braying	1.0	1.0	0.0	False	3.120313
...	...	...	...	...	...	...
25150	96	NaN	NaN	NaN	NaN	0.134079
25151	97	NaN	NaN	NaN	NaN	1.281923
25152	98	NaN	NaN	NaN	NaN	0.640961
25153	99	NaN	NaN	NaN	NaN	0.211401
25154	9966	NaN	NaN	NaN	NaN	0.320481

25155 rows × 6 columns

In [ ]:
```
words[words.isnull().any(axis=1)]
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score
24902	0	NaN	NaN	NaN	NaN	6.229023
24903	00	NaN	NaN	NaN	NaN	0.640961
24904	000	NaN	NaN	NaN	NaN	1.281923
24905	00001	NaN	NaN	NaN	NaN	0.320481
24906	007	NaN	NaN	NaN	NaN	0.001160
...	...	...	...	...	...	...
25150	96	NaN	NaN	NaN	NaN	0.134079
25151	97	NaN	NaN	NaN	NaN	1.281923
25152	98	NaN	NaN	NaN	NaN	0.640961
25153	99	NaN	NaN	NaN	NaN	0.211401
25154	9966	NaN	NaN	NaN	NaN	0.320481

253 rows × 6 columns

In [ ]:
```
words.dropna(inplace=True)
```

In [ ]:
```
words.sort_values(by='chi2_score', ascending=False).reset_index(drop=True).head(20)
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score
0	bitch	591.0	577.0	14.0	False	1730.540692
1	women	4334.0	1877.0	2457.0	False	854.725669
2	pussy	250.0	224.0	26.0	False	580.533909
3	whore	207.0	197.0	10.0	False	566.126961
4	cunt	196.0	187.0	9.0	False	539.664231
5	bitches	118.0	115.0	3.0	False	343.890048
6	men	1464.0	658.0	806.0	False	340.493873
7	slut	123.0	109.0	14.0	False	277.099631
8	whores	79.0	75.0	4.0	False	214.644166
9	thots	58.0	57.0	1.0	False	172.831343
10	url	3414.0	507.0	2907.0	False	164.805184
11	cunts	55.0	52.0	3.0	False	147.785656
12	sluts	50.0	43.0	7.0	False	103.663251
13	feminists	118.0	75.0	43.0	False	99.104493
14	hag	40.0	35.0	5.0	False	87.009890
15	hoe	29.0	28.0	1.0	False	82.436068
16	attention	131.0	76.0	55.0	False	81.163227
17	pussies	27.0	26.0	1.0	False	76.209339
18	thot	27.0	26.0	1.0	False	76.209339
19	twat	21.0	21.0	0.0	False	65.526576

Word length

In [ ]:
```
words['len'] = words['word'].apply(lambda x: len(x))
words.sort_values(by='len', ascending=False).reset_index(drop=True).head(20)
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score	len
0	oooooooooooooooooooool	1.0	0.0	1.0	False	0.320481	24
1	raaaaaavvvvvvinnnnnggggg	1.0	0.0	1.0	False	0.320481	24
2	hahaahahhhhahahahhhaa	1.0	0.0	1.0	False	0.320481	21
3	hahahahahahahahahaha	2.0	2.0	0.0	False	6.240626	20
4	mischaracterization	1.0	1.0	0.0	False	3.120313	19
5	alkjtlkjafdlkdaflkj	1.0	0.0	1.0	False	0.320481	19
6	oversimplification	1.0	0.0	1.0	False	0.320481	18
7	sssssssssshadilay	1.0	1.0	0.0	False	3.120313	18
8	feeeeeeeeeeelings	1.0	1.0	0.0	False	3.120313	18
9	disproportionately	1.0	0.0	1.0	False	0.320481	18
10	unfollowtrump4prez	1.0	0.0	1.0	False	0.320481	18
11	indistinguishable	2.0	1.0	1.0	False	0.720397	17
12	institutionalized	1.0	0.0	1.0	False	0.320481	17
13	opportunistically	1.0	1.0	0.0	False	3.120313	17
14	reeeeeeeeeeeeeee	1.0	0.0	1.0	False	0.320481	17
15	characterizations	1.0	0.0	1.0	False	0.320481	17
16	disproportionate	1.0	1.0	0.0	False	3.120313	16
17	unapologetically	3.0	0.0	3.0	False	0.961442	16
18	responsibilities	6.0	4.0	2.0	False	5.867822	16
19	characterization	1.0	0.0	1.0	False	0.320481	16

In [ ]:
```
words['len'].describe()
```

Out[ ]:
```
count    24902.000000
mean         6.930287
std          2.470459
min          1.000000
25%          5.000000
50%          7.000000
75%          9.000000
max         24.000000
Name: len, dtype: float64
```

Correlation between word length, frequency and `chi2` score

In [ ]:
```
words[['freq', 'freq_sexist', 'freq_not_sexist', 'chi2_score', 'len']].corr()
```

Out[ ]:

	freq	freq_sexist	freq_not_sexist	chi2_score	len
freq	1.000000	0.933274	0.987631	0.323695	-0.094555
freq_sexist	0.933274	1.000000	0.865414	0.530709	-0.079310
freq_not_sexist	0.987631	0.865414	1.000000	0.219888	-0.097286
chi2_score	0.323695	0.530709	0.219888	1.000000	-0.021536
len	-0.094555	-0.079310	-0.097286	-0.021536	1.000000

Words not in English dictionary

Select words not in English dictionary

In [ ]:
```
words['found'] = words['word'].apply(lambda x: x in english_words)
words[(words['found'] == False) & (words['is_emoji'] == False)].reset_index(drop=True)
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score	len	found
0	betabucks	1.0	1.0	0.0	False	3.120313	9	False
1	creampied	1.0	1.0	0.0	False	3.120313	9	False
2	muthafuck	1.0	1.0	0.0	False	3.120313	9	False
3	mostt	1.0	1.0	0.0	False	3.120313	5	False
4	ininity	1.0	1.0	0.0	False	3.120313	7	False
...	...	...	...	...	...	...	...	...
2559	wife's	37.0	7.0	30.0	False	0.576431	6	False
2560	cucks	46.0	15.0	31.0	False	1.740269	5	False
2561	woman's	61.0	18.0	43.0	False	0.910659	7	False
2562	women's	120.0	45.0	75.0	False	11.427815	7	False
2563	gabfam	118.0	15.0	103.0	False	8.576693	6	False

