In [79]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

In [80]:
```
df = pd.read_csv('spam.csv',encoding = 'ISO-8859-1')
```

In [81]:
```
df.shape
```

Out[81]:
```
(5572, 5)
```

In [82]:
```
df.head()
```

Out[82]:

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
0	ham	Go until jurong point, crazy.. Available only ...	NaN	NaN	NaN
1	ham	Ok lar... Joking wif u oni...	NaN	NaN	NaN
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...	NaN	NaN	NaN
3	ham	U dun say so early hor... U c already then say...	NaN	NaN	NaN
4	ham	Nah I don't think he goes to usf, he lives aro...	NaN	NaN	NaN

In [83]:
```
df.columns
```

Out[83]:
```
Index(['v1', 'v2', 'Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'], dtype='object')
```

In [84]:
```
df.isnull().sum()
```

Out[84]:
```
v1               0
v2               0
Unnamed: 2    5522
Unnamed: 3    5560
Unnamed: 4    5566
dtype: int64
```

In [85]:
```
df.drop(columns=['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],inplace = True)
```

In [86]:
```
df.head()
```

Out[86]:

	v1	v2
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [87]:
```
df.rename(columns = {'v1': 'Target', 'v2': 'Text'},inplace = True)
```

In [88]:
```
df.head()
```

Out[88]:

	Target	Text
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [89]:
```
from sklearn.preprocessing import LabelEncoder
encoder = LabelEncoder()
```

In [90]:
```
df['Target'] = encoder.fit_transform(df['Target'])
df.head()
```

Out[90]:

	Target	Text
0	0	Go until jurong point, crazy.. Available only ...
1	0	Ok lar... Joking wif u oni...
2	1	Free entry in 2 a wkly comp to win FA Cup fina...
3	0	U dun say so early hor... U c already then say...
4	0	Nah I don't think he goes to usf, he lives aro...

In [91]:
```
df.duplicated().sum()
```

Out[91]:
```
403
```

In [92]:
```
df = df.drop_duplicates(keep = 'first')
```

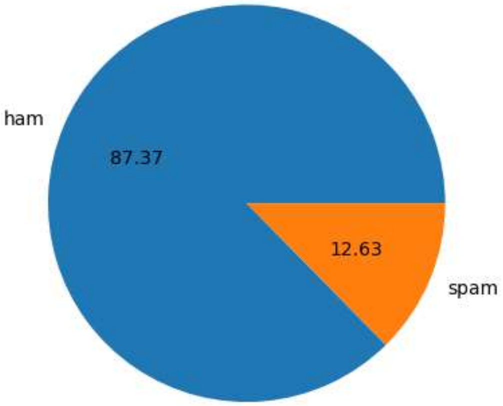
In [93]:
```
df.shape
```

Out[93]:
```
(5169, 2)
```

In [94]:
```
df['Target'].value_counts()
```

Out[94]:
```
0    4516
1     653
Name: Target, dtype: int64
```

In [95]:
```
plt.pie(df['Target'].value_counts(), labels = ['ham','spam'],autopct = '%0.2f')
plt.show()
```



In [96]:
```
pip install nltk
```

```
Requirement already satisfied: nltk in c:\users\red devil\anaconda3.4\lib\site-packages (3.7)
Requirement already satisfied: click in c:\users\red devil\anaconda3.4\lib\site-packages (from nltk) (8.0.4)
Requirement already satisfied: tqdm in c:\users\red devil\anaconda3.4\lib\site-packages (from nltk) (4.64.1)
Requirement already satisfied: regex>=2021.8.3 in c:\users\red devil\anaconda3.4\lib\site-packages (from nltk) (2022.7.9)
Requirement already satisfied: joblib in c:\users\red devil\anaconda3.4\lib\site-packages (from nltk) (1.1.1)
Requirement already satisfied: colorama in c:\users\red devil\anaconda3.4\lib\site-packages (from click->nltk) (0.4.6)
Note: you may need to restart the kernel to use updated packages.
```

