Лабораторная работа 3 по ТМО

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Обработка пропусков в данных, кодирование категориальных признаков, масштабирование данных

In [69]:
```
# read the data
import pandas as pd
reviews = pd.read_csv("./winemag-data-130k-v2.csv", index_col=0)
pd.set_option('max_rows', 5)
```

Смотрим тип данных (допустим, цену):

In [70]:
```
reviews.price.dtype
```

Out[70]:
```
dtype('float64')
```

In [71]:
```
reviews.dtypes
```

Out[71]:
```
country        object
description    object
                ...
variety        object
winery         object
Length: 13, dtype: object
```

Пропуски в данных. Простая замена

Как видим, существует довольно много строк, где не указана страна:

In [72]:
```
reviews[reviews.country.isnull()]
```

Out[72]:

	country	description	designation	points	price	province	region_1	region_2	taster_name	taster_twitter_handle
913	NaN	Amber in color, this wine has aromas of peach ...	Asureti Valley	87	30.0	NaN	NaN	NaN	Mike DeSimone	@worldwineguys
3131	NaN	Soft, fruity and juicy, this is a pleasant, si...	Partager	83	NaN	NaN	NaN	NaN	Roger Voss	@vossroger
...	...	...	...	...	...	...	...	...	...	...
129590	NaN	A blend of 60% Syrah, 30% Cabernet Sauvignon a...	Shah	90	30.0	NaN	NaN	NaN	Mike DeSimone	@worldwineguys
129900	NaN	This wine offers a delightful bouquet of black...	NaN	91	32.0	NaN	NaN	NaN	Mike DeSimone	@worldwineguys

63 rows × 13 columns

Заменим пустые значения на Unknown:

In [73]:
```
for column in ["country", "region_1", "region_2"]:
    reviews[column] = reviews[column].fillna("Unknown")
```

Сработало:

In [74]:
```
reviews[reviews.country.isnull()]
```

Out[74]:

country	description	designation	points	price	province	region_1	region_2	taster_name	taster_twitter_handle	title

In [75]:
```
reviews[reviews.region_1.isnull()]
```

Out[75]:

country	description	designation	points	price	province	region_1	region_2	taster_name	taster_twitter_handle	title

In [76]:
```
reviews[reviews.region_2.isnull()]
```

Out[76]:

country	description	designation	points	price	province	region_1	region_2	taster_name	taster_twitter_handle	title

Пропуски в данных. Импьютация

У нас в датасете больше нет NaN. Но импьютацию из лекции опробовать охота. Сделаем виртуальный датасет:

In [77]:
```
from sklearn.impute import SimpleImputer
from sklearn.impute import MissingIndicator
```

In [78]:
```
# Фильтр для проверки заполнения пустых значений
d = {
      'name': ['Dasha', 'Tanya', 'Andrey', 'Igor', 'Katya', 'Rodion', 'Artyom'],
      'mood': [30, None, 20, 20, 25, None, 22]
    }
df = pd.DataFrame(data=d)

moods = df[['mood']]

indicator = MissingIndicator()
mask_missing_values_only = indicator.fit_transform(moods)
mask_missing_values_only
```

Out[78]:
```
array([[False],
       [ True],
       [False],
       [False],
       [False],
       [ True],
       [False]])
```

In [79]:
```
strategies=['mean', 'median','most_frequent']
```

In [80]:
```
def test_num_impute(strategy_param):
    imp_num = SimpleImputer(strategy=strategy_param)
    data_num_imp = imp_num.fit_transform(moods)
    return data_num_imp[mask_missing_values_only]
```

In [81]:
```
for strategy in strategies:
    print(strategy, test_num_impute(strategy))
```

```
mean [23.4 23.4]
median [22. 22.]
most_frequent [20. 20.]
```

До импьютации:

In [82]:
```
pd.set_option('display.max_rows', 500)
df.head(n=100500)
```

Out[82]:

	name	mood
0	Dasha	30.0
1	Tanya	NaN
2	Andrey	20.0
3	Igor	20.0
4	Katya	25.0
5	Rodion	NaN
6	Artyom	22.0

После импьютации:

In [83]:
```
test_num_impute('mean')[0]
```

Out[83]: 23.4

In [84]:
```
df_imputed = df
df_imputed['mood'] = df_imputed['mood'].fillna(test_num_impute('mean')[0])
df_imputed.head(n=100500)
```

Out[84]:

	name	mood
0	Dasha	30.0
1	Tanya	23.4
2	Andrey	20.0
3	Igor	20.0
4	Katya	25.0
5	Rodion	23.4
6	Artyom	22.0

А ещё можно просто выкидывать:

In [85]:
```
reviews = reviews.dropna()
```

Преобразование в категориальные признаки данных

In [86]:
```
reviews.country.unique()
```

Out[86]:
```
array(['Portugal', 'US', 'Spain', 'Italy', 'France', 'Argentina', 'Chile',
       'Australia', 'South Africa', 'Israel', 'Hungary', 'Austria',
       'Greece', 'Canada', 'Mexico', 'New Zealand', 'Romania', 'Germany',
       'Luxembourg', 'Georgia', 'Uruguay', 'England', 'Lebanon', 'Brazil',
       'Slovenia', 'Moldova', 'Czech Republic', 'Peru', 'India',
       'Bulgaria', 'Cyprus', 'Turkey', 'Armenia', 'Switzerland',
       'Croatia', 'Ukraine', 'Serbia', 'Morocco', 'Macedonia', 'China'],
      dtype=object)
```

Label encoding

In [87]:
```
from sklearn.preprocessing import LabelEncoder, OneHotEncoder
le = LabelEncoder()

countries = pd.DataFrame({'country':reviews.country})
countries['country'].unique()
```

Out[87]:
```
array(['Portugal', 'US', 'Spain', 'Italy', 'France', 'Argentina', 'Chile',
       'Australia', 'South Africa', 'Israel', 'Hungary', 'Austria',
       'Greece', 'Canada', 'Mexico', 'New Zealand', 'Romania', 'Germany',
       'Luxembourg', 'Georgia', 'Uruguay', 'England', 'Lebanon', 'Brazil',
       'Slovenia', 'Moldova', 'Czech Republic', 'Peru', 'India',
       'Bulgaria', 'Cyprus', 'Turkey', 'Armenia', 'Switzerland',
       'Croatia', 'Ukraine', 'Serbia', 'Morocco', 'Macedonia', 'China'],
      dtype=object)
```

In [88]:
```
countries_nums = le.fit_transform(countries['country'])

import numpy
numpy.unique(countries_nums)
```

Out[88]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33,
       34, 35, 36, 37, 38, 39])
```

In [89]:
```
print(len(countries['country'].unique()), "vs", len(numpy.unique(countries_nums)))
```

```
40 vs 40
```

Ничего не потерялось.

One hot encoding

In [90]:
```
df
```

Out[90]:

	name	mood
0	Dasha	30.0
1	Tanya	23.4
2	Andrey	20.0
3	Igor	20.0
4	Katya	25.0
5	Rodion	23.4
6	Artyom	22.0

In [91]:
```
ohe = OneHotEncoder(categories="auto")

cat_enc_ohe = ohe.fit_transform(df[["mood"]])
```

In [92]:
```
cat_enc_ohe.shape
```

Out[92]:
```
(7, 5)
```

In [93]:
```
cat_enc_ohe.todense()
```

Out[93]:
```
matrix([[0., 0., 0., 0., 1.],
        [0., 0., 1., 0., 0.],
        [1., 0., 0., 0., 0.],
        [1., 0., 0., 0., 0.],
        [0., 0., 0., 1., 0.],
        [0., 0., 1., 0., 0.],
        [0., 1., 0., 0., 0.]])
```

Круто!

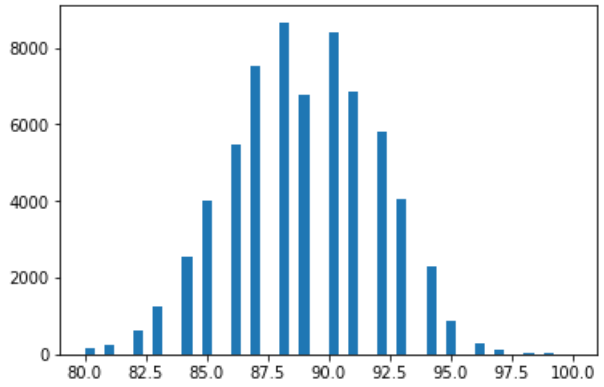
Масштабирование данных

In [94]:
```
from sklearn.preprocessing import MinMaxScaler, StandardScaler, Normalizer
import seaborn as sns
import matplotlib.pyplot as plt
```

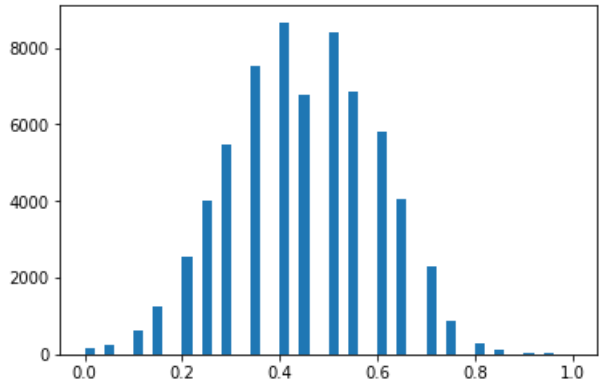
In [95]:
```
sc1 = MinMaxScaler()
sc1_data = sc1.fit_transform(reviews[['points']])
```

```
/home/igor-vodka/.local/lib/python3.6/site-packages/sklearn/preprocessing/data.py:323: DataConversionWarning: Data with input dtype int64 were all converted to float64 by MinMaxScaler.
  return self.partial_fit(X, y)
```

In [96]:
```
plt.hist(reviews['points'], 50)
plt.show()
```



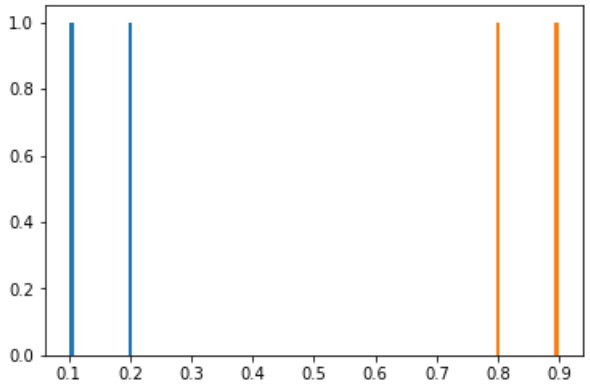
In [97]:
```
plt.hist(sc1_data, 50)
plt.show()
```



Немного нормализации данных

In [98]:
```
sc3 = Normalizer(norm='l1')
sc3_data = sc3.fit_transform([[1, 9], [2, 8]])
```

In [99]:
```
plt.hist(sc3_data, 50)
plt.show()
```



In [100]:
```
sc3_data
```

Out[100]:
```
array([[0.1, 0.9],
       [0.2, 0.8]])
```

Готово.

ОО...

In [ ]:
```
```