2564 rows × 8 columns

In [ ]:

```
for word in words[(words['found'] == False) & (words['is_emoji'] == False)]['word']:
    # if word not contains any alphabetic character, delete it
    if not any(c.isalpha() for c in word):
        words.drop(words[words['word'] == word].index, inplace=True)
        continue
    # if word ends with "'s" and the word without "'s" is in english words, delete it
    if word.endswith("'s") and word[:-2] in english_words:
        words.drop(words[words['word'] == word].index, inplace=True)
        continue
words[(words['found'] == False) & (words['is_emoji'] == False)].reset_index(drop=True)
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	is_emoji	chi2_score	len	found
0	betabucks	1.0	1.0	0.0	False	3.120313	9	False
1	creampied	1.0	1.0	0.0	False	3.120313	9	False
2	muthafuck	1.0	1.0	0.0	False	3.120313	9	False
3	mostt	1.0	1.0	0.0	False	3.120313	5	False
4	ininity	1.0	1.0	0.0	False	3.120313	7	False
...	...	...	...	...	...	...	...	...
1953	ausfam	25.0	4.0	21.0	False	0.930279	6	False
1954	libtards	25.0	3.0	22.0	False	2.047818	8	False
1955	:d	28.0	0.0	28.0	False	8.973458	2	False
1956	cucks	46.0	15.0	31.0	False	1.740269	5	False
1957	gabfam	118.0	15.0	103.0	False	8.576693	6	False

1958 rows × 8 columns

In [ ]:

```
not_found_words = words[(words['found'] == False) & (words['is_emoji'] == False)][['word', 'freq
not_found_words
```

Out[ ]:

	word	freq	freq_sexist	freq_not_sexist	chi2_score
0	betabucks	1.0	1.0	0.0	3.120313
1	creampied	1.0	1.0	0.0	3.120313
2	muthafuck	1.0	1.0	0.0	3.120313
3	mostt	1.0	1.0	0.0	3.120313
4	ininity	1.0	1.0	0.0	3.120313
...	...	...	...	...	...
1953	ausfam	25.0	4.0	21.0	0.930279
1954	libtards	25.0	3.0	22.0	2.047818
1955	:d	28.0	0.0	28.0	8.973458
1956	cucks	46.0	15.0	31.0	1.740269
1957	gabfam	118.0	15.0	103.0	8.576693

1958 rows × 5 columns

Get 1 example text containing words not in English dictionary and get all texts' id containing words not in English dictionary

In [ ]:
```
not_found_words['text_ids'] = not_found_words['word'].apply(lambda x: get_text_ids(x))
not_found_words['example_text'] = not_found_words['text_ids'].apply(lambda x: edos.loc[x[0]]['te
not_found_words[['word', 'freq', 'chi2_score', 'example_text']].reset_index(drop=True)
```

Out[ ]:

	word	freq	chi2_score	example_text
0	betabucks	1.0	3.120313	aww you could have pumped and dumped her. at least you took the 2nd best option, anything but betabucks
1	creampied	1.0	3.120313	Yeah, my wife has 7 kids by 9 different men, got creampied by 50, spitroasted by 12 pairs, and is in an open marriage with me, but she comes home to me every night. So in the end, who wins?
2	muthafuck	1.0	3.120313	.....im wiggapriveledge yo git ti fuck oota here yo niggapriveledge muthafuck ya on ma turf ya all pay me ho.
3	mostt	1.0	3.120313	In my experience women don't recommend guys to their friends. If she doesn't want him then mostt likely other women don't
4	ininity	1.0	3.120313	trousers to ininity and beyond, people post it if they think it haven't been posted before, while it is annoying, i do still see a point of re-posting this kind of post, so every new red pilled man can see how annoying/toxic female nature is
...	...	...	...	...
1953	ausfam	25.0	0.930279	Schoolgirl, 15, has her jaw broken in three places during vicious brawl that spilled onto the road and saw students assault parents [URL] #AusFam #AusPol #ausfam #auspol #Ausfam #Auspol #Australia
1954	libtards	25.0	2.047818	#EmpressMichelle just needs to pack her shit, #stfu and move to Venezuela. Thank you to all the #Libtards who gave us these two pieces of shit [URL]
1955	:d	28.0	8.973458	TL:DR unclear covered her in shit and now she is calling the police...
1956	cucks	46.0	1.740269	AITA is full of cucks who downvote anything where a man is in the right against a woman.
1957	gabfam	118.0	8.576693	Remember when the German lady was kicked from behind down the stairs? Well here's the scum that did it [URL] #MEGA #SpeakFreely #GabFam

1958 rows × 4 columns

In [ ]:
```
not_found_words.to_csv('not_found_words.csv', index=False)
```