In [97]:
```
import nltk
```

In [98]:
```
nltk.download('punkt')
```

```
[nltk_data] Downloading package punkt to C:\Users\Red
[nltk_data]     Devil\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

Out[98]:
```
True
```

In [99]:
```
True
```

Out[99]:
```
True
```

In [100]:

```
df['Num_characters'] = df['Text'].apply(len)
df.head()
```

Out[100]:

	Target	Text	Num_characters
0	0	Go until jurong point, crazy.. Available only ...	111
1	0	Ok lar... Joking wif u oni...	29
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155
3	0	U dun say so early hor... U c already then say...	49
4	0	Nah I don't think he goes to usf, he lives aro...	61

In [101]:

```
df['Num_words'] = df['Text'].apply(lambda x : len(nltk.sent_tokenize(x)))
df.head()
```

Out[101]:

	Target	Text	Num_characters	Num_words
0	0	Go until jurong point, crazy.. Available only ...	111	2
1	0	Ok lar... Joking wif u oni...	29	2
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155	2
3	0	U dun say so early hor... U c already then say...	49	1
4	0	Nah I don't think he goes to usf, he lives aro...	61	1

In [102]:

```
df['Num_sentences'] = df['Text'].apply(lambda x : len(nltk.sent_tokenize(x)))
df.head()
```

Out[102]:

	Target	Text	Num_characters	Num_words	Num_sentences
0	0	Go until jurong point, crazy.. Available only ...	111	2	2
1	0	Ok lar... Joking wif u oni...	29	2	2
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155	2	2
3	0	U dun say so early hor... U c already then say...	49	1	1
4	0	Nah I don't think he goes to usf, he lives aro...	61	1	1

In [103]:

```
df[['Num_characters','Num_words','Num_sentences']].describe()
```

Out[103]:

	Num_characters	Num_words	Num_sentences
count	5169.000000	5169.000000	5169.000000
mean	78.977945	1.947185	1.947185
std	58.236293	1.362406	1.362406
min	2.000000	1.000000	1.000000
25%	36.000000	1.000000	1.000000
50%	60.000000	1.000000	1.000000
75%	117.000000	2.000000	2.000000
max	910.000000	28.000000	28.000000

In [104]:

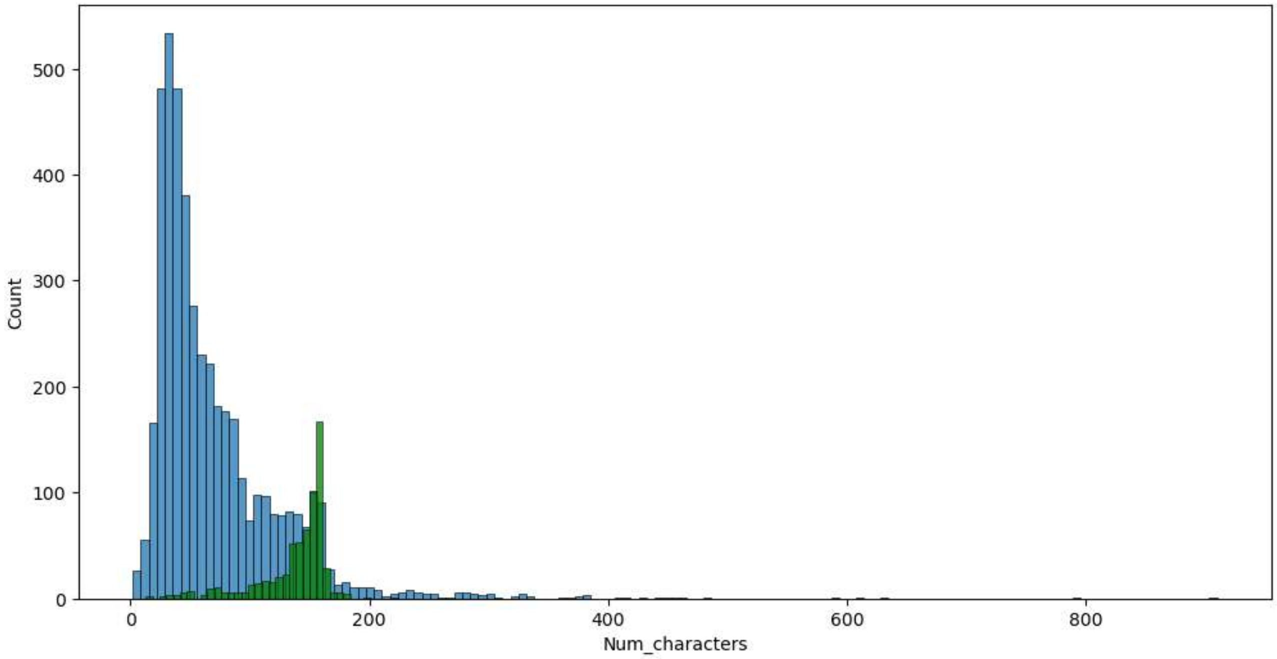
```
df[df['Target']==0][['Num_characters','Num_words','Num_sentences']].describe()
```

Out[104]:

	Num_characters	Num_words	Num_sentences
count	4516.000000	4516.000000	4516.000000
mean	70.459256	1.799601	1.799601
std	56.358207	1.278465	1.278465
min	2.000000	1.000000	1.000000
25%	34.000000	1.000000	1.000000
50%	52.000000	1.000000	1.000000
75%	90.000000	2.000000	2.000000
max	910.000000	28.000000	28.000000

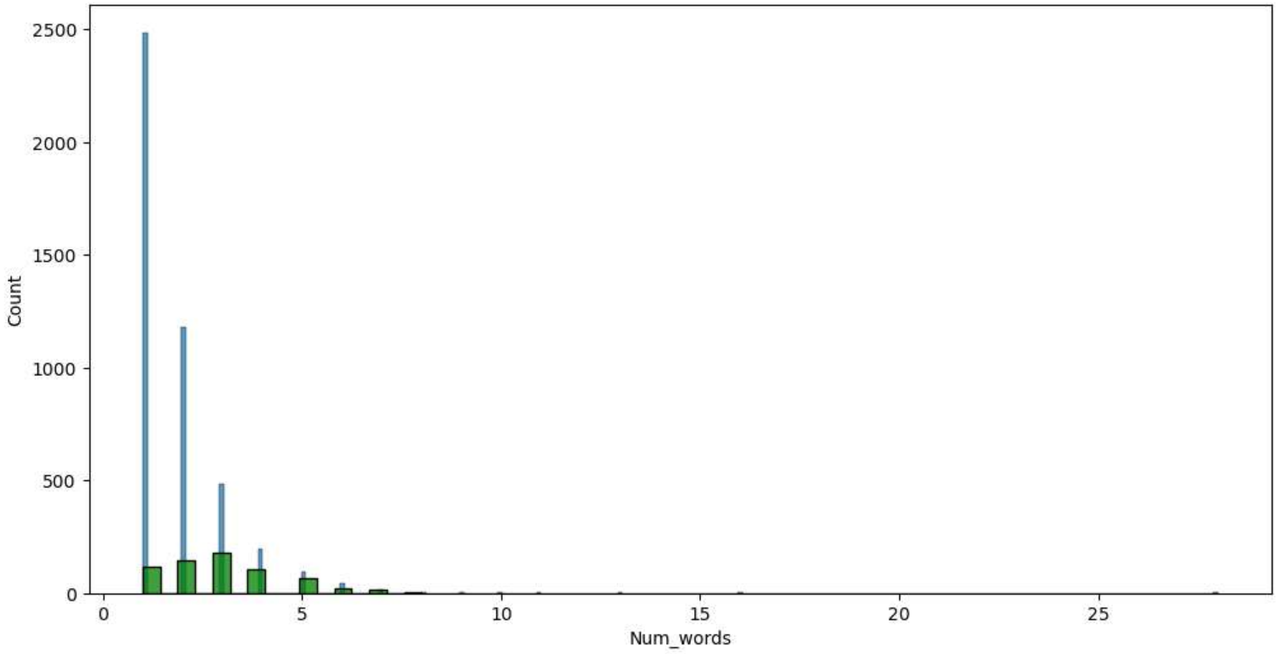
```
In [105]: plt.figure(figsize =(12,6))
          sns.histplot(df[df['Target']==0]['Num_characters'])
          sns.histplot(df[df['Target']==1]['Num_characters'],color = 'green')
```

```
Out[105]: <Axes: xlabel='Num_characters', ylabel='Count'>
```



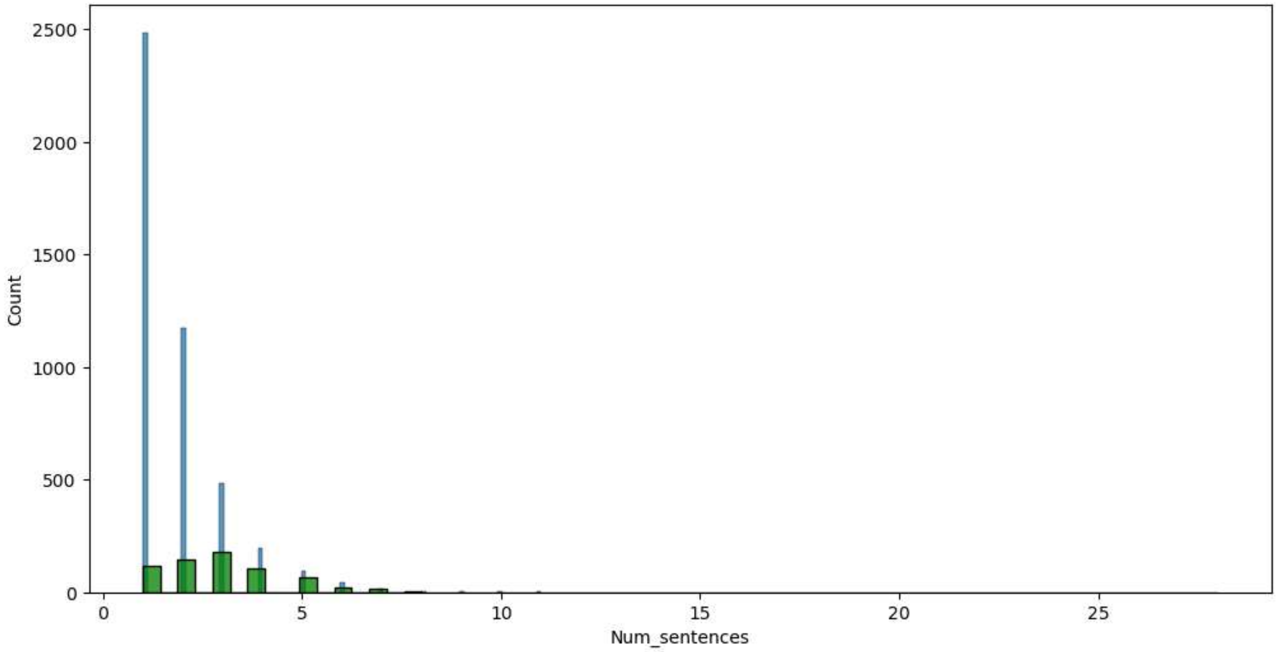
```
In [106]: plt.figure(figsize =(12,6))
          sns.histplot(df[df['Target']==0]['Num_words'])
          sns.histplot(df[df['Target']==1]['Num_words'],color = 'green')
```

```
Out[106]: <Axes: xlabel='Num_words', ylabel='Count'>
```



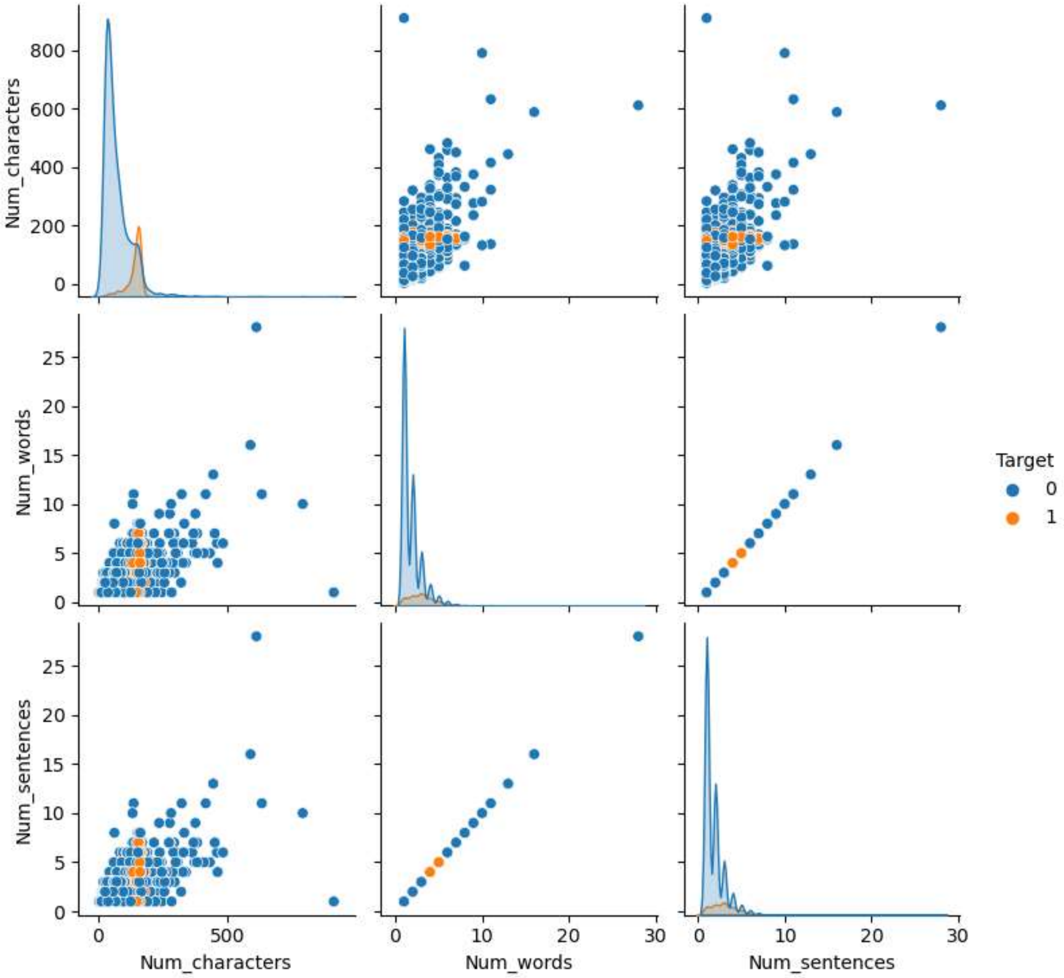
```
In [107]: plt.figure(figsize =(12,6))
          sns.histplot(df[df['Target']==0]['Num_sentences'])
          sns.histplot(df[df['Target']==1]['Num_sentences'],color = 'green')
```

```
Out[107]: <Axes: xlabel='Num_sentences', ylabel='Count'>
```



```
In [108]: sns.pairplot(df,hue = 'Target')
```

```
Out[108]: <seaborn.axisgrid.PairGrid at 0x29258943fd0>
```



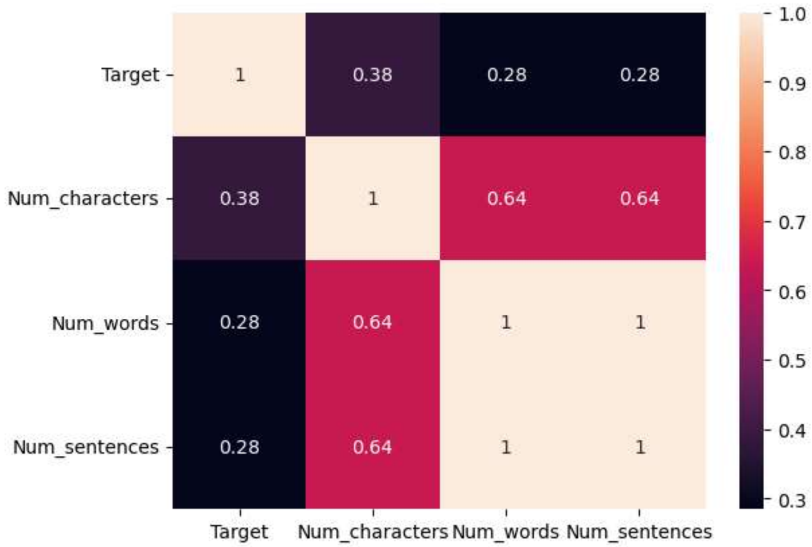
In [109]:

```
sns.heatmap(df.corr(),annot = True)
```

```
C:\Users\Red Devil\AppData\Local\Temp\ipykernel_8656\2221401063.py:1: FutureWarning: The default value of numeric_only in Da
taFrame.corr is deprecated. In a future version, it will default to False. Select only valid columns or specify the value of
numeric_only to silence this warning.
  sns.heatmap(df.corr(),annot = True)
```

Out[109]:

```
<Axes: >
```



In [110]:

```
from nltk.corpus import stopwords
```

In [111]:

```
import string
```

In [112]:

```
from nltk.stem.porter import PorterStemmer
ps = PorterStemmer()
```

In [113]:

```
def transform_text(Text):
    Text = Text.lower()
    Text = nltk.word_tokenize(Text)

    y = []
    for i in Text:
        if i.isalnum():
            y.append(i)
    Text = y[:]
    y.clear()

    for i in Text:
        y.append(ps.stem(i))

    return " ".join(y)
```

In [114]:

```
transform_text("I'm gonna be home soon and i don't want to talk about this stuff anymore tonight, k? I've cried enough today."
```

Out[114]:

```
'i gon na be home soon and i do want to talk about thi stuff anymor tonight k i cri enough today'
```

In [115]:

```
df['Text'][10]
```

Out[115]:

```
"I'm gonna be home soon and i don't want to talk about this stuff anymore tonight, k? I've cried enough today."
```

In [116]:

```
ps.stem('loving')
```

Out[116]:

```
'love'
```

In [117]:

```
df['Transformed_text'] = df['Text'].apply(transform_text)
```

In [118]:
```
df.head()
```

Out[118]:

	Target	Text	Num_characters	Num_words	Num_sentences	Transformed_text
0	0	Go until jurong point, crazy.. Available only ...	111	2	2	go until jurong point crazi avail onli in bugi...
1	0	Ok lar... Joking wif u oni...	29	2	2	ok lar joke wif u oni
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155	2	2	free entri in 2 a wkli comp to win fa cup fina...
3	0	U dun say so early hor... U c already then say...	49	1	1	u dun say so earli hor u c alreadi then say
4	0	Nah I don't think he goes to usf, he lives aro...	61	1	1	nah i do think he goe to usf he live around he...

In [119]:
```
pip install wordcloud
```

```
Requirement already satisfied: wordcloud in c:\users\red devil\anaconda3.4\lib\site-packages (1.9.2)
Requirement already satisfied: matplotlib in c:\users\red devil\anaconda3.4\lib\site-packages (from wordcloud) (3.7.0)
Requirement already satisfied: numpy>=1.6.1 in c:\users\red devil\anaconda3.4\lib\site-packages (from wordcloud) (1.23.5)
Requirement already satisfied: pillow in c:\users\red devil\anaconda3.4\lib\site-packages (from wordcloud) (9.4.0)
Requirement already satisfied: cycler>=0.10 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordcloud)
(0.11.0)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wo
rdcloud) (2.8.2)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordcl
oud) (3.0.9)
Requirement already satisfied: packaging>=20.0 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordclo
ud) (22.0)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordcl
oud) (1.0.5)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordc
loud) (1.4.4)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\red devil\anaconda3.4\lib\site-packages (from matplotlib->wordc
loud) (4.25.0)
Requirement already satisfied: six>=1.5 in c:\users\red devil\anaconda3.4\lib\site-packages (from python-dateutil>=2.7->matp
lotlib->wordcloud) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

In [120]:
```
from wordcloud import WordCloud
wc = WordCloud(width = 500,height = 500,min_font_size = 10,background_color = 'white')
```

In [121]:
```
spam_wc = wc.generate(df[df['Target']==1]['Transformed_text'].str.cat(sep = " "))
```

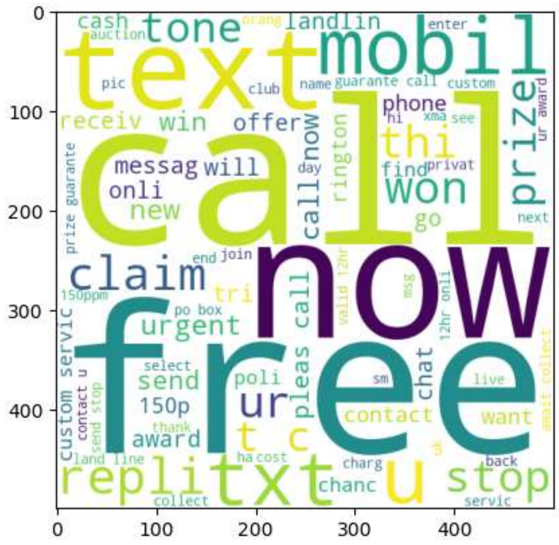
In [122]:
```
plt.figure(figsize = (15,6))
```

Out[122]:
```
<Figure size 1500x600 with 0 Axes>

<Figure size 1500x600 with 0 Axes>
```

In [123]:
```
plt.imshow(spam_wc)
```

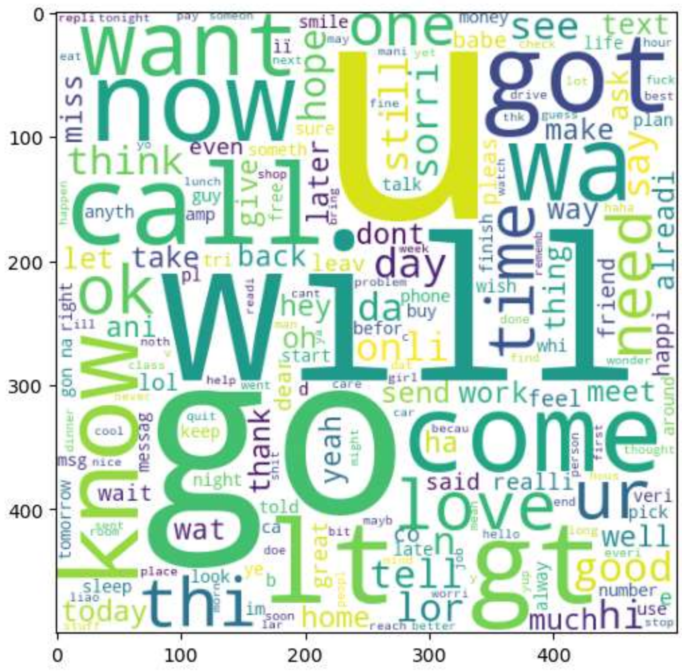
Out[123]:
```
<matplotlib.image.AxesImage at 0x2925a671270>
```



In [124]:
```
ham_wc = wc.generate(df[df['Target'] == 0]['Transformed_text'].str.cat(sep=" "))
```

In [125]:
```
plt.figure(figsize =(15,6))
plt.imshow(ham_wc)
```

Out[125]:
```
<matplotlib.image.AxesImage at 0x2925b9e3be0>
```



In [126]:
```
df.head()
```

Out[126]:

	Target	Text	Num_characters	Num_words	Num_sentences	Transformed_text
0	0	Go until jurong point, crazy.. Available only ...	111	2	2	go until jurong point crazi avail onli in bugi...
1	0	Ok lar... Joking wif u oni...	29	2	2	ok lar joke wif u oni
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155	2	2	free entri in 2 a wkli comp to win fa cup fina...
3	0	U dun say so early hor... U c already then say...	49	1	1	u dun say so earli hor u c alreadi then say
4	0	Nah I don't think he goes to usf, he lives aro...	61	1	1	nah i do think he goe to usf he live around he...

In [127]:
```
# Top words used in spam sms
spam_corpus = []
for msg in df[df['Target'] == 1]['Transformed_text'].tolist():
    for word in msg.split():
        spam_corpus.append(word)
```

In [128]:
```
len(spam_corpus)
```

Out[128]:
```
14475
```

In [129]:
```
ham_corpus = []
for msg in df[df['Target']==0]['Transformed_text'].tolist():
    for word in msg.split():
        ham_corpus.append(word)
```

In [130]:
```
len(ham_corpus)
```

Out[130]:
```
62799
```

In [131]:
```
df.head()
```

Out[131]:

	Target	Text	Num_characters	Num_words	Num_sentences	Transformed_text
0	0	Go until jurong point, crazy.. Available only ...	111	2	2	go until jurong point crazi avail onli in bugi...
1	0	Ok lar... Joking wif u oni...	29	2	2	ok lar joke wif u oni
2	1	Free entry in 2 a wkly comp to win FA Cup fina...	155	2	2	free entri in 2 a wkli comp to win fa cup fina...
3	0	U dun say so early hor... U c already then say...	49	1	1	u dun say so earli hor u c alreadi then say
4	0	Nah I don't think he goes to usf, he lives aro...	61	1	1	nah i do think he goe to usf he live around he...

In [132]:

```
from sklearn.feature_extraction.text import TfidfVectorizer
import nltk
from nltk.corpus import stopwords
from collections import Counter
```

In [133]:

```
vect = TfidfVectorizer(min_df = 1,stop_words = 'english',lowercase = True)
```

In [134]:

```
from sklearn.model_selection import train_test_split
df.loc[df['Target']=='spam','Target']=0
df.loc[df['Target']=='ham','Target']=1
X=df['Text']
y=df['Target']
X_train,X_test,y_train,y_test =  train_test_split(X,y,test_size = 20, random_state = 0 )
X_train_vect = vect.fit_transform(X_train)
X_test_vect = vect.transform(X_test)
```

In [135]:

```
y_train = y_train.astype('int')
y_test = y_test.astype('int')
```

In [136]:

```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(X_train_vect,y_train)
```

Out[136]:

```
▾ LogisticRegression

LogisticRegression()
```

In [137]:

```
from sklearn.metrics import accuracy_score
```

In [138]:

```
pre = model.predict(X_test_vect)
acc = accuracy_score(y_test,pre)
print('Accuracy: ', acc.round(4)*100,"%" )
```

```
Accuracy:  100.0 %
```

In [ ]: