Выгрузка данных из лабораторной работы №2 (вариант №11)

Вариант №11: [misc.forsale, sci.med, talk.religion.misc]

In [1]:
```
import warnings
from sklearn.datasets import fetch_20newsgroups
warnings.simplefilter(action='ignore', category=FutureWarning)
```

In [2]:
```
categories = ['misc.forsale', 'sci.med', 'talk.religion.misc']
remove = ['headers', 'footers', 'quotes']

twenty_train_full = fetch_20newsgroups(subset='train', categories=categories, sh
twenty_test_full = fetch_20newsgroups(subset='test', categories=categories, shuf
```

Применение стемминга

In [3]:
```
import nltk
from nltk import word_tokenize
from nltk.stem import *

nltk.download('punkt')
```

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

Out[3]:
```
True
```

In [4]:
```
def stemming(data):
    porter_stemmer = PorterStemmer()
    stem = []
    for text in data:
        nltk_tokens = word_tokenize(text)
        line = ''.join([' ' + porter_stemmer.stem(word) for word in nltk_tokens])
        stem.append(line)
    return stem
```

In [5]:
```
stem_train = stemming(twenty_train_full.data)
stem_test = stemming(twenty_test_full.data)
```

Вариант №11

Методы: [MNB, DT, KNN]

In [6]:
```
from sklearn.naive_bayes import MultinomialNB
from sklearn.tree import DecisionTreeClassifier
```

```
from sklearn.neighbors import KNeighborsClassifier
```

In [7]:
```
stop_words = [None, 'english']
max_features_values = [100, 500, 1000, 2000, 3000, 4000, 5000]
use_idf = [True, False]
```

In [8]:
```
dt_first = range(1, 5, 1)
dt_second = range(5, 100, 20)

decision_tree_max_depth = [*dt_first, *dt_second]
```

In [9]:
```
parameters_mnb = {
    'vect__max_features': max_features_values,
    'vect__stop_words': stop_words,
    'tfidf__use_idf': use_idf,
    'clf__alpha': (0.1, 1, 2)
}

parameters_dtc = {
    'vect__max_features': max_features_values,
    'vect__stop_words': stop_words,
    'tfidf__use_idf': use_idf,
    'clf__criterion': ('gini', 'entropy'),
    'clf__max_depth': decision_tree_max_depth,
}

parameters_knc = {
    'vect__max_features': max_features_values,
    'vect__stop_words': stop_words,
    'tfidf__use_idf': use_idf,
    'clf__n_neighbors': range(1, 10),
    'clf__p': (2, 1) # 2 - Евклидово, 1 - городские кварталы
}
```

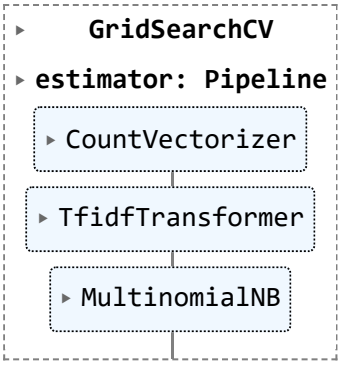
In [10]:
```
from sklearn.model_selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.feature_extraction.text import CountVectorizer, TfidfTransformer
```

Наивный байесовский классификатор

Без использования стема

In [11]:
```
text_clf_mnb = Pipeline([('vect', CountVectorizer()),
                         ('tfidf', TfidfTransformer()),
                         ('clf', MultinomialNB())])
gscv_mnb = GridSearchCV(text_clf_mnb, param_grid=parameters_mnb, n_jobs=-1)
gscv_mnb.fit(twenty_train_full.data, twenty_train_full.target)
```

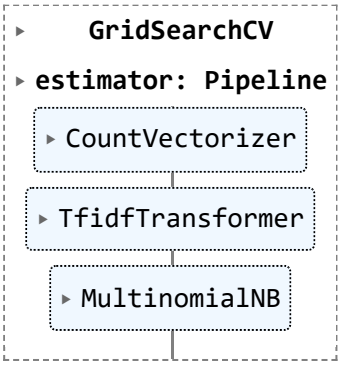
Out[11]:



С использованием стема

In [12]:
```
text_clf_mnb_stem = Pipeline([('vect', CountVectorizer()),
                              ('tfidf', TfidfTransformer()),
                              ('clf', MultinomialNB())])
gscv_mnb_stem = GridSearchCV(text_clf_mnb_stem, param_grid=parameters_mnb, n_job
gscv_mnb_stem.fit(stem_train, twenty_train_full.target)
```

Out[12]:

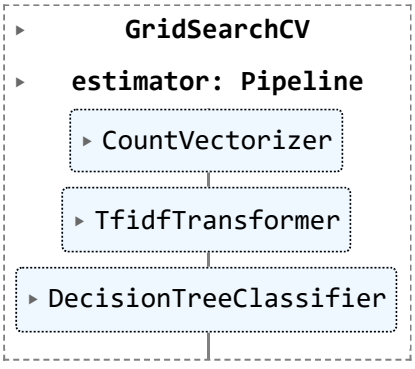


Дерево решений

Без использования стема

In [13]:
```
text_clf_dt = Pipeline([('vect', CountVectorizer()),
                        ('tfidf', TfidfTransformer()),
                        ('clf', DecisionTreeClassifier())])
gscv_dt = GridSearchCV(text_clf_dt, param_grid=parameters_dtc, n_jobs=-1)
gscv_dt.fit(twenty_train_full.data, twenty_train_full.target)
```

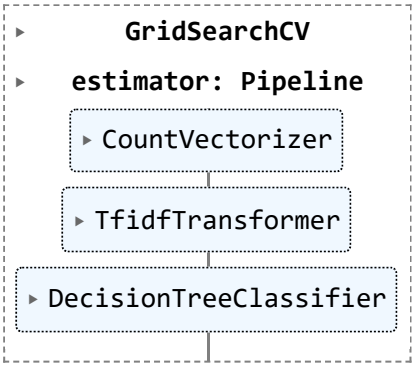
Out[13]:



С использованием стема

In [14]:
```
text_clf_dt_stem = Pipeline([('vect', CountVectorizer()),
                             ('tfidf', TfidfTransformer()),
                             ('clf', DecisionTreeClassifier())])
gscv_dt_stem = GridSearchCV(text_clf_dt_stem, param_grid=parameters_dtc, n_jobs=
gscv_dt_stem.fit(stem_train, twenty_train_full.target)
```

Out[14]:

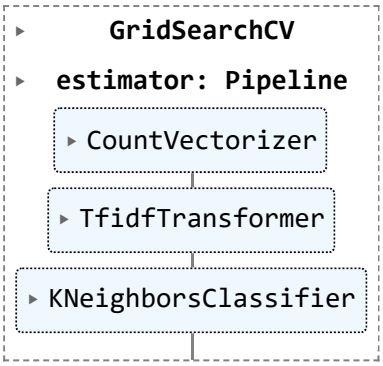


К-ближайших соседей

Без использования стема

In [15]:
```
text_clf_knc = Pipeline([('vect', CountVectorizer()),
                         ('tfidf', TfidfTransformer()),
                         ('clf', KNeighborsClassifier())])
gscv_knc = GridSearchCV(text_clf_knc, param_grid=parameters_knc, n_jobs=-1)
gscv_knc.fit(twenty_train_full.data, twenty_train_full.target)
```

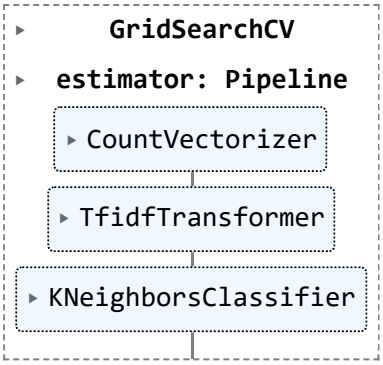
Out[15]:



С использованием стема

In [16]:
```
text_clf_knc_stem = Pipeline([('vect', CountVectorizer()),
                              ('tfidf', TfidfTransformer()),
                              ('clf', KNeighborsClassifier())])
gscv_knc_stem = GridSearchCV(text_clf_knc_stem, param_grid=parameters_knc, n_job
gscv_knc_stem.fit(stem_train, twenty_train_full.target)
```

Out[16]:



Вывод полученных результатов анализа

In [17]:
```
from sklearn.metrics import classification_report
```

In [18]:
```
predicted_mnb = gscv_mnb.predict(twenty_test_full.data)
print('Наивный байесовский классификатор без стема\n')
print(classification_report(twenty_test_full.target, predicted_mnb, target_names
print(gscv_mnb.best_params_)
```

```
Наивный байесовский классификатор без стема

                    precision    recall  f1-score   support

      misc.forsale       0.95      0.94      0.95       390
           sci.med       0.87      0.92      0.89       396
talk.religion.misc       0.88      0.81      0.84       251

          accuracy                           0.90      1037
         macro avg       0.90      0.89      0.90      1037
      weighted avg       0.90      0.90      0.90      1037

{'clf__alpha': 0.1, 'tfidf__use_idf': True, 'vect__max_features': 5000, 'vect__
stop_words': 'english'}
```

In [19]:
```
predicted_mnb_stem = gscv_mnb_stem.predict(twenty_test_full.data)
print('Наивный байесовский классификатор со стемом\n')
print(classification_report(twenty_test_full.target, predicted_mnb_stem, target_
print(gscv_mnb_stem.best_params_)
```

```
Наивный байесовский классификатор со стемом

                    precision    recall  f1-score   support

      misc.forsale       0.89      0.94      0.92       390
           sci.med       0.87      0.86      0.86       396
talk.religion.misc       0.86      0.80      0.83       251

          accuracy                           0.88      1037
         macro avg       0.87      0.87      0.87      1037
      weighted avg       0.87      0.88      0.87      1037

{'clf__alpha': 0.1, 'tfidf__use_idf': True, 'vect__max_features': 5000, 'vect__
stop_words': 'english'}
```

In [20]:
```
predicted_dt = gscv_dt.predict(twenty_test_full.data)
print('Дерево решений без стема\n')
print(classification_report(twenty_test_full.target, predicted_dt, target_names=
print(gscv_dt.best_params_)
```

```
Дерево решений без стема

                    precision    recall  f1-score   support

      misc.forsale       0.83      0.84      0.84       390
           sci.med       0.79      0.57      0.66       396
talk.religion.misc       0.54      0.77      0.64       251

          accuracy                           0.72      1037
         macro avg       0.72      0.73      0.71      1037
      weighted avg       0.75      0.72      0.72      1037

{'clf__criterion': 'gini', 'clf__max_depth': 65, 'tfidf__use_idf': True, 'vect_
_max_features': 1000, 'vect__stop_words': 'english'}
```

In [21]:
```
predicted_dt_stem = gscv_dt_stem.predict(twenty_test_full.data)
print('Дерево решений со стемом\n')
print(classification_report(twenty_test_full.target, predicted_dt_stem, target_r
print(gscv_dt_stem.best_params_)
```

```
Дерево решений со стемом

                    precision    recall  f1-score   support

      misc.forsale       0.80      0.72      0.76       390
           sci.med       0.73      0.45      0.56       396
talk.religion.misc       0.44      0.78      0.57       251

          accuracy                           0.63      1037
         macro avg       0.66      0.65      0.63      1037
      weighted avg       0.69      0.63      0.64      1037

{'clf__criterion': 'gini', 'clf__max_depth': 65, 'tfidf__use_idf': False, 'vect
__max_features': 2000, 'vect__stop_words': 'english'}
```

In [22]:
```
predicted_knc = gscv_knc.predict(twenty_test_full.data)
print('К-ближайших соседей без стема\n')
print(classification_report(twenty_test_full.target, predicted_knc, target_names
print(gscv_knc.best_params_)
```

```
К-ближайших соседей без стема

                    precision    recall  f1-score   support

      misc.forsale       0.77      0.81      0.79       390
           sci.med       0.71      0.61      0.66       396
talk.religion.misc       0.53      0.61      0.57       251

          accuracy                           0.69      1037
         macro avg       0.67      0.68      0.67      1037
      weighted avg       0.69      0.69      0.69      1037

{'clf__n_neighbors': 4, 'clf__p': 2, 'tfidf__use_idf': True, 'vect__max_feature
s': 100, 'vect__stop_words': 'english'}
```

In [23]:
```
predicted_knc_stem = gscv_knc_stem.predict(twenty_test_full.data)
print('К-ближайших соседей со стемом\n')
print(classification_report(twenty_test_full.target, predicted_knc_stem, target_
print(gscv_knc_stem.best_params_)
```

```
К-ближайших соседей со стемом

                    precision    recall  f1-score   support

      misc.forsale       0.62      0.80      0.70       390
           sci.med       0.58      0.61      0.59       396
talk.religion.misc       0.71      0.33      0.45       251

          accuracy                           0.61      1037
         macro avg       0.64      0.58      0.58      1037
      weighted avg       0.63      0.61      0.60      1037

{'clf__n_neighbors': 2, 'clf__p': 2, 'tfidf__use_idf': True, 'vect__max_feature
s': 100, 'vect__stop_words': 'english'}
```

Сравнительная таблица

In [24]:
```
import pandas as pd
```

In [25]:
```
writer = pd.ExcelWriter('result.xlsx', engine='openpyxl')

# Наивный байесовский классификатор без стема
df1 = pd.DataFrame(classification_report(predicted_mnb, twenty_test_full.target,
# Наивный байесовский классификатор со стемом
df2 = pd.DataFrame(classification_report(predicted_mnb_stem, twenty_test_full.ta
# Дерево решений без стема
df3 = pd.DataFrame(classification_report(predicted_dt, twenty_test_full.target,
# Дерево решений со стемом
df4 = pd.DataFrame(classification_report(predicted_dt_stem, twenty_test_full.tar
# К-ближайших соседей без стема
df5 = pd.DataFrame(classification_report(predicted_knc, twenty_test_full.target,
# К-ближайших соседей со стемом
df6 = pd.DataFrame(classification_report(predicted_knc_stem, twenty_test_full.ta

df1.to_excel(writer, sheet_name='НБК без стема')
df2.to_excel(writer, sheet_name='НБК со стемом')
df3.to_excel(writer, sheet_name='Дерево решений без стема')
df4.to_excel(writer, sheet_name='Дерево решений со стемом')
df5.to_excel(writer, sheet_name='К-ближайших соседей без стема')
df6.to_excel(writer, sheet_name='К-ближайших соседей со стемом')

writer.save()
```

In [26]:
```
gscv_mnb.best_params_
```

Out[26]:
```
{'clf__alpha': 0.1,
 'tfidf__use_idf': True,
 'vect__max_features': 5000,
 'vect__stop_words': 'english'}
```

In [26]: