МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
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Факультет «Информатика и системы управления»
Кафедра «Систем обработки информации и управления»

ОТЧЕТ

Лабораторная работа №_____ 2_____
по дисциплине «Методы машинного обучения»

Тема: «Обработка признаков (часть 1).
»

ИСПОЛНИТЕЛЬ: Ли Яцзинь
ФИО
группа ИУ5И-25 _____
подпись"__

ПРЕПОДАВАТЕЛЬ: Гапанюк_Ю .Е__

Москва - 2024

Задание:

1. Выбрать набор данных (датасет), содержащий категориальные и числовые признаки и пропуски в данных. Для выполнения следующих пунктов можно использовать несколько различных наборов данных (один для обработки пропусков, другой для категориальных признаков и т.д.) Просьба не использовать датасет, на котором данная задача решалась в лекции.
2. Для выбранного датасета (датасетов) на основе материалов лекций решить следующие задачи:
   i. устранение пропусков в данных;
   ii. кодирование категориальных признаков;
   iii. нормализация числовых признаков.

Загрузка и первичный анализ данных

Используем данные из соревнования : Effects of Alcohol on Student Performance.
A Study of Stellenbosch University Students.

```
[2] # Будем использовать только обучающую выборку
    hdata_loaded = pd.read_csv('/content/Untitled Folder/Stats survey.csv', sep=',')

[3] hdata_loaded.shape

    (406, 17)

[4] hdata = hdata_loaded
```

Удаление пропущенных значений

Информация о наборе данных

```
list(zip(hdata.columns, [i for i in hdata.dtypes]))
```

```
[('Timestamp', dtype('O')),
 ('Your Sex?', dtype('O')),
 ('Your Matric (grade 12) Average/ GPA (in %)', dtype('float64')),
 ('What year were you in last year (2023) ?', dtype('O')),
 ('What faculty does your degree fall under?', dtype('O')),
 ('Your 2023 academic year average/GPA in % (Ignore if you are 2024 1st year student)',
  dtype('float64')),
 ('Your Accommodation Status Last Year (2023)', dtype('O')),
 ('Monthly Allowance in 2023', dtype('O')),
 ('Were you on scholarship/bursary in 2023?', dtype('O')),
 ('Additional amount of studying (in hrs) per week', dtype('O')),
 ('How often do you go out partying/socialising during the week? ',
  dtype('O')),
 ('On a night out, how many alcoholic drinks do you consume?', dtype('O')),
 ('How many classes do you miss per week due to alcohol reasons, (i.e: being hungover or too tired?)',
  dtype('O')),
 ('How many modules have you failed thus far into your studies?', dtype('O')),
 ('Are you currently in a romantic relationship?', dtype('O')),
 ('Do your parents approve alcohol consumption?', dtype('O')),
 ('How strong is your relationship with your parent/s?', dtype('O'))]
```

Колонки с пропусками

```
# Колонки с пропусками
hcols_with_na = [c for c in hdata.columns if hdata[c].isnull().sum() > 0]
hcols_with_na
```

```
['Your Sex?',
 'Your Matric (grade 12) Average/ GPA (in %)',
 'What year were you in last year (2023) ?',
 'What faculty does your degree fall under?',
 'Your 2023 academic year average/GPA in % (Ignore if you are 2024 1st year student)',
 'Your Accommodation Status Last Year (2023)',
 'Monthly Allowance in 2023',
 'Were you on scholarship/bursary in 2023?',
 'Additional amount of studying (in hrs) per week',
 'How often do you go out partying/socialising during the week? ',
 'On a night out, how many alcoholic drinks do you consume?',
 'How many classes do you miss per week due to alcohol reasons, (i.e: being hungover or too tired?)',
 'How many modules have you failed thus far into your studies?',
 'Are you currently in a romantic relationship?',
 'Do your parents approve alcohol consumption?',
 'How strong is your relationship with your parent/s?']
```

```
[7] hdata.shape
```

```
(406, 17)
```

Количество пропусков

```
# Количество пропусков
[(c, hdata[c].isnull().sum()) for c in hcols_with_na]
```

```
[('Your Sex?', 2),
 ('Your Matric (grade 12) Average/ GPA (in %)', 7),
 ('What year were you in last year (2023) ?', 73),
 ('What faculty does your degree fall under?', 7),
 ('Your 2023 academic year average/GPA in % (Ignore if you are 2024 1st year student)',
  86),
 ('Your Accommodation Status Last Year (2023)', 23),
 ('Monthly Allowance in 2023', 31),
 ('Were you on scholarship/bursary in 2023?', 8),
 ('Additional amount of studying (in hrs) per week', 3),
 ('How often do you go out partying/socialising during the week? ', 2),
 ('On a night out, how many alcoholic drinks do you consume?', 2),
 ('How many classes do you miss per week due to alcohol reasons, (i.e: being hungover or too tired?)',
  3),
 ('How many modules have you failed thus far into your studies?', 3),
 ('Are you currently in a romantic relationship?', 3),
 ('Do your parents approve alcohol consumption?', 4),
 ('How strong is your relationship with your parent/s?', 3)]
```

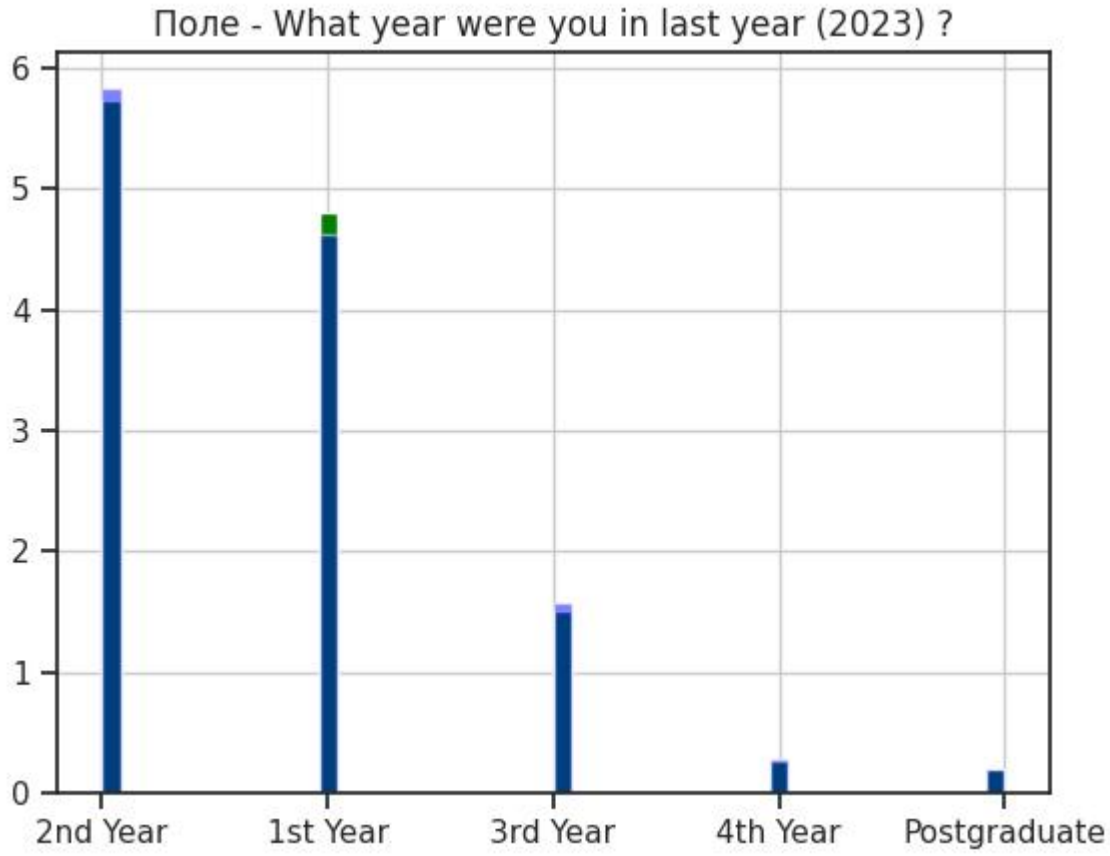
Доля (процент) пропусков

```
# Доля (процент) пропусков
[(c, hdata[c].isnull().mean()) for c in hcols_with_na]
```

```
[('Your Sex?', 0.0049261083743842365),
 ('Your Matric (grade 12) Average/ GPA (in %)', 0.017241379310344827),
 ('What year were you in last year (2023) ?', 0.17980295566502463),
 ('What faculty does your degree fall under?', 0.017241379310344827),
 ('Your 2023 academic year average/GPA in % (Ignore if you are 2024 1st year student)',
  0.21182266009852216),
 ('Your Accommodation Status Last Year (2023)', 0.05665024630541872),
 ('Monthly Allowance in 2023', 0.07635467980295567),
 ('Were you on scholarship/bursary in 2023?', 0.019704433497536946),
 ('Additional amount of studying (in hrs) per week', 0.007389162561576354),
 ('How often do you go out partying/socialising during the week? ',
  0.0049261083743842365),
 ('On a night out, how many alcoholic drinks do you consume?',
  0.0049261083743842365),
 ('How many classes do you miss per week due to alcohol reasons, (i.e: being hungover or too tired?)',
  0.007389162561576354),
 ('How many modules have you failed thus far into your studies?',
  0.007389162561576354),
 ('Are you currently in a romantic relationship?', 0.007389162561576354),
 ('Do your parents approve alcohol consumption?', 0.009852216748768473),
 ('How strong is your relationship with your parent/s?', 0.007389162561576354)]
```

```
[10] # Колонки для которых удаляются пропуски
     hcols_with_na_temp = ['What year were you in last year (2023) ?', 'Your 2023 academic yea
```

```
plot_hist_diff(hdata, hdata_drop, hcols_with_na_temp)
```



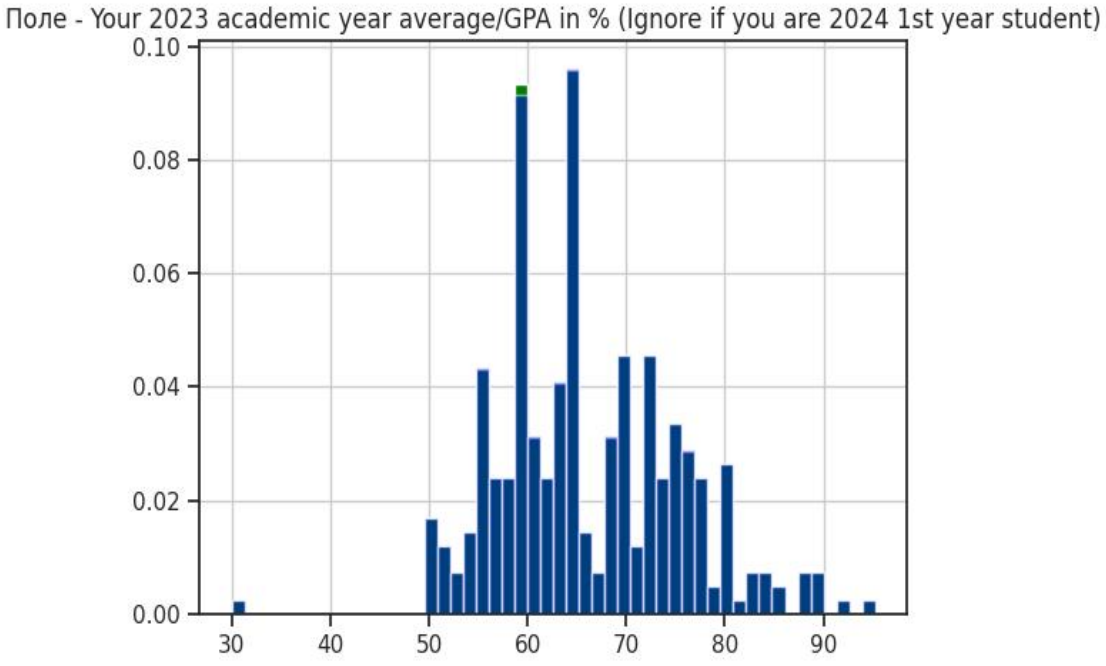


Рисунок 1-

Кодирование категориальных признаков

Используем только некоторые признаки

```
# Используем только некоторые признаки
cols_filter = ['Your  Sex?', 'Monthly  Allowance  in  2023', 'Do  your  parents  approve  alcohol  (

              ]
data = hdata_loaded[cols_filter]
data.head()
```

	Your Sex?	Monthly Allowance in 2023	Do your parents approve alcohol consumption?
0	Female	R 4001- R 5000	Yes
1	Male	R 7001 - R 8000	Yes
2	Male	R 4001- R 5000	Yes
3	Male	R 6001 - R 7000	Yes
4	Female	R 4001- R 5000	Yes

后续步骤: 使用 data生成代码 查看推荐的图表

```
[30] # Заполним пропуски
data.dropna(subset=['Your  Sex?', 'Monthly  Allowance  in  2023'], inplace=True)
```

```
<ipython-input-30-59e195734685>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.ht
  data.dropna(subset=['Your Sex?', 'Monthly Allowance in 2023'], inplace=True)
```

```
# От каюты оставляет только первую букву
# и убираем каюты типа T так как их мало
data['Do  your  parents  approve  alcohol  consumption?'] = data['Do  your  parents  approve  alcohol
data = data[data['Do  your  parents  approve  alcohol  consumption?'] != 'T']
```

```
<ipython-input-31-f3ac57143140>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.ht
  data['Do your parents approve alcohol consumption?'] = data['Do your parents approve alcohol consumptic
```

```
[32] # Убедимся что нет пустых значений
data.isnull().sum()
```

```
Your Sex?                                0
Monthly Allowance in 2023                0
Do your parents approve alcohol consumption?    0
dtype: int64
```

Кодирование категорий целочисленными значениями - label encoding

```
[33] from sklearn.preprocessing import LabelEncoder

[34] le = LabelEncoder()
     cat_enc_le = le.fit_transform(data['Do your parents approve alcohol consumption?'])

[36] data['Do your parents approve alcohol consumption?'].unique()

     array(['Y', 'N', 'n'], dtype=object)

[38] np.unique(cat_enc_le)

     array([0, 1, 2])

     le.inverse_transform([0, 1, 2])

     array(['N', 'Y', 'n'], dtype=object)
```

Нормализация числовых признако

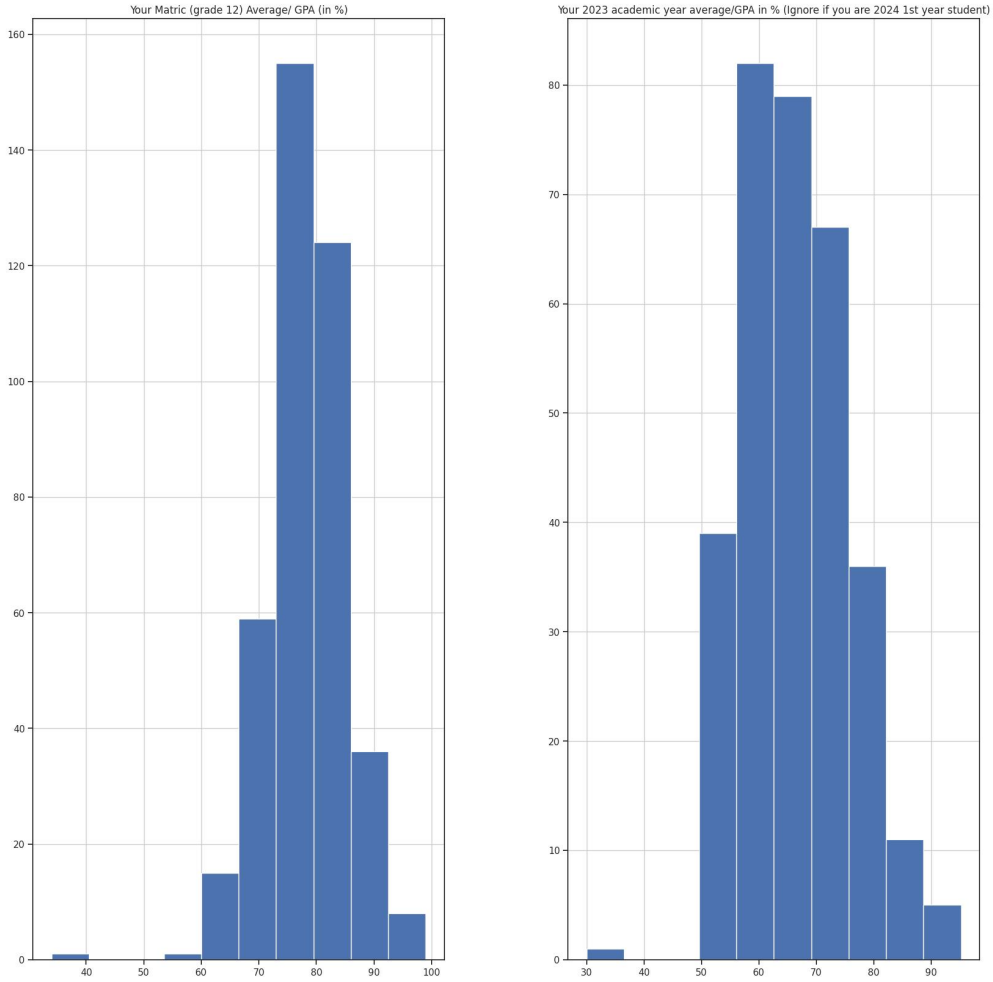
Нормализация числовых признако

```
def diagnostic_plots(df, variable):
        plt.figure(figsize=(15,6))
        # гистограмма
        plt.subplot(1, 2, 1)
        df[variable].hist(bins=30)
        ## Q-Q plot
        plt.subplot(1, 2, 2)
        stats.probplot(df[variable], dist="norm", plot=plt)
        plt.show()
```

+ 代码 + 文本

```
[43] # Будем использовать только обучающую выборку
     data = pd.read_csv('/content/Untitled Folder/Stats survey.csv', sep=",")

     data.hist(figsize=(20,20))
     plt.show()
```



Исходное распределение

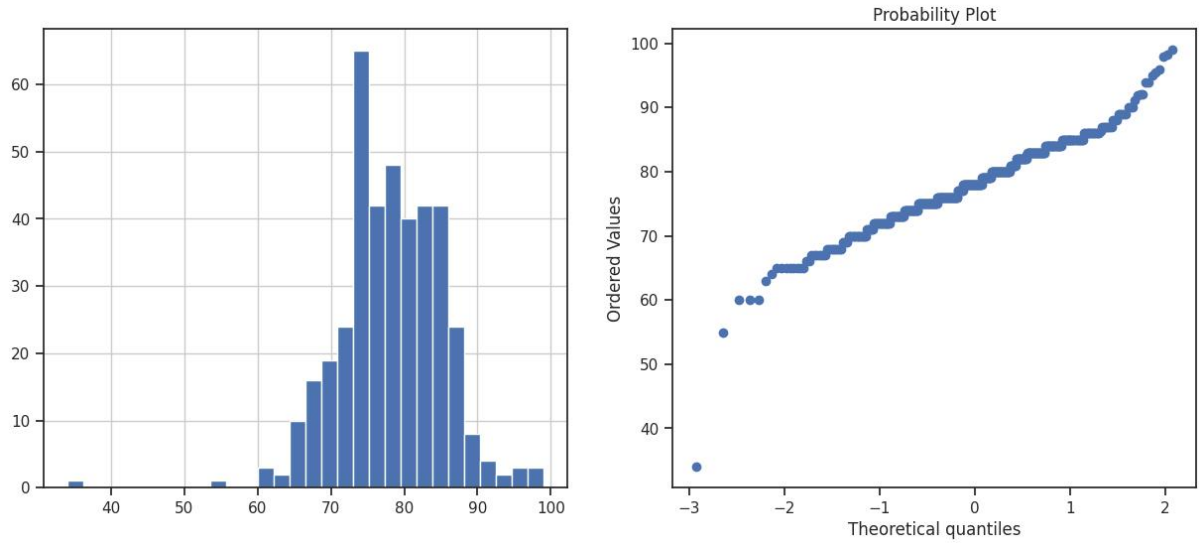


Рисунок 2- Исходное распределение

Логарифмическое преобразование

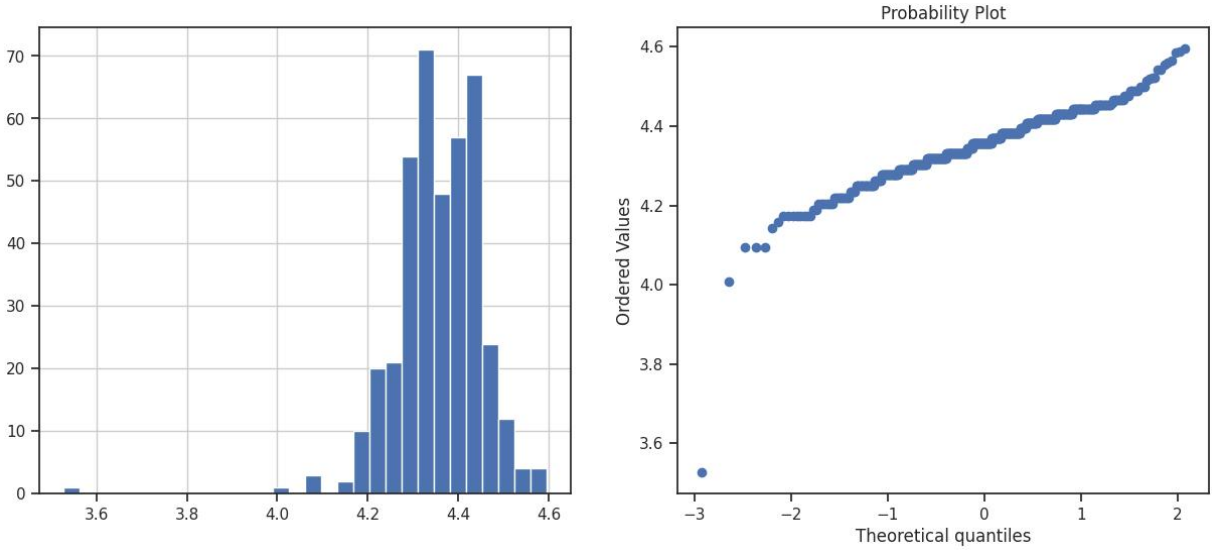


Рисунок 3-Логарифмическое преобразование