In [52]:
```
import os
os.getcwd()
```

Out[52]:
```
'/home/sapatevaibhav/Documents/ML'
```

In [1]:
```
import pandas as pd
```

In [5]:
```
df = pd.read_csv('SMSSpamCollection', sep='\t', names =['tag','data']);
```

In [6]:
```
df
```

Out[6]:

	tag	data
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...
...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...
5568	ham	Will ü b going to esplanade fr home?
5569	ham	Pity, * was in mood for that. So...any other s...
5570	ham	The guy did some bitching but I acted like i'd...
5571	ham	Rofl. Its true to its name

5572 rows × 2 columns

In [9]:
```
import nltk
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     /home/sapatevaibhav/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
```

Out[9]:
```
True
```

In [15]:
```
from nltk.corpus import stopwords
swords = stopwords.words('english')
from nltk.stem import PorterStemmer
ps = PorterStemmer()
```

In [21]:
```
from sklearn.feature_extraction.text import TfidfVectorizer
from nltk.tokenize import word_tokenize
```

In [22]:

```
def clean_text(sent):
    tokens = word_tokenize(sent)
    clean = [word for word in tokens
            if word.isdigit() or word.isalpha()]
    clean = [ps.stem(word) for word in clean
            if word not in swords]
    return clean
```

In [17]:

```
tfidf = TfidfVectorizer(analyzer = clean_text)
```

In [25]:

```
nltk.download('punkt')
```

```
[nltk_data] Downloading package punkt to
[nltk_data]     /home/sapatevaibhav/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
```

Out[25]:

```
True
```

In [32]:

```
x = df['data']
y = df['tag']
x_new = tfidf.fit_transform(x)
```

In [28]:

```
x.shape
```

Out[28]:

```
(5572,)
```

In [29]:

```
x_new.shape
```

Out[29]:

```
(5572, 6513)
```

In [30]:

```
x_new
```

Out[30]:

```
<5572x6513 sparse matrix of type '<class 'numpy.float64'>'
        with 52578 stored elements in Compressed Sparse Row format>
```

In [31]:

```
y.value_counts()
```

Out[31]:

```
ham     4825
spam     747
Name: tag, dtype: int64
```

In [34]:

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x_new, y , random_state = 0,
```

In [35]:

```
from sklearn.naive_bayes import GaussianNB
```

In [37]:

```
nb = GaussianNB()
```

In [38]:

```
nb.fit(x_train.toarray(), y_train)
```

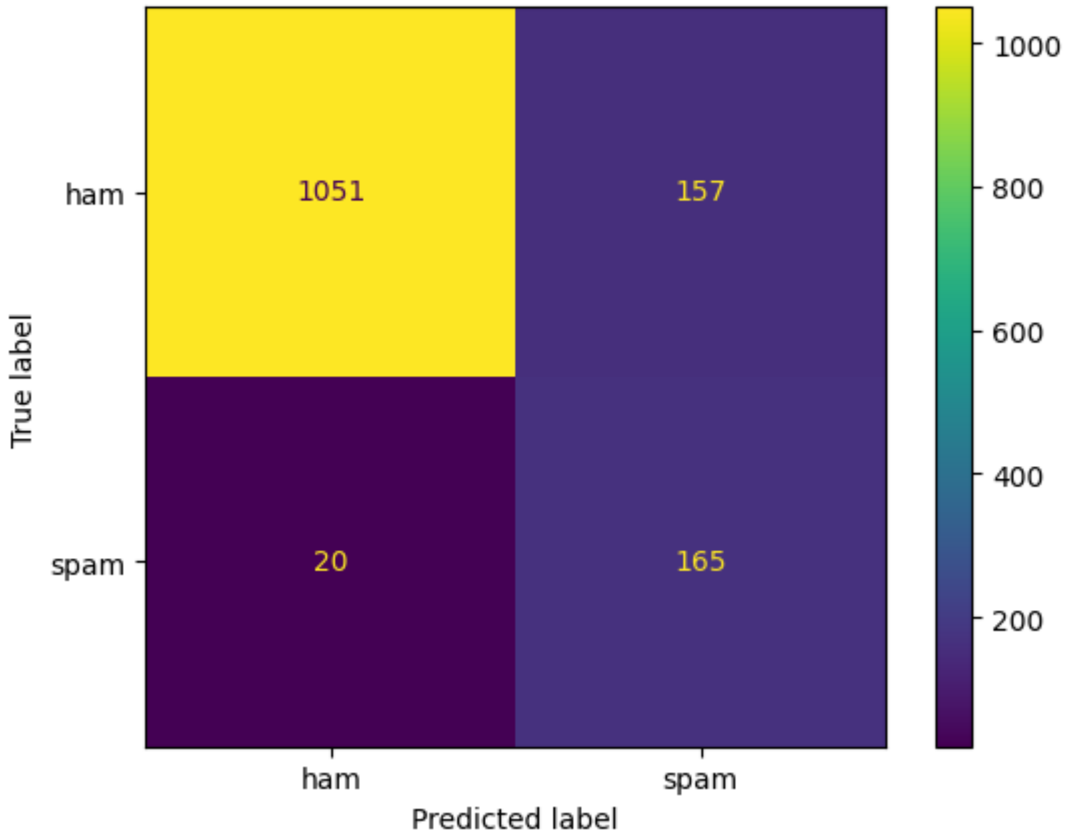
Out[38]:

▾ GaussianNB

GaussianNB()

In [39]:

```
y_pred = nb.predict(x_test.toarray())
from sklearn.metrics import ConfusionMatrixDisplay
ConfusionMatrixDisplay.from_predictions(y_test, y_pred);
```



In [41]:
```
from sklearn.metrics import accuracy_score, classification_report
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

         ham       0.98      0.87      0.92      1208
        spam       0.51      0.89      0.65       185

    accuracy                           0.87      1393
   macro avg       0.75      0.88      0.79      1393
weighted avg       0.92      0.87      0.89      1393
```

In [42]:
```
from sklearn.ensemble import RandomForestClassifier
rf = RandomForestClassifier(random_state = 0)
```

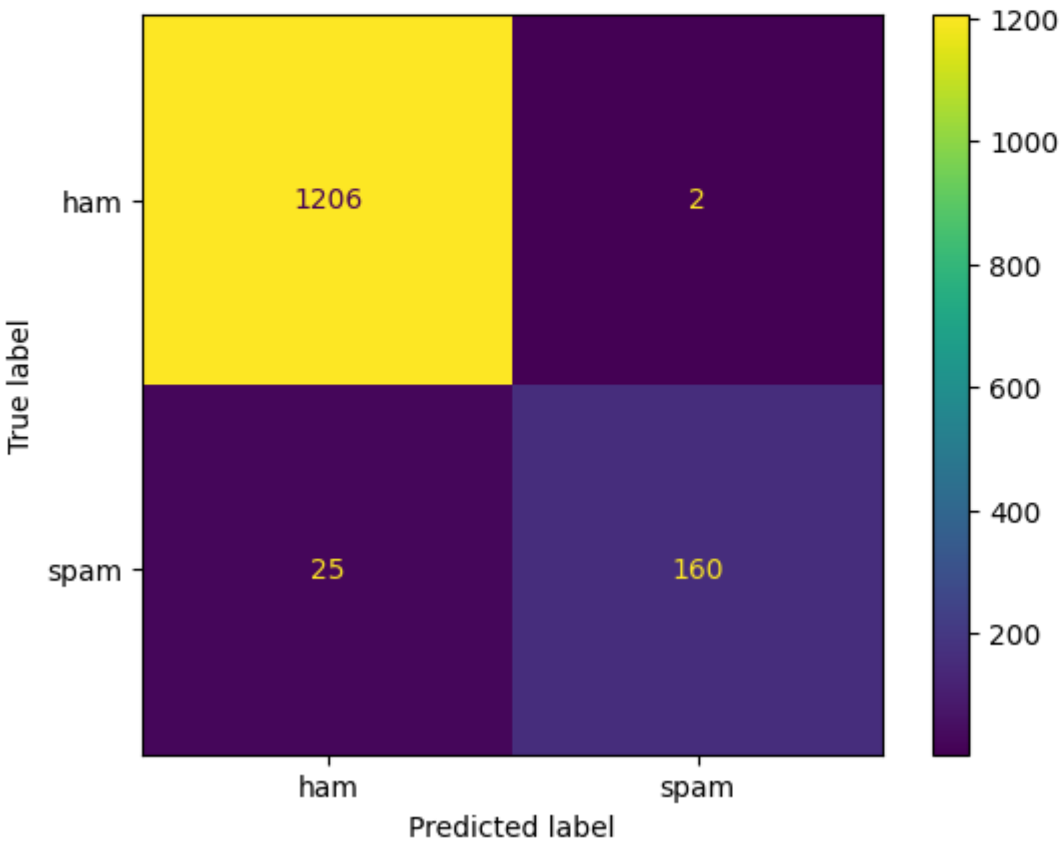
In [43]:
```
rf.fit(x_train, y_train)
```

Out[43]:
```
▾         RandomForestClassifier

RandomForestClassifier(random_state=0)
```

In [44]:
```
y_pred = rf.predict(x_test)
ConfusionMatrixDisplay.from_predictions(y_test, y_pred)
```

Out[44]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7fe716527d6
0>
```



```
In [45]: print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

         ham       0.98      1.00      0.99      1208
        spam       0.99      0.86      0.92       185

    accuracy                           0.98      1393
   macro avg       0.98      0.93      0.96      1393
weighted avg       0.98      0.98      0.98      1393
```

```
In [46]: from sklearn.linear_model import LogisticRegression
log = LogisticRegression()
log.fit(x_train, y_train)
y_pred = log.predict(x_test)
accuracy_score(y_test, y_pred)
```

```
Out[46]: 0.9641062455132807
```

```
In [47]: from sklearn.model_selection import GridSearchCV
params ={
        'criterion': ['gini','entropy'],
        'max_features': ['sqrt','log2'],
        'random_state': [0,1,2,3,4],
        'class_weight': ['balanced', 'balanced_subsample']
}
```

```
In [48]: grid = GridSearchCV(rf, param_grid = params, cv = 5, scoring = 'accuracy')
```

```
In [49]: grid.fit(x_train, y_train)
```

Out[49]:

```
▸ GridSearchCV
▸ estimator: RandomForestClassifier
    ▸ RandomForestClassifier
```

In [50]:

```
rf = grid.best_estimator_
```

In [51]:

```
y_pred = rf.predict(x_test)
accuracy_score(y_test, y_pred)
```

Out[51]:

```
0.9777458722182341
```