Dawood Sarfraz

Duplicate Questions using RandomForestClassifier and XGBoostClassifier with Basic Feature Engineering ¶

Dataset Description

The ground truth is the set of labels that have been supplied by human experts. The ground truth labels are inherently subjective, as the true meaning of sentences can never be known with certainty. Human labeling is also a 'noisy' process, and reasonable people will disagree. As a result, the ground truth labels on this dataset should be taken to be 'informed' but not 100% accurate, and may include incorrect labeling. We believe the labels, on the whole, to represent a reasonable consensus, but this may often not be true on a case by case basis for individual items in the dataset.

Please note: All of the questions in the training set are genuine examples from Quora.

Data fields

*** id -** the id of a training set question pair
*** qid1, qid2 -** - unique ids of each question (only available in train.csv)
*** question1, question2 -** - the full text of each question
*** is_duplicate -** the target variable, set to 1 if question1 and question2 have essentially the same meaning, and 0 otherwise.

With some Basic Feature Engineering

Q1 total words -> No. of words in Question 1

Q2 total words -> No. of words in Question 2

Q1 length -> Character length in Question 1

Q2 length -> Character length in Question 2

Words common in both questions -> Unique words in both like I'm Dawood. My name is DAwood. Here Dawood is Common

Total Words in questions. -> Mean (words of Q1 + words of Q2)

Shared words -> Question1 & Question2 (common words / Total words) mean how much words are same in both questions

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
df = pd.read_csv("train.csv")
```

In [3]:

```
df.shape
```

Out[3]:

```
(404290, 6)
```

In [4]:

```
df.head(5)
```

Out[4]:

	id	qid1	qid2	question1	question2	is_duplicate
0	0	1	2	What is the step by step guide to invest in sh...	What is the step by step guide to invest in sh...	0
1	1	3	4	What is the story of Kohinoor (Koh-i-Noor) Dia...	What would happen if the Indian government sto...	0
2	2	5	6	How can I increase the speed of my internet co...	How can Internet speed be increased by hacking...	0
3	3	7	8	Why am I mentally very lonely? How can I solve...	Find the remainder when [math]23^{24}[/math] i...	0
4	4	9	10	Which one dissolve in water quikly sugar, salt...	Which fish would survive in salt water?	0

In [5]:

```
df.tail(5)
```

Out[5]:

	id	qid1	qid2	question1	question2	is_duplicate
404285	404285	433578	379845	How many keywords are there in the Racket prog...	How many keywords are there in PERL Programmin...	0
404286	404286	18840	155606	Do you believe there is life after death?	Is it true that there is life after death?	1
404287	404287	537928	537929	What is one coin?	What's this coin?	0
404288	404288	537930	537931	What is the approx annual cost of living while...	I am having little hairfall problem but I want...	0
404289	404289	537932	537933	What is like to have sex with cousin?	What is it like to have sex with your cousin?	0

In [6]:

```
df.sample(5)
```

Out[6]:

	id	qid1	qid2	question1	question2	is_duplicate
378207	378207	509589	509590	My ex was physically and emotionally abusive a...	Will one with abusive tendencies change over t...	0
135150	135150	215887	215888	Why dont the native americans get their own st...	Why is there no Native American country?	0
187621	187621	285917	198666	What is an informal economy? What are the adva...	What are the advantages and disadvantages of a...	1
245898	245898	189674	358836	You are being banished to a deserted island. E...	How would you answer the question, "If everyon...	0
182727	182727	279596	279597	Are all backgrounds websites the same?	Is it advisable to have a website and app that...	0

In [7]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 404290 entries, 0 to 404289
Data columns (total 6 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   id            404290 non-null  int64 
 1   qid1          404290 non-null  int64 
 2   qid2          404290 non-null  int64 
 3   question1     404289 non-null  object
 4   question2     404288 non-null  object
 5   is_duplicate  404290 non-null  int64 
dtypes: int64(4), object(2)
memory usage: 18.5+ MB
```

In [8]:

```
df.isnull().sum()
```

Out[8]:

```
id              0
qid1            0
qid2            0
question1       1
question2       2
is_duplicate    0
dtype: int64
```

In [9]:

```
df.duplicated().sum()
```

Out[9]:

```
0
```

In [10]:

```
print(df["is_duplicate"].value_counts())
print((df["is_duplicate"].value_counts()/df["is_duplicate"].count())*100)
```

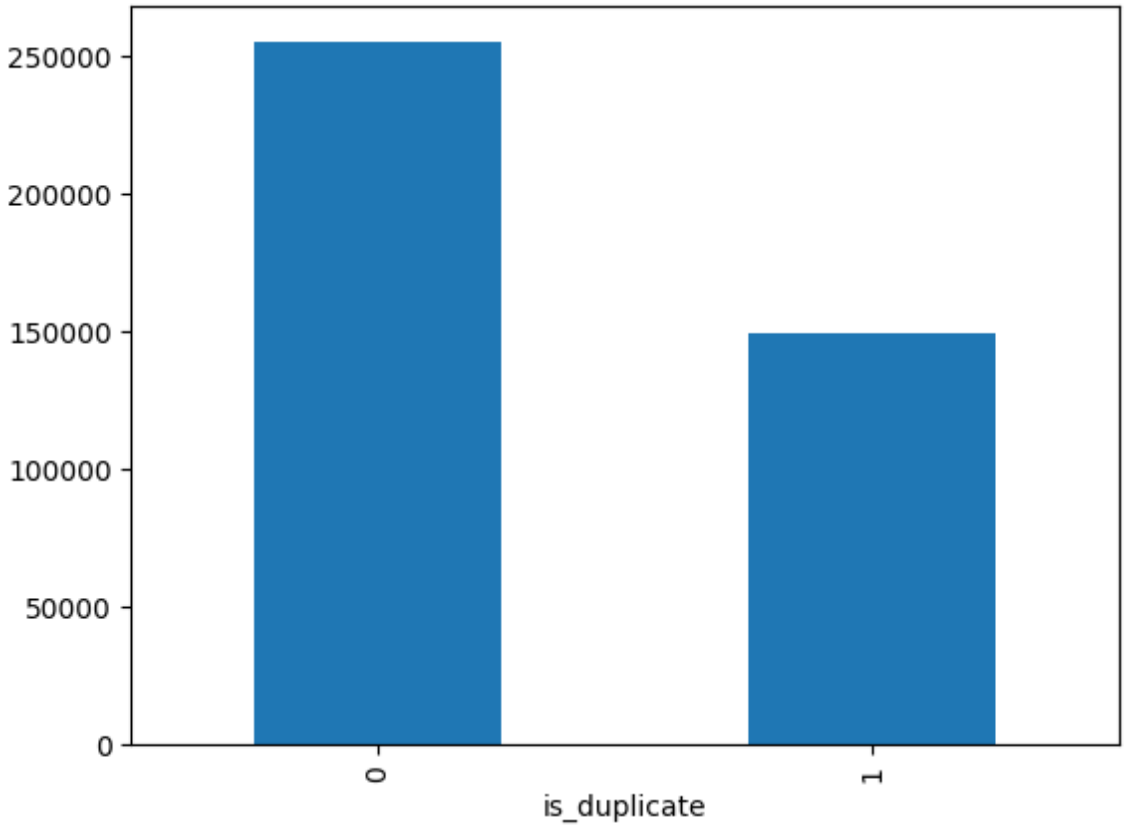
```
is_duplicate
0    255027
1    149263
Name: count, dtype: int64
is_duplicate
0    63.080215
1    36.919785
Name: count, dtype: float64
```

In [11]:

```
df["is_duplicate"].value_counts().plot(kind="bar")
```

Out[11]:

```
<Axes: xlabel='is_duplicate'>
```

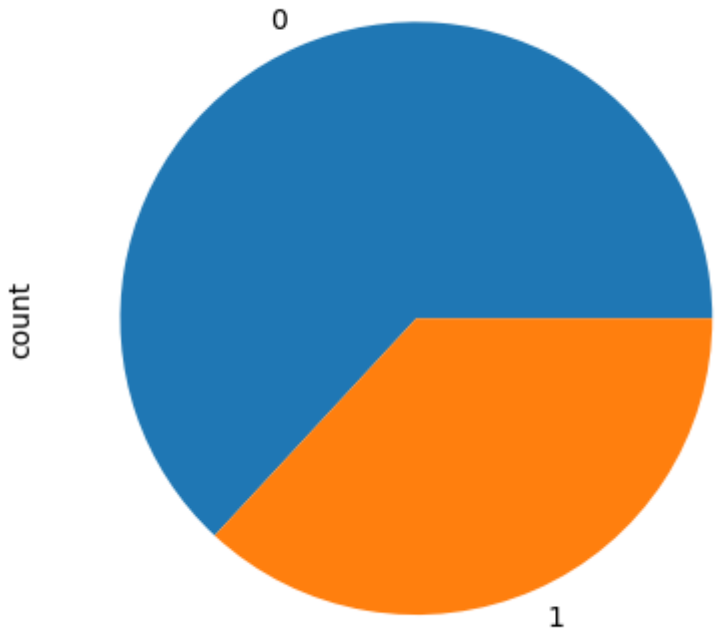


In [12]:

```
df["is_duplicate"].value_counts().plot(kind="pie")
```

Out[12]:

```
<Axes: ylabel='count'>
```



In [13]:

```
qid = pd.Series(df["qid1"].tolist() + df["qid2"].tolist())
print("Number of Unique questions",np.unique(qid).shape[0])
```

```
Number of Unique questions 537933
```

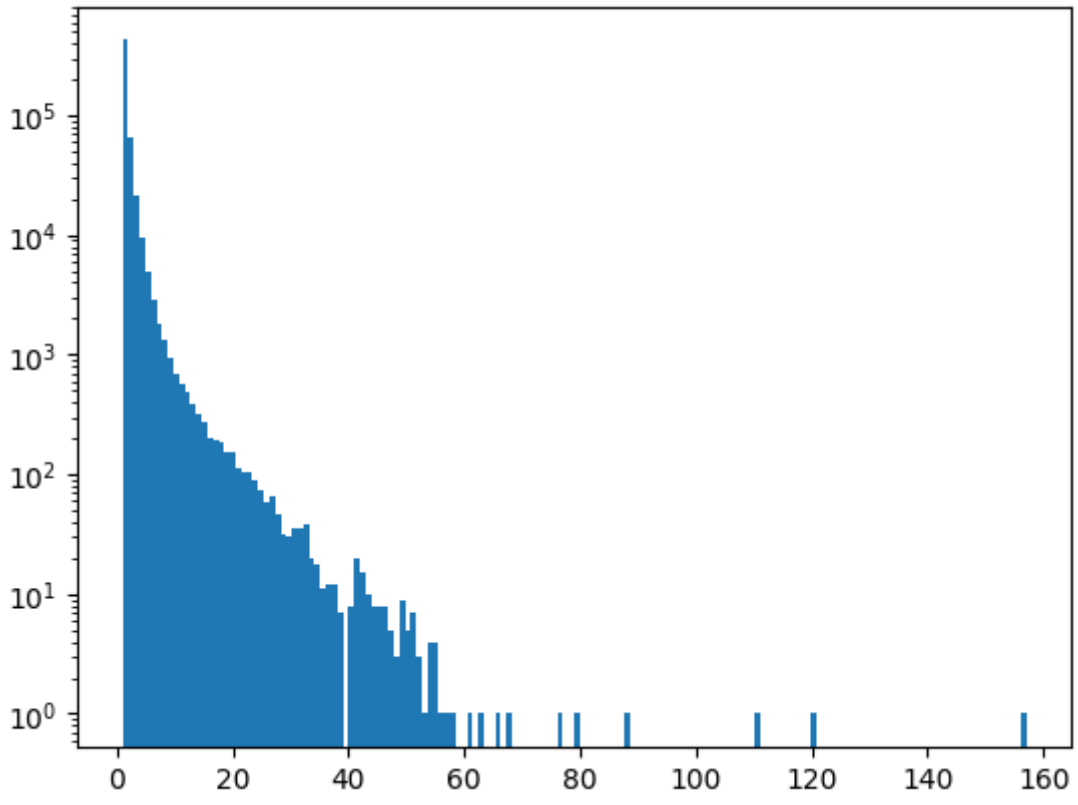
In [14]:

```
x = qid.value_counts()>1
print("Number of questions repeated",x[x].shape[0])
```

```
Number of questions repeated 111780
```

In [15]:

```
plt.hist(qid.value_counts().values,bins=160)
plt.yscale("log")
plt.show()
```



In [16]:

```
new_df = df.sample(20000,random_state=0)
```

In [17]:

```
new_df.shape
```

Out[17]:

```
(20000, 6)
```

In [18]:

```
new_df.isnull().sum()
```

Out[18]:

```
id              0
qid1            0
qid2            0
question1       0
question2       0
is_duplicate    0
dtype: int64
```

In [19]:

```
new_df.duplicated().sum()
```

Out[19]:

```
0
```

In [20]:

```
new_df = new_df.dropna()
```

In [21]:

```
new_df.isnull().sum()
```

Out[21]:

```
id              0
qid1            0
qid2            0
question1       0
question2       0
is_duplicate    0
dtype: int64
```

In [22]:

```
new_df["q1_chars"] = new_df["question1"].str.len()
new_df["q2_chars"] = new_df["question2"].str.len()
```

In [23]:

```
new_df
```

Out[23]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47
139264	139264	221574	221575	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...	0	76	64
240135	240135	227307	351892	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?	1	71	45
3336	3336	6613	6614	Height: How would a 14 year old increase his h...	How should I increase my height?	1	52	32
...	...	...	...	...	...	...	...	...
329087	329087	455711	455712	Why is atheism authoritative in academic denia...	Why are moderators on Quora heavily biased in ...	0	148	64
53257	53257	94172	7614	Is being introverted bad?	How do introverts enjoy life?	0	25	29
33097	33097	60852	60853	How can I win the Amazon India buy box when I ...	How can I win the Amazon India buy box, when I...	1	82	83
84600	84600	143012	143013	Can you remove a turtle from its shell without...	Can turtles go inside their shells when they a...	0	58	60
340422	340422	88252	56903	Why did the Indian government ban Rs. 500 and ...	Why do you think Indian government has demolis...	1	64	75

20000 rows × 8 columns

In [ ]:

```
```

In [24]:

```
new_df["num_of_words_q1"] = new_df["question1"].apply(lambda row: (len(row.split(
new_df["num_of_words_q2"] = new_df["question2"].apply(lambda row: (len(row.split(
```

In [25]:

```
new_df.shape
```

Out[25]:

```
(20000, 10)
```

In [26]:

```
new_df.head(5)
```

Out[26]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	nur
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44	
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47	
139264	139264	221574	221575	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...	0	76	64	
240135	240135	227307	351892	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?	1	71	45	
3336	3336	6613	6614	Height: How would a 14 year old increase his h...	How should I increase my height?	1	52	32	

In [27]:

```
new_df.tail(5)
```

Out[27]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	r
329087	329087	455711	455712	Why is atheism authoritative in academic denia...	Why are moderators on Quora heavily biased in ...	0	148	64	
53257	53257	94172	7614	Is being introverted bad?	How do introverts enjoy life?	0	25	29	
33097	33097	60852	60853	How can I win the Amazon India buy box when I ...	How can I win the Amazon India buy box, when I...	1	82	83	
84600	84600	143012	143013	Can you remove a turtle from its shell without...	Can turtles go inside their shells when they a...	0	58	60	
340422	340422	88252	56903	Why did the Indian government ban Rs. 500 and ...	Why do you think Indian government has demolis...	1	64	75	

In [28]:

```
new_df.sample(5)
```

Out[28]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars
132473	132473	212110	212111	In the Tsar's Winter Palace, how were the hall...	Why does my AC thermostat have no power?	0	138	40
5476	5476	10772	10773	How do I fix Netflix problems on Roku?	How do you fix Netflix Wii problems?	0	38	36
309079	309079	433014	433015	What is the benefit of taking taxable bill?	What is the benefit of taking a membership at ...	0	43	56
132840	132840	212631	120686	What is the best phone to buy below $100?	Which is the best phone to buy under 20000?	0	41	43
361416	361416	469043	491261	What books should entrepreneurs read?	What are the seven must read book for the budd...	0	37	63

In [29]:

```
def common_words_in_questions(row):
    w1 = set(map(lambda word: word.lower().strip(), row["question1"].split(" ")))
    w2 = set(map(lambda word: word.lower().strip(), row["question2"].split(" ")))

    return len(w1 & w2)
```

In [30]:

```
new_df["common_words"] = new_df.apply(common_words_in_questions, axis=1)
```

In [31]:

```
new_df.head()
```

Out[31]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	nur
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44	
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47	
139264	139264	221574	221575	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...	0	76	64	
240135	240135	227307	351892	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?	1	71	45	
3336	3336	6613	6614	Height: How would a 14 year old increase his h...	How should I increase my height?	1	52	32	

In [32]:

```
def total_words_in_question(row):
    w1 = set(map(lambda word: word.lower().strip(), row["question1"].split(" ")))
    w2 = set(map(lambda word: word.lower().strip(), row["question2"].split(" ")))

    return (len(w1) + len(w2))
```

In [33]:

```
a = list((map(lambda word: word.lower().strip(),"I am Final Year Student and I w
```

In [34]:

```
a
```

Out[34]:

```
['i',
 'am',
 'final',
 'year',
 'student',
 'and',
 'i',
 'want',
 'to',
 'go',
 'to',
 'usa']
```

In [35]:

```
a = set(a)
```

In [36]:

```
a # remove duplicates
```

Out[36]:

```
{'am', 'and', 'final', 'go', 'i', 'student', 'to', 'usa', 'want', 'y
ear'}
```

In [ ]:

```

```

In [37]:

```
new_df["total_words_in_questions"] = new_df.apply(total_words_in_question,axis=1)
```

In [38]:

```
new_df.shape
```

Out[38]:

```
(20000, 12)
```

In [39]:

```
new_df.head(5)
```

Out[39]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	nur
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44	
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47	
139264	139264	221574	221575	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...	0	76	64	
240135	240135	227307	351892	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?	1	71	45	
3336	3336	6613	6614	Height: How would a 14 year old increase his h...	How should I increase my height?	1	52	32	

In [40]:

```
new_df.tail()
```

Out[40]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	r
329087	329087	455711	455712	Why is atheism authoritative in academic denia...	Why are moderators on Quora heavily biased in ...	0	148	64	
53257	53257	94172	7614	Is being introverted bad?	How do introverts enjoy life?	0	25	29	
33097	33097	60852	60853	How can I win the Amazon India buy box when I ...	How can I win the Amazon India buy box, when I...	1	82	83	
84600	84600	143012	143013	Can you remove a turtle from its shell without...	Can turtles go inside their shells when they a...	0	58	60	
340422	340422	88252	56903	Why did the Indian government ban Rs. 500 and ...	Why do you think Indian government has demolis...	1	64	75	

In [41]:

```
new_df.sample(5)
```

Out[41]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_cl
117306	117306	190891	190892	What is the difference J2EE and J2SE?	What is the difference between JavaScript and ...	0	37	
274372	274372	77615	16463	How do I improve my conversation skills with a...	How do I improve my communication skills in on...	1	53	
152859	152859	240074	240075	What universities does chemical Financial recr...	Which would be a better option DTU pct or USIT...	0	99	
2623	2623	5212	5213	What are some less known facts about Gustav Sc...	How was Gustav Schwarzenegger's relationship w...	0	59	
340643	340643	468406	468407	Why is the corner of my eye soring?	What are some treatments for soreness in my co...	0	35	

In [42]:

```
new_df["shared_words_in_questions"] = (new_df["common_words"] / new_df["total_wor
```

In [43]:

```
new_df.shape
```

Out[43]:

```
(20000, 13)
```

In [44]:

```
new_df.head(5)
```

Out[44]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	nur
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44	
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47	
139264	139264	221574	221575	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...	0	76	64	
240135	240135	227307	351892	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?	1	71	45	
3336	3336	6613	6614	Height: How would a 14 year old increase his h...	How should I increase my height?	1	52	32	

In [45]:

```
new_df.tail(5)
```

Out[45]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	r
329087	329087	455711	455712	Why is atheism authoritative in academic denia...	Why are moderators on Quora heavily biased in ...	0	148	64	
53257	53257	94172	7614	Is being introverted bad?	How do introverts enjoy life?	0	25	29	
33097	33097	60852	60853	How can I win the Amazon India buy box when I ...	How can I win the Amazon India buy box, when I...	1	82	83	
84600	84600	143012	143013	Can you remove a turtle from its shell without...	Can turtles go inside their shells when they a...	0	58	60	
340422	340422	88252	56903	Why did the Indian government ban Rs. 500 and ...	Why do you think Indian government has demolis...	1	64	75	

In [46]:

```
new_df.sample(5)
```

Out[46]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	nur
178067	178067	129216	88971	What are some effective methods to grow taller...	How can I grow taller at 18?	1	56	28	
367646	367646	345622	108957	What are the best songs for learning American ...	What are the best English songs?	0	54	32	
188824	188824	52837	51586	What's the purpose of a human life?	What is the purpose of life? Why are we here?	1	35	45	
202056	202056	54926	304224	Which coaching is best for iit?	Which is the best coaching institute for IITs?	1	31	46	
74535	74535	127718	127719	Do electric radiators emit radiation (at harmf...	If my phone is in flight mode, will it emit ra...	0	145	54	

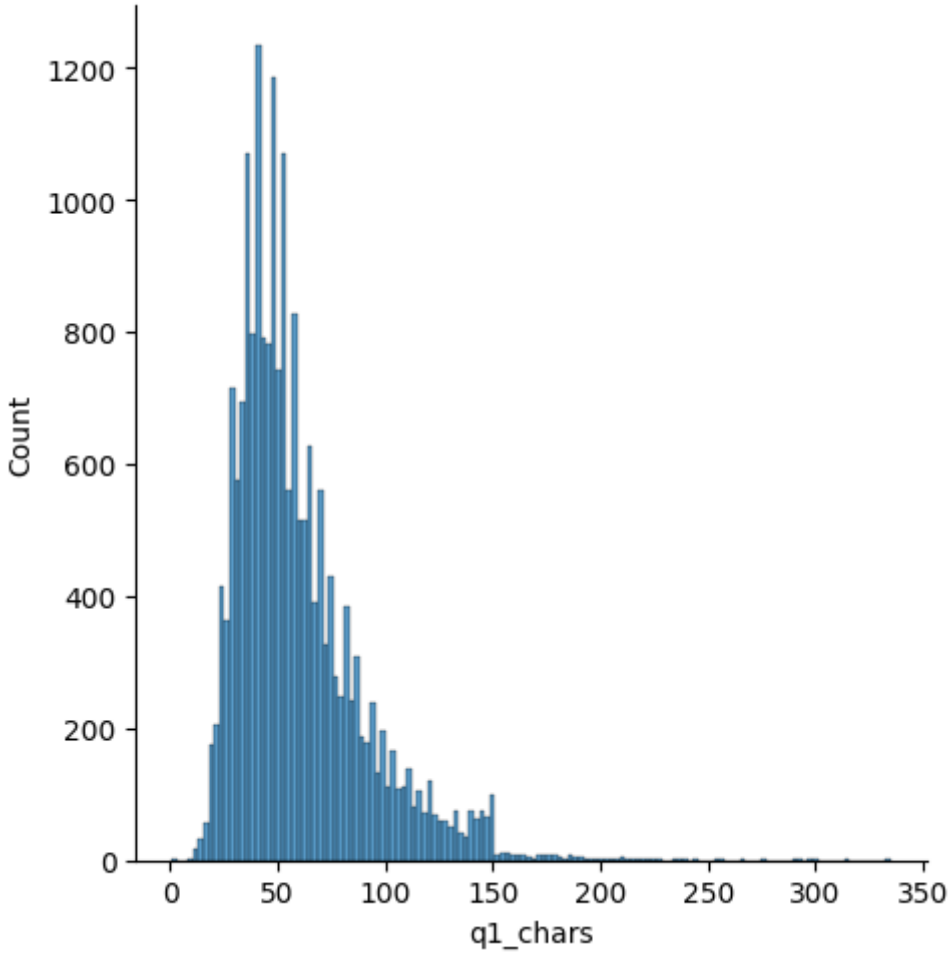
Feature Anaysis of Question 1

In [47]:

```
sns.displot(new_df["q1_chars"])
```

Out[47]:

```
<seaborn.axisgrid.FacetGrid at 0x7ff1ef401810>
```



In [48]:

```
print("Minimum No, of Characters", new_df["q1_chars"].min())
```

```
Minimum No, of Characters 1
```

In [49]:

```
print("Maximum No. of Characters", new_df["q1_chars"].max())
```

```
Maximum No. of Characters 335
```

In [50]:

```
print("Average No. of Characters", int(new_df["q1_chars"].mean()))
```

```
Average No. of Characters 59
```

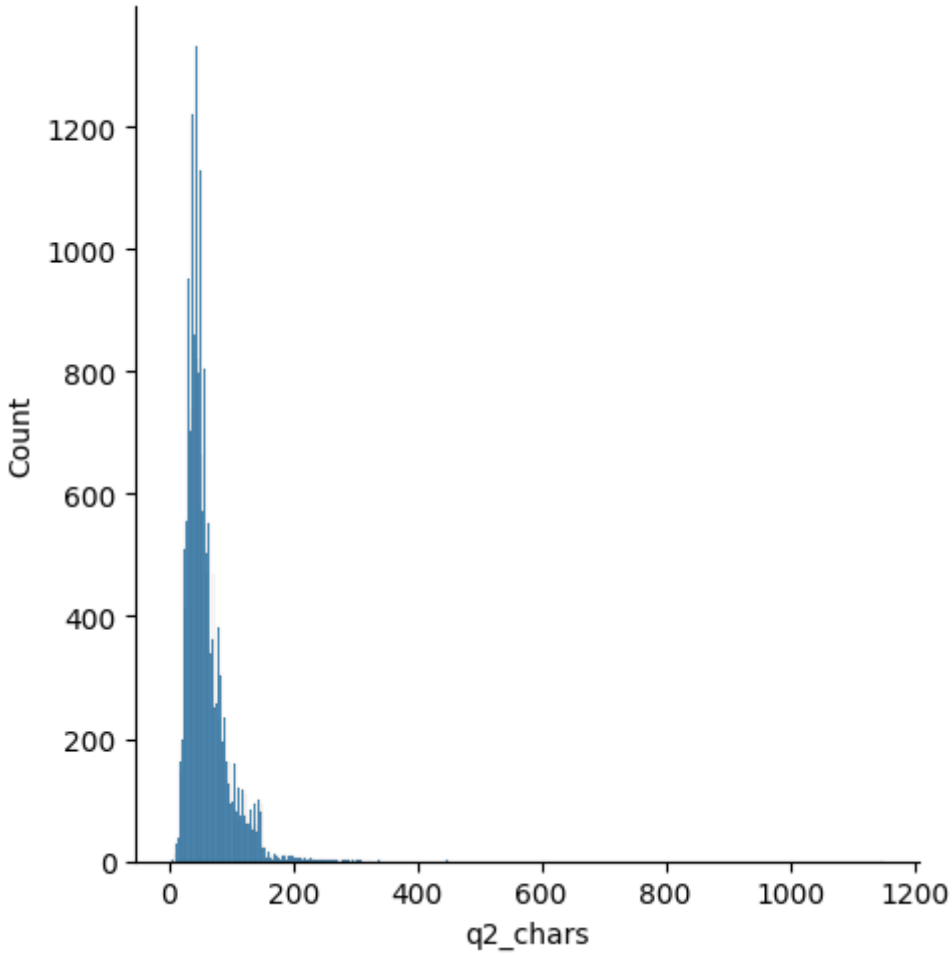
Features Anaysis of Question 2

In [51]:

```
sns.displot(new_df["q2_chars"])
```

Out[51]:

```
<seaborn.axisgrid.FacetGrid at 0x7ff1fc36efb0>
```



In [52]:

```
print("Minimum No. of Characters", new_df["q2_chars"].min())
```

```
Minimum No. of Characters 5
```

In [53]:

```
print("Maximum No. of Characters", new_df["q2_chars"].max())
```

```
Maximum No. of Characters 1151
```

In [54]:

```
print("Average No. of Characters", int(new_df["q2_chars"].mean()))
```

```
Average No. of Characters 60
```

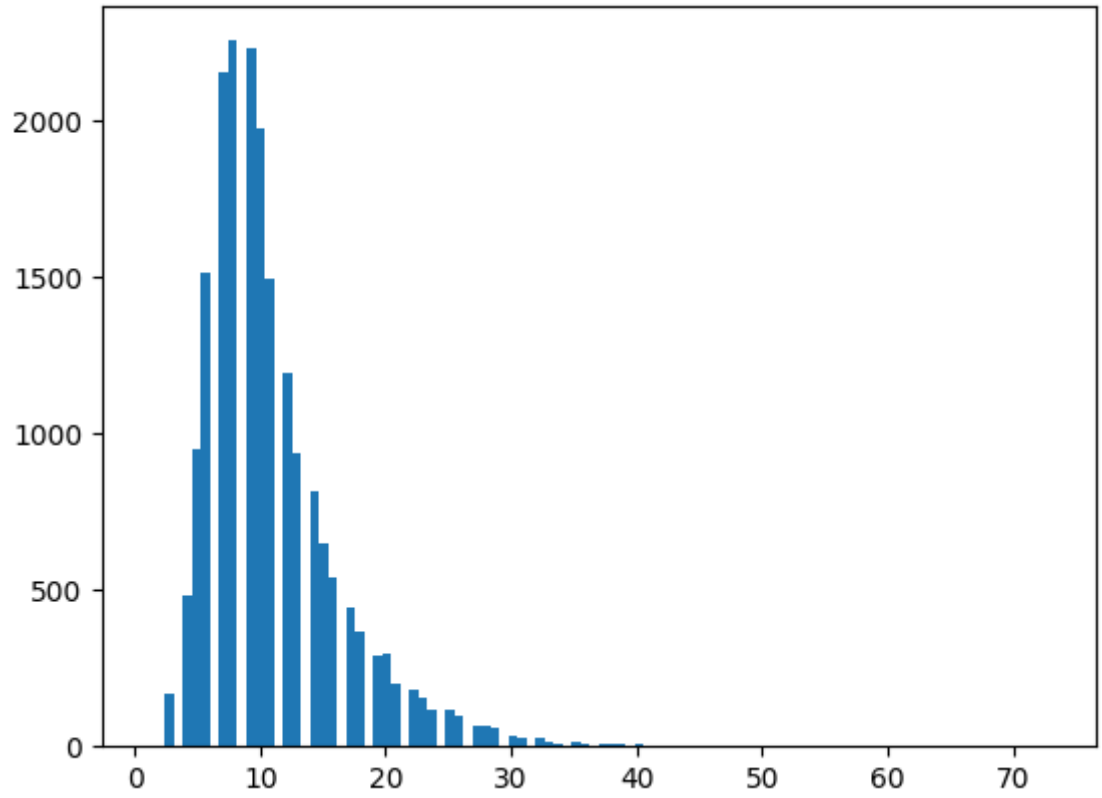
Features Anaysis of Question 1 Words

In [55]:

```
plt.hist(new_df["num_of_words_q1"],bins=100)
```

Out[55]:

```
(array([2.000e+00, 3.000e+00, 1.680e+02, 0.000e+00, 4.830e+02, 9.480
e+02,
        1.515e+03, 0.000e+00, 2.156e+03, 2.254e+03, 0.000e+00, 2.230
e+03,
        1.975e+03, 1.496e+03, 0.000e+00, 1.192e+03, 9.360e+02, 0.000
e+00,
        8.170e+02, 6.490e+02, 5.400e+02, 0.000e+00, 4.410e+02, 3.680
e+02,
        0.000e+00, 2.880e+02, 2.970e+02, 1.990e+02, 0.000e+00, 1.810
e+02,
        1.560e+02, 1.170e+02, 0.000e+00, 1.150e+02, 1.000e+02, 0.000
e+00,
        6.800e+01, 6.600e+01, 6.000e+01, 0.000e+00, 3.400e+01, 2.900
e+01,
        0.000e+00, 2.700e+01, 1.400e+01, 1.000e+01, 0.000e+00, 1.400
e+01,
        6.000e+00, 0.000e+00, 5.000e+00, 5.000e+00, 5.000e+00, 0.000
e+00,
        6.000e+00, 3.000e+00, 4.000e+00, 0.000e+00, 4.000e+00, 2.000
e+00,
        0.000e+00, 0.000e+00, 3.000e+00, 1.000e+00, 0.000e+00, 1.000
e+00,
        1.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000
e+00,
        1.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000
e+00,
        0.000e+00, 0.000e+00, 1.000e+00, 0.000e+00, 0.000e+00, 2.000
e+00,
        0.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000
e+00,
        0.000e+00, 0.000e+00, 0.000e+00, 1.000e+00, 0.000e+00, 0.000
e+00,
        0.000e+00, 0.000e+00, 0.000e+00, 1.000e+00]),
 array([ 1.  ,  1.72,  2.44,  3.16,  3.88,  4.6 ,  5.32,  6.04,  6.7
6,
         7.48,  8.2 ,  8.92,  9.64, 10.36, 11.08, 11.8 , 12.52, 13.2
4,
        13.96, 14.68, 15.4 , 16.12, 16.84, 17.56, 18.28, 19.  , 19.7
2,
        20.44, 21.16, 21.88, 22.6 , 23.32, 24.04, 24.76, 25.48, 26.2
,
        26.92, 27.64, 28.36, 29.08, 29.8 , 30.52, 31.24, 31.96, 32.6
8,
        33.4 , 34.12, 34.84, 35.56, 36.28, 37.  , 37.72, 38.44, 39.1
6,
        39.88, 40.6 , 41.32, 42.04, 42.76, 43.48, 44.2 , 44.92, 45.6
4,
        46.36, 47.08, 47.8 , 48.52, 49.24, 49.96, 50.68, 51.4 , 52.1
2,
        52.84, 53.56, 54.28, 55.  , 55.72, 56.44, 57.16, 57.88, 58.6
,
        59.32, 60.04, 60.76, 61.48, 62.2 , 62.92, 63.64, 64.36, 65.0
8,
        65.8 , 66.52, 67.24, 67.96, 68.68, 69.4 , 70.12, 70.84, 71.5
6,
        72.28, 73.  ]),
 <BarContainer object of 100 artists>)
```




```
print("Minimum No. of Characters", new_df["num_of_words_q1"].min())
```

```
Minimum No. of Characters 1
```

In [57]:

```
print("Maximum No. of Characters", new_df["num_of_words_q1"].max())
```

```
Maximum No. of Characters 73
```

In [58]:

```
print("Average No. of Characters", int(new_df["num_of_words_q1"].mean()))
```

```
Average No. of Characters 10
```

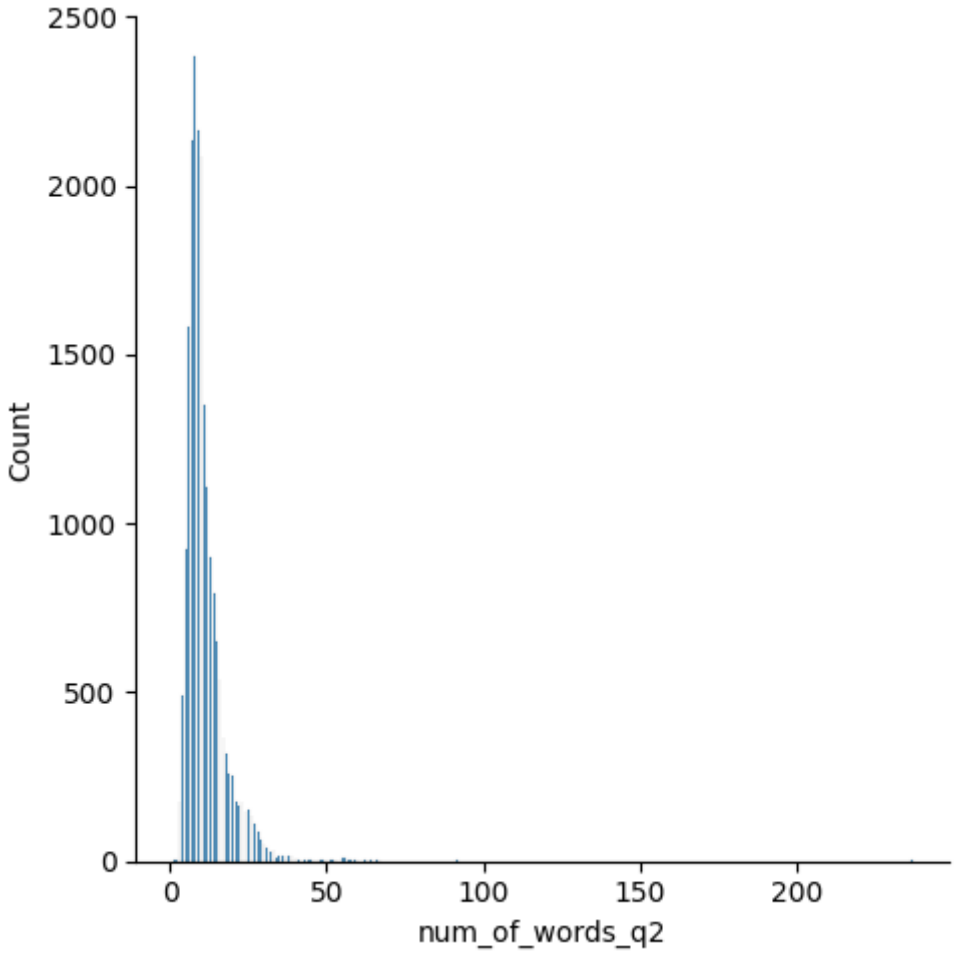
Features Anaysis of Question 2 Words

In [59]:

```
sns.displot(new_df["num_of_words_q2"])
```

Out[59]:

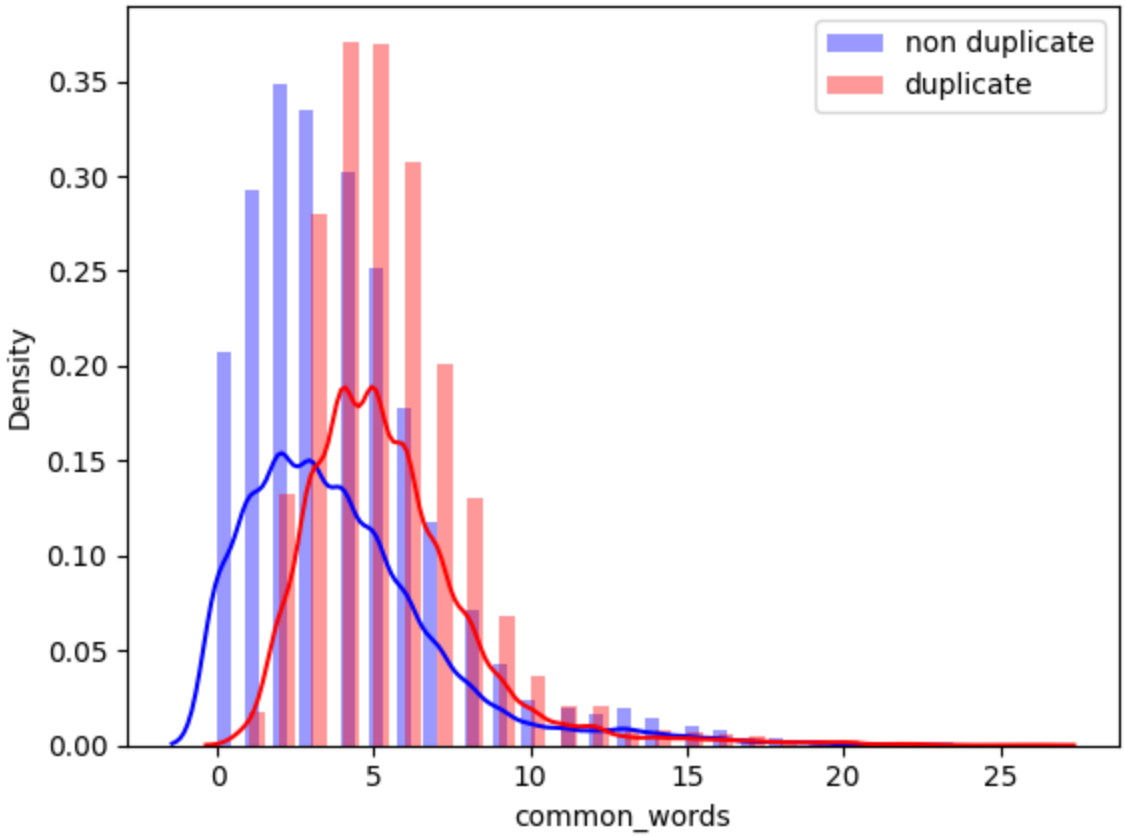
```
<seaborn.axisgrid.FacetGrid at 0x7ff1ef02bb20>
```



In [60]:

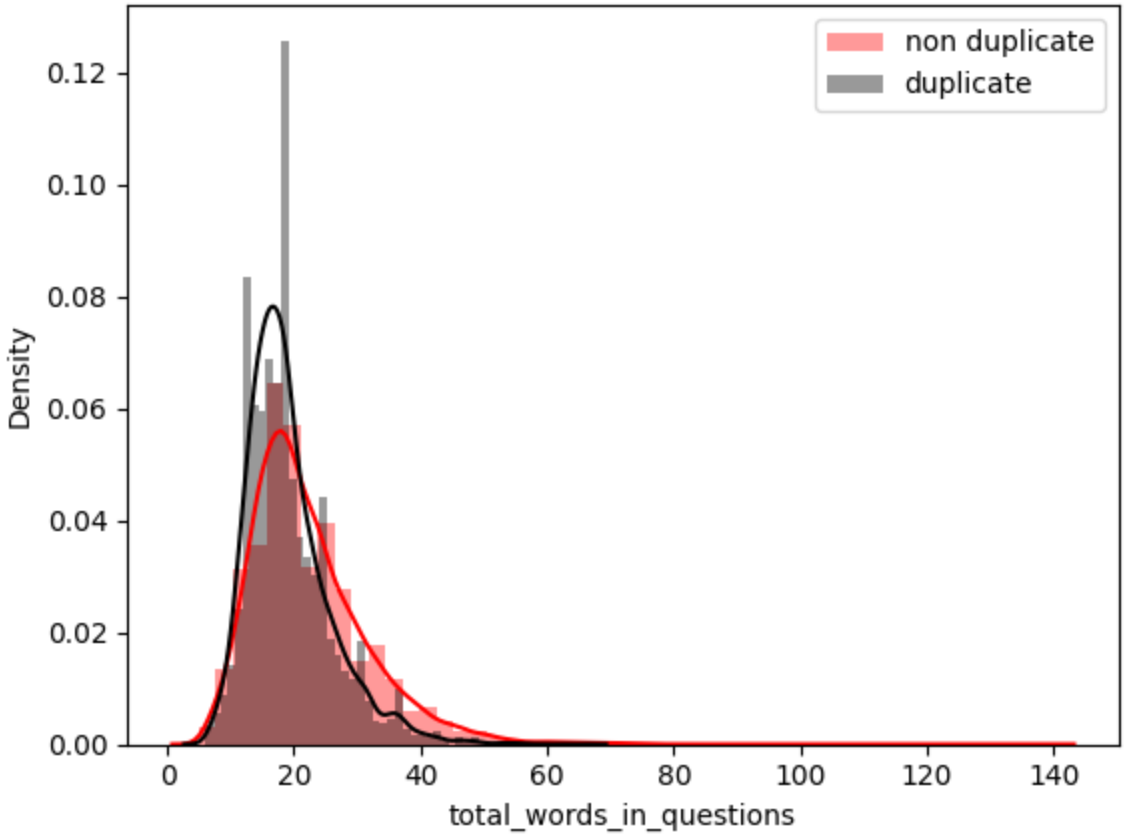
```
# common words
sns.distplot(new_df[new_df['is_duplicate'] == 0]['common_words'],label='non dupli
sns.distplot(new_df[new_df['is_duplicate'] == 1]['common_words'],label='duplicate

plt.legend()
plt.show()
```



In [61]:

```
# total words
sns.distplot(new_df[new_df['is_duplicate'] == 0]['total_words_in_questions'],labe
sns.distplot(new_df[new_df['is_duplicate'] == 1]['total_words_in_questions'],labe
plt.legend()
plt.show()
```



In [62]:

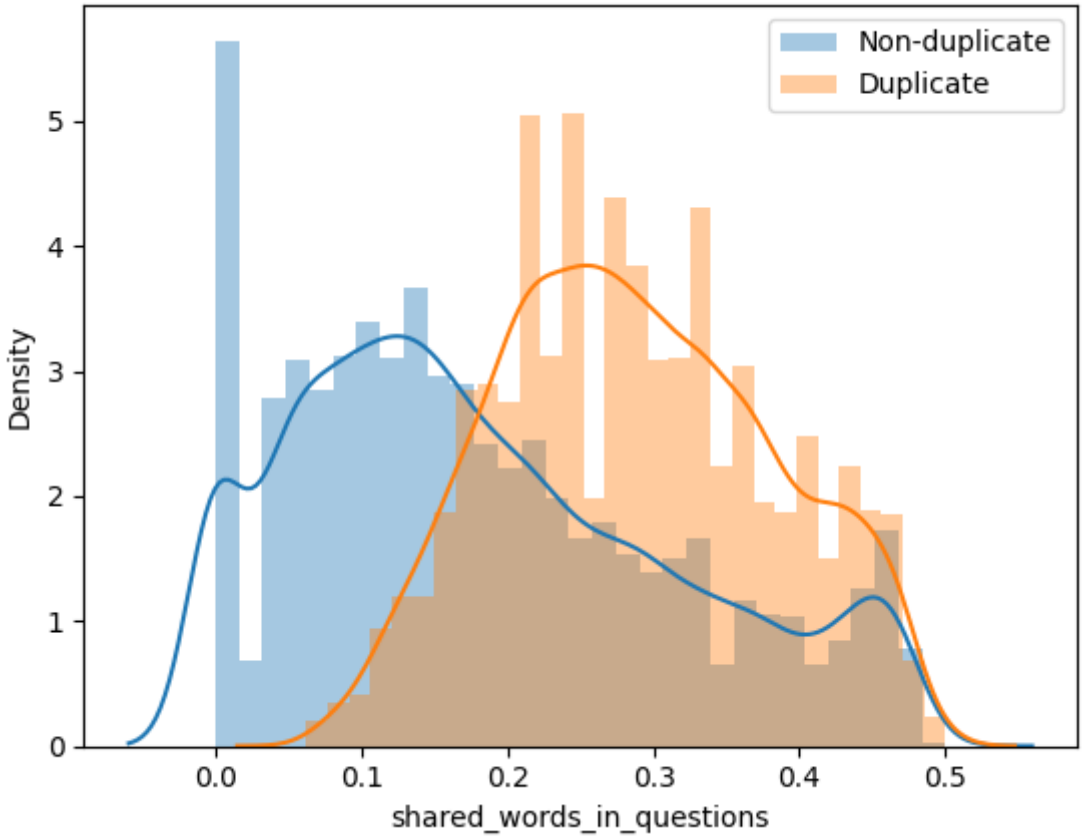
```
new_df.head(2)
```

Out[62]:

	id	qid1	qid2	question1	question2	is_duplicate	q1_chars	q2_chars	num_
187265	187265	61254	82970	Are we near World War 3?	Is World War 3 closer than it has ever been?	1	24	44	
6557	6557	12839	12840	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?	1	38	47	

In [63]:

```
# word share
sns.distplot(new_df[new_df['is_duplicate'] == 0]["shared_words_in_questions"],lab
sns.distplot(new_df[new_df['is_duplicate'] == 1]['shared_words_in_questions'],lab
plt.legend()
plt.show()
```



In [64]:

```
ques_df = new_df[['question1','question2']]
```

In [65]:

```
ques_df.head(5)
```

Out[65]:

	question1	question2
187265	Are we near World War 3?	Is World War 3 closer than it has ever been?
6557	What are the best Doctor Doom stories?	What are the best comics featuring Doctor Doom?
139264	Why are Newton's rings circular in shape? Why ...	Why is a circular ring pattern obtained in New...
240135	How does Wikipedia ensure content quality / au...	How does Wikipedia keep content quality high?
3336	Height: How would a 14 year old increase his h...	How should I increase my height?

In [66]:

```
final_df = new_df.drop(columns=['id','qid1','qid2','question1','question2'])
print(final_df.shape)
final_df.head()
```

```
(20000, 8)
```

Out[66]:

	is_duplicate	q1_chars	q2_chars	num_of_words_q1	num_of_words_q2	common_wor
187265	1	24	44	6	10	
6557	1	38	47	7	8	
139264	0	76	64	14	11	
240135	1	71	45	10	7	
3336	1	52	32	10	6	

In [67]:

```
from sklearn.feature_extraction.text import CountVectorizer
# merge texts
questions = list(ques_df['question1']) + list(ques_df['question2'])

cv = CountVectorizer(max_features=3000)
q1_arr, q2_arr = np.vsplit(cv.fit_transform(questions).toarray(),2)
```

In [68]:

```
temp_df1 = pd.DataFrame(q1_arr, index= ques_df.index)
temp_df2 = pd.DataFrame(q2_arr, index= ques_df.index)
temp_df = pd.concat([temp_df1, temp_df2], axis=1)
temp_df.shape
```

Out[68]:

```
(20000, 6000)
```

In [69]:

```
final_df = pd.concat([final_df, temp_df], axis=1)
print(final_df.shape)
final_df.head()
```

```
(20000, 6008)
```

Out[69]:

	is_duplicate	q1_chars	q2_chars	num_of_words_q1	num_of_words_q2	common_wor
187265	1	24	44	6	10	
6557	1	38	47	7	8	
139264	0	76	64	14	11	
240135	1	71	45	10	7	
3336	1	52	32	10	6	

5 rows × 6008 columns

In [70]:

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(final_df.iloc[:,1:].values,final
```

In [71]:

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score
rf = RandomForestClassifier()
rf.fit(X_train,y_train)
y_pred = rf.predict(X_test)
accuracy_score(y_test,y_pred)
```

Out[71]:

```
0.7585
```

In [72]:

```
from xgboost import XGBClassifier
xgb = XGBClassifier()
xgb.fit(X_train,y_train)
y_pred = xgb.predict(X_test)
accuracy_score(y_test,y_pred)
```

Out[72]:

```
0.75575
```

In [ ]:

In [ ]:

```
```