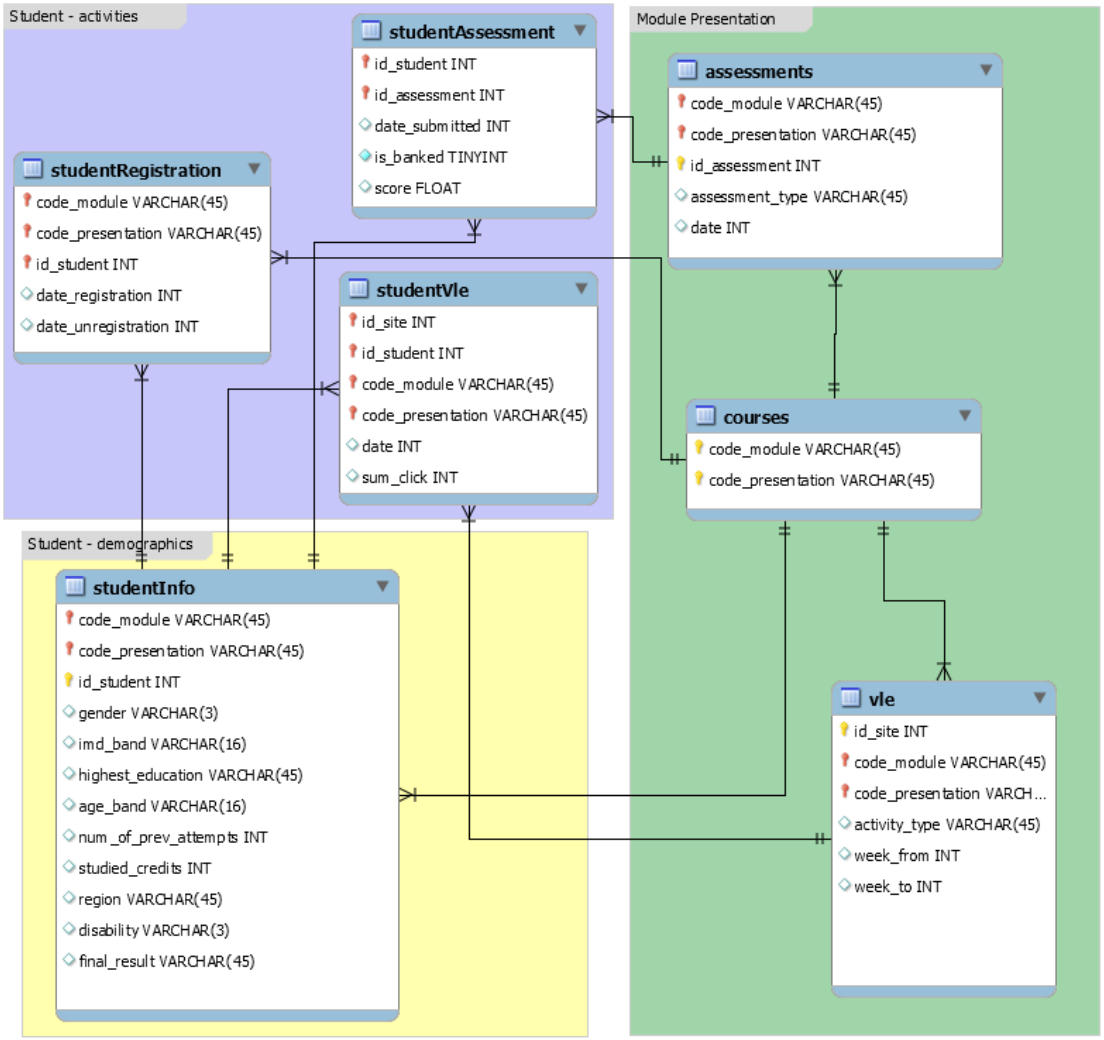
analysis

September 30, 2021

[150]:
```
import pandas

def read_data(file_name):
    csv_file = pandas.read_csv(f'./data/{file_name}.csv')
    print('Head')
    print(csv_file.head())
    print()
    print('Statistics')
    print(csv_file.describe())
    return csv_file
```

[151]:
```
import matplotlib.pyplot as plt

def show_hist(data, column_name, bins=30):
    plt.title(column_name)
    plt.hist(data[column_name], bins=bins)

def show_bar(data, column_name):
    plt.title(column_name)
    data[column_name].value_counts().plot(kind="bar")
```

1 Data Model


Student - activities
studentAssessment
id_student INT
id_assessment INT
date_submitted INT
is_banked TINYINT
score FLOAT
studentRegistration
code_module VARCHAR(45)
code_presentation VARCHAR(45)
id_student INT
date_registration INT
date_unregistration INT
studentVle
id_site INT
id_student INT
code_module VARCHAR(45)
code_presentation VARCHAR(45)
date INT
sum_click INT
Module Presentation
assessments
code_module VARCHAR(45)
code_presentation VARCHAR(45)
id_assessment INT
assessment_type VARCHAR(45)
date INT
courses
code_module VARCHAR(45)
code_presentation VARCHAR(45)
vle
id_site INT
code_module VARCHAR(45)
code_presentation VARCH...
activity_type VARCHAR(45)
week_from INT
week_to INT
Student - demographics
studentInfo
code_module VARCHAR(45)
code_presentation VARCHAR(45)
id_student INT
gender VARCHAR(3)
imd_band VARCHAR(16)
highest_education VARCHAR(45)
age_band VARCHAR(16)
num_of_prev_attempts INT
studied_credits INT
region VARCHAR(45)
disability VARCHAR(3)
final_result VARCHAR(45)

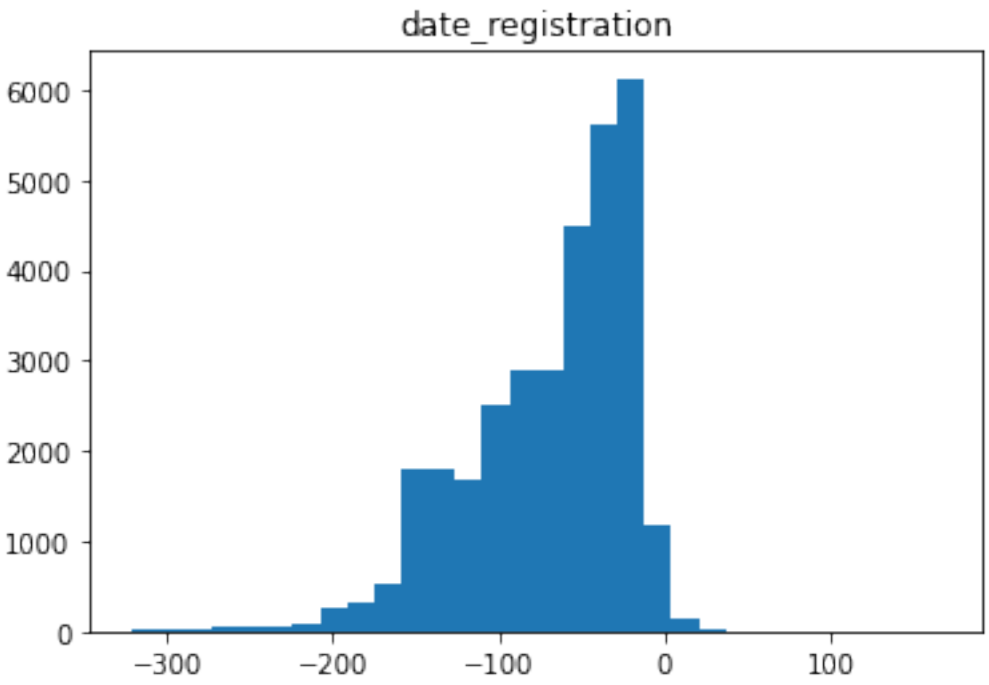
1.1 Student registrations

- code_module – an identification code for a module.
- code_presentation - the identification code of the presentation.
- id_student – a unique identification number for the student.
- date_registration – the date of student's registration on the module presentation, this is the number of days measured relative to the start of the module-presentation (e.g. the negative value -30 means that the student registered to module presentation 30 days before it started).
- date_unregistration – date of student unregistration from the module presentation, this is the number of days measured relative to the start of the module-presentation. Students, who completed the course have this field empty. Students who unregistered have Withdrawal as the value of the final_result column in the studentInfo.csv file.

[152]:
```
studentRegistration = read_data("studentRegistration")
```

```
Head
  code_module code_presentation  id_student  date_registration  \
0         AAA              2013J       11391             -159.0
1         AAA              2013J       28400              -53.0
2         AAA              2013J       30268              -92.0
3         AAA              2013J       31604              -52.0
4         AAA              2013J       32885             -176.0

   date_unregistration
0                  NaN
1                  NaN
2                 12.0
3                  NaN
4                  NaN

Statistics
         id_student  date_registration  date_unregistration
count  3.259300e+04       32548.000000         10072.000000
mean   7.066877e+05         -69.411300            49.757645
std    5.491673e+05          49.260522            82.460890
min    3.733000e+03        -322.000000          -365.000000
25%    5.085730e+05        -100.000000            -2.000000
50%    5.903100e+05         -57.000000            27.000000
75%    6.444530e+05         -29.000000           109.000000
max    2.716795e+06         167.000000           444.000000
```

[153]:
```
show_hist(studentRegistration, "date_registration")
```


date_registration
6000
5000
4000
3000
2000
1000
0
−300
−200
−100
0
100

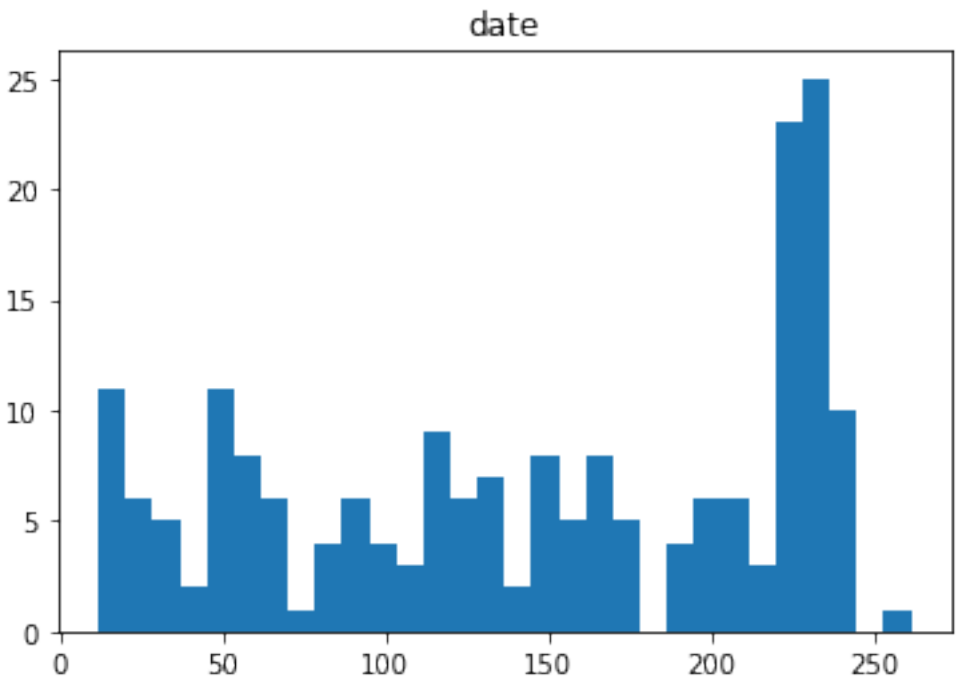
1.2 Assessments

- code_module – identification code of the module, to which the assessment belongs.
- code_presentation - identification code of the presentation, to which the assessment belongs.
- id_assessment – identification number of the assessment.
- assessment_type – type of assessment. Three types of assessments exist: Tutor Marked Assessment (TMA), Computer Marked Assessment (CMA) and Final Exam (Exam).
- date – information about the final submission date of the assessment calculated as the number of days since the start of the module-presentation. The starting date of the presentation has number 0 (zero).
- weight - weight of the assessment in %. Typically, Exams are treated separately and have the weight 100%; the sum of all other assessments is 100%.

[154]:
```
assessments = read_data("assessments")
```

```
Head
  code_module code_presentation  id_assessment assessment_type   date  weight
0         AAA              2013J           1752             TMA   19.0    10.0
1         AAA              2013J           1753             TMA   54.0    20.0
2         AAA              2013J           1754             TMA  117.0    20.0
3         AAA              2013J           1755             TMA  166.0    20.0
4         AAA              2013J           1756             TMA  215.0    30.0

Statistics
       id_assessment        date      weight
count     206.000000  195.000000  206.000000
mean    26473.975728  145.005128   20.873786
std     10098.625521   76.001119   30.384224
min      1752.000000   12.000000    0.000000
25%     15023.250000   71.000000    0.000000
50%     25364.500000  152.000000   12.500000
75%     34891.750000  222.000000   24.250000
max     40088.000000  261.000000  100.000000
```

[155]:
```
show_hist(assessments, "date")
```


date
25
20
15
10
5
0
0
50
100
150
200
250

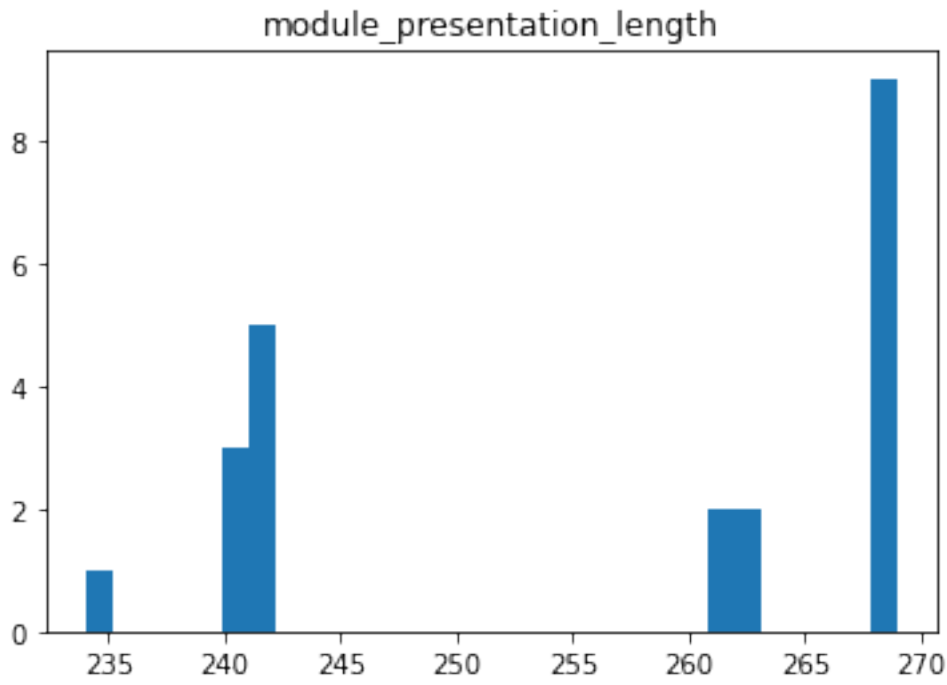
1.3 Courses

- code_module – code name of the module, which serves as the identifier.
- code_presentation – code name of the presentation. It consists of the year and "B" for the presentation starting in February and "J" for the presentation starting in October.
- length - length of the module-presentation in days.

[156]:
```
courses = read_data("courses")
```

```
Head
  code_module code_presentation  module_presentation_length
0         AAA              2013J                         268
1         AAA              2014J                         269
2         BBB              2013J                         268
3         BBB              2014J                         262
4         BBB              2013B                         240

Statistics
       module_presentation_length
count                   22.000000
mean                   255.545455
std                     13.654677
min                    234.000000
25%                    241.000000
50%                    261.500000
75%                    268.000000
max                    269.000000
```

[157]:
```
show_hist(courses, "module_presentation_length")
```


module_presentation_length
0
2
4
6
8
235
240
245
250
255
260
265
270

1.4 Virtual learning environments

- id_site – an identification number of the material.
- code_module – an identification code for module.
- code_presentation - the identification code of presentation.
- activity_type – the role associated with the module material.
- week_from – the week from which the material is planned to be used.
- week_to – week until which the material is planned to be used.

[158]:
```
vles = read_data("vle")
```

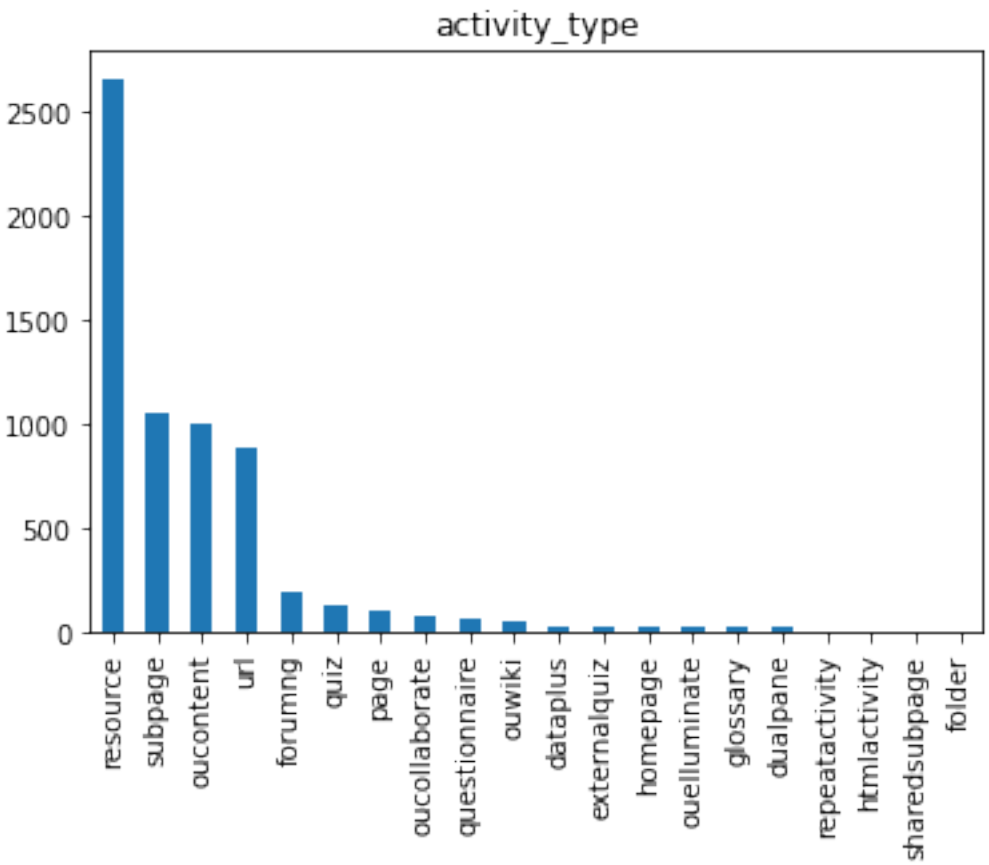
Head

	id_site	code_module	code_presentation	activity_type	week_from	week_to
0	546943	AAA	2013J	resource	NaN	NaN
1	546712	AAA	2013J	oucontent	NaN	NaN
2	546998	AAA	2013J	resource	NaN	NaN
3	546888	AAA	2013J	url	NaN	NaN
4	547035	AAA	2013J	resource	NaN	NaN

Statistics

	id_site	week_from	week_to
count	6.364000e+03	1121.000000	1121.000000
mean	7.260991e+05	15.204282	15.214987
std	1.283151e+05	8.792865	8.779806
min	5.267210e+05	0.000000	0.000000
25%	6.615928e+05	8.000000	8.000000
50%	7.300965e+05	15.000000	15.000000
75%	8.140162e+05	22.000000	22.000000
max	1.077905e+06	29.000000	29.000000

[159]:
```
show_bar(vles, "activity_type")
```


activity_type
2500
2000
1500
1000
500
0
resource
subpage
oucontent
url
forumng
quiz
page
oucollaborate
questionnaire
ouwiki
dataplus
externalquiz
homepage
ouelluminate
glossary
dualpane
repeatactivity
htmlactivity
sharedsubpage
folder

1.5 Student virtual learning environments

- code_module – an identification code for a module.
- code_presentation - the identification code of the module presentation.
- id_student – a unique identification number for the student.
- id_site - an identification number for the VLE material.
- date – the date of student's interaction with the material measured as the number of days since the start of the module-presentation.
- sum_click – the number of times a student interacts with the material in that day.

[160]:
```
studentVles = read_data("studentVle")
```

Head

	code_module	code_presentation	id_student	id_site	date	sum_click
0	AAA	2013J	28400	546652	-10	4
1	AAA	2013J	28400	546652	-10	1
2	AAA	2013J	28400	546652	-10	1
3	AAA	2013J	28400	546614	-10	11
4	AAA	2013J	28400	546714	-10	1

Statistics

	id_student	id_site	date	sum_click
count	1.065528e+07	1.065528e+07	1.065528e+07	1.065528e+07
mean	7.333336e+05	7.383234e+05	9.517400e+01	3.716946e+00
std	5.827060e+05	1.312196e+05	7.607130e+01	8.849047e+00
min	6.516000e+03	5.267210e+05	-2.500000e+01	1.000000e+00
25%	5.077430e+05	6.735190e+05	2.500000e+01	1.000000e+00
50%	5.882360e+05	7.300690e+05	8.600000e+01	2.000000e+00
75%	6.464840e+05	8.770300e+05	1.560000e+02	3.000000e+00
max	2.698588e+06	1.049562e+06	2.690000e+02	6.977000e+03

1.6 Student information

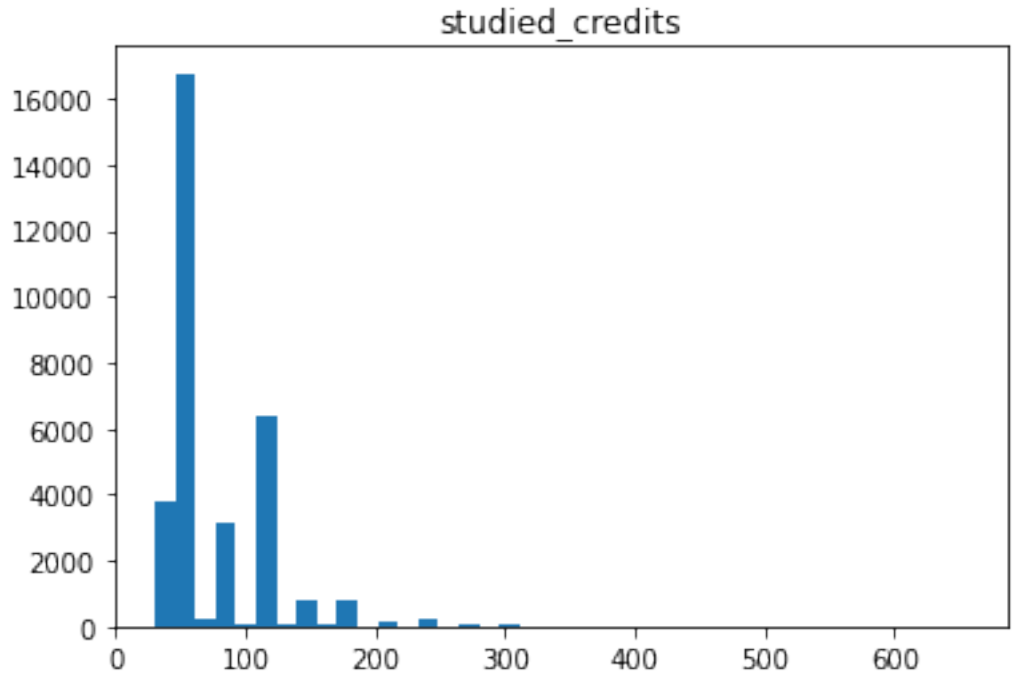
- code_module – an identification code for a module on which the student is registered.
- code_presentation - the identification code of the presentation during which the student is registered on the module.
- id_student – a unique identification number for the student.
- gender – the student's gender.
- region – identifies the geographic region, where the student lived while taking the module-presentation.
- highest_education – highest student education level on entry to the module presentation.
- imd_band – specifies the Index of Multiple Depravation band of the place where the student lived during the module-presentation.
- age_band – band of the student's age.
- num_of_prev_attempts – the number times the student has attempted this module.
- studied_credits – the total number of credits for the modules the student is currently studying.
- disability – indicates whether the student has declared a disability.
- final_result – student's final result in the module-presentation.

[161]:
```
studentInfo = read_data("studentInfo")
```

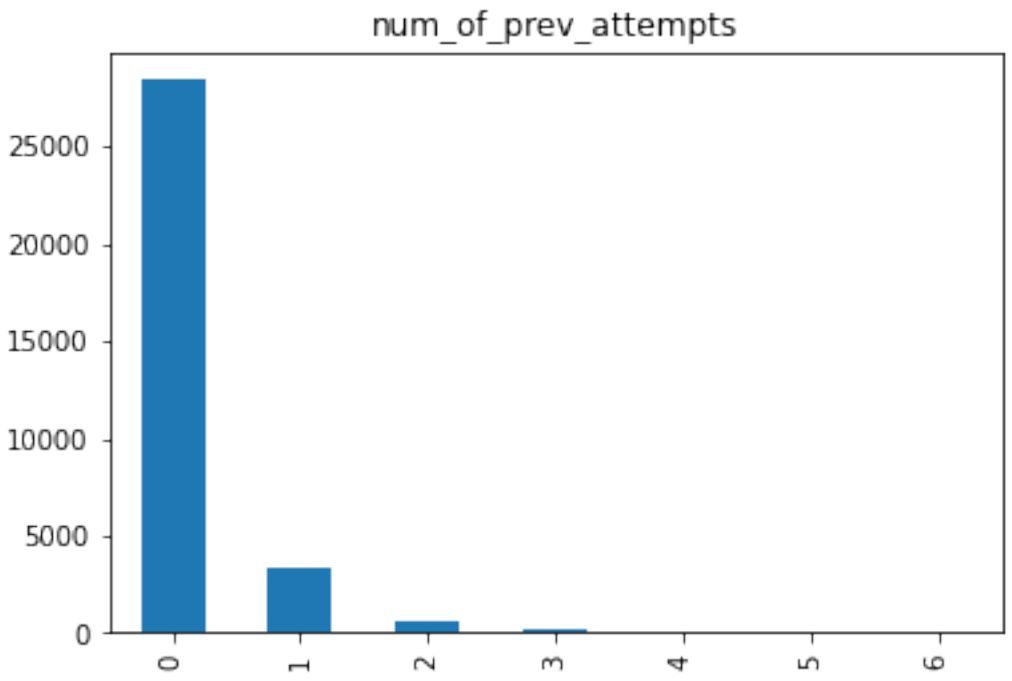
```
Head
  code_module code_presentation  id_student gender                region  \
0         AAA             2013J       11391      M   East Anglian Region
1         AAA             2013J       28400      F              Scotland
2         AAA             2013J       30268      F  North Western Region
3         AAA             2013J       31604      F     South East Region
4         AAA             2013J       32885      F  West Midlands Region

       highest_education imd_band age_band  num_of_prev_attempts  \
0       HE Qualification  90-100%     55<=                     0
1       HE Qualification   20-30%    35-55                     0
2  A Level or Equivalent   30-40%    35-55                     0
3  A Level or Equivalent   50-60%    35-55                     0
4     Lower Than A Level   50-60%     0-35                     0

   studied_credits disability final_result
0              240          N         Pass
1               60          N         Pass
2               60          Y    Withdrawn
3               60          N         Pass
4               60          N         Pass

Statistics
         id_student  num_of_prev_attempts  studied_credits
count  3.259300e+04          32593.000000     32593.000000
mean   7.066877e+05              0.163225        79.758691
std    5.491673e+05              0.479758        41.071900
min    3.733000e+03              0.000000        30.000000
25%    5.085730e+05              0.000000        60.000000
```

50%	5.903100e+05	0.000000	60.000000
75%	6.444530e+05	0.000000	120.000000
max	2.716795e+06	6.000000	655.000000

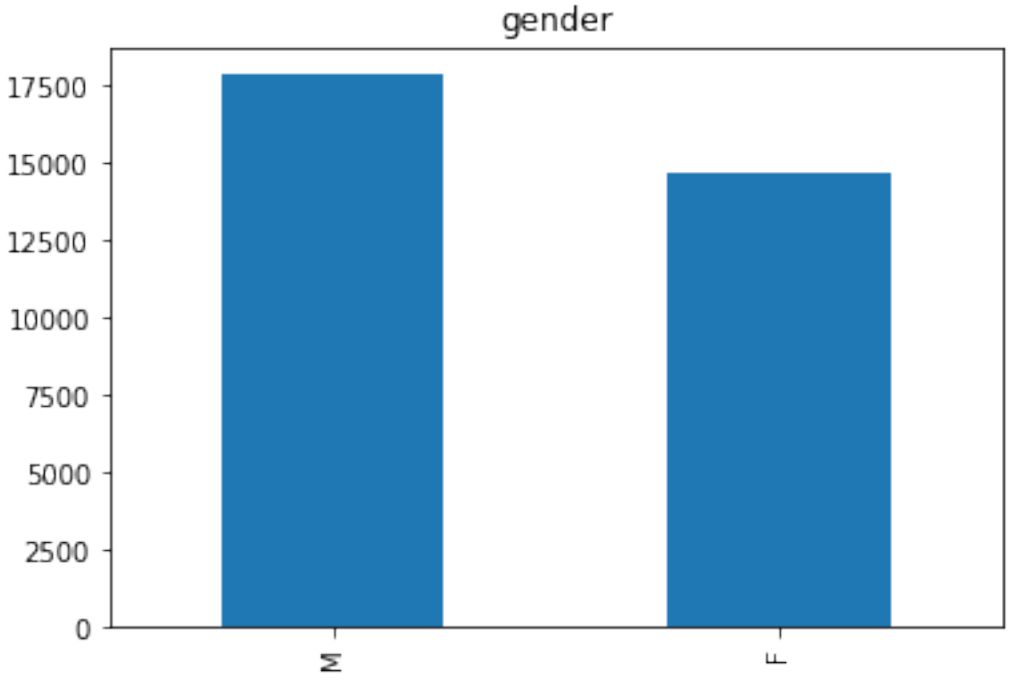
[173]:
```
show_hist(studentInfo, "studied_credits", bins=40)
```



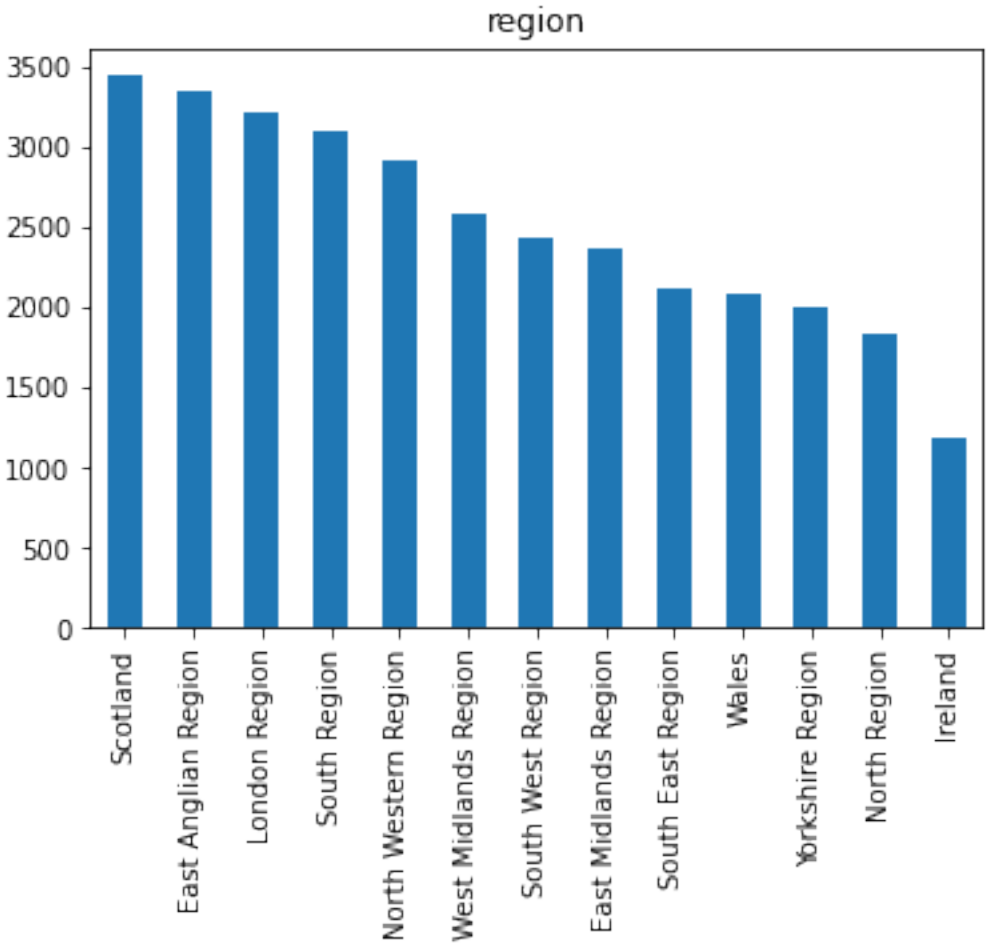
[163]:
```
show_bar(studentInfo, "num_of_prev_attempts")
```



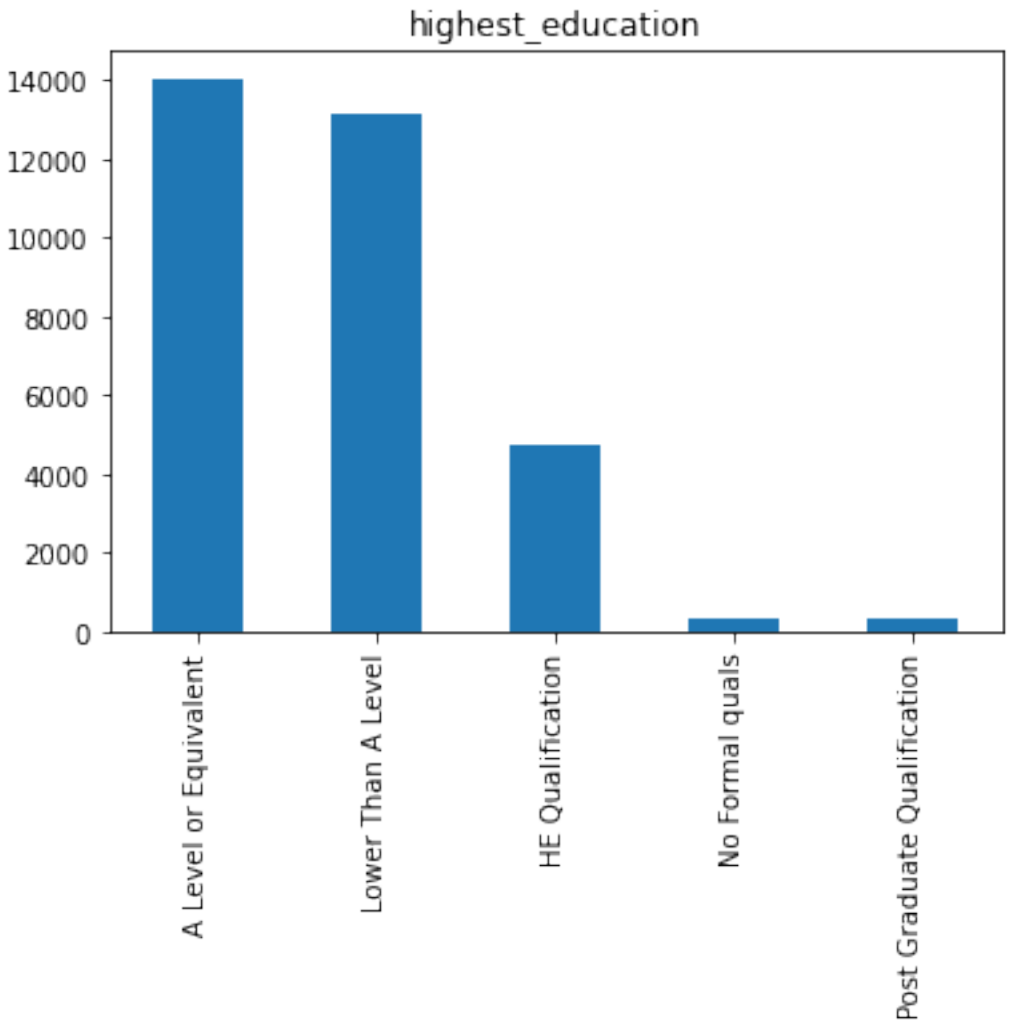
[164]:
```
show_bar(studentInfo, "gender")
```



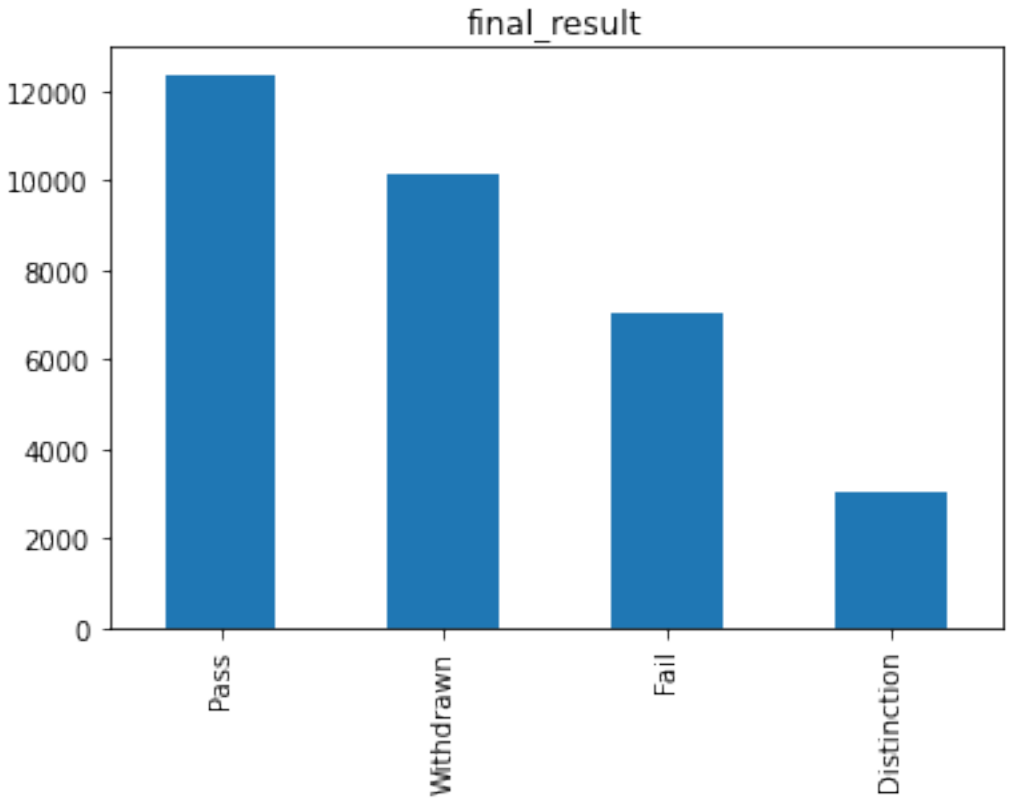
[165]:
```
show_bar(studentInfo, "region")
```



[166]:
```
show_bar(studentInfo, "highest_education")
```



[167]:
```
show_bar(studentInfo, "final_result")
```


final_result
12000
10000
8000
6000
4000
2000
0
Pass
Withdrawn
Fail
Distinction

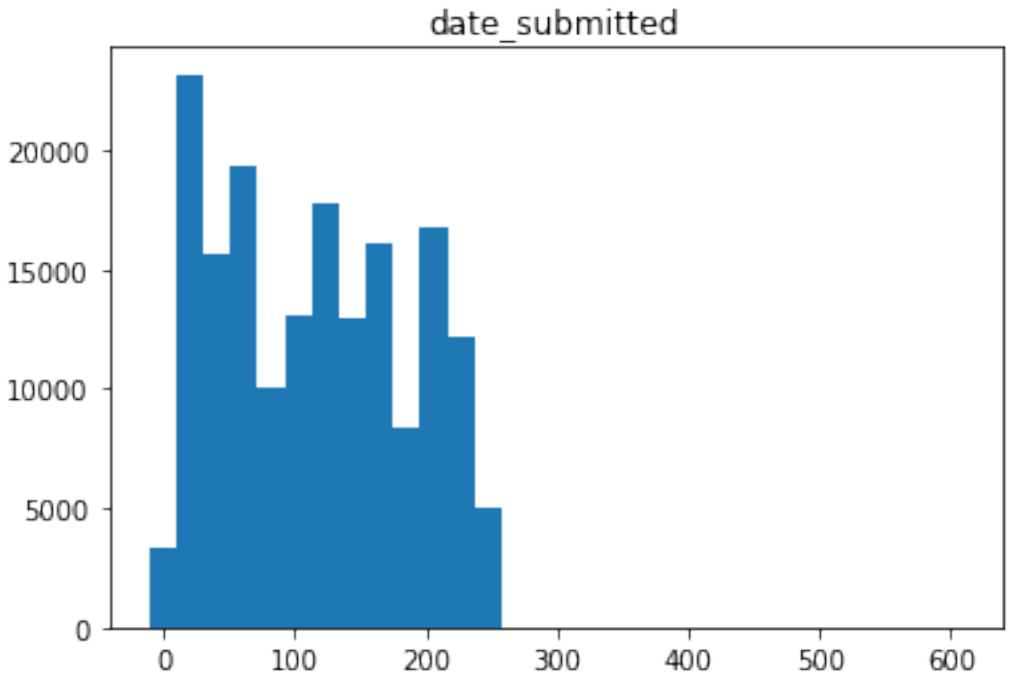
1.7 Student assessments

- id_assessment – the identification number of the assessment.
- id_student – a unique identification number for the student.
- date_submitted – the date of student submission, measured as the number of days since the start of the module presentation.
- is_banked – a status flag indicating that the assessment result has been transferred from a previous presentation.
- score – the student's score in this assessment. The range is from 0 to 100. The score lower than 40 is interpreted as Fail. The marks are in the range from 0 to 100.

[168]:
```
studentAssessments = read_data("studentAssessment")
```

```
Head
   id_assessment  id_student  date_submitted  is_banked  score
0           1752       11391              18          0   78.0
1           1752       28400              22          0   70.0
2           1752       31604              17          0   72.0
3           1752       32885              26          0   69.0
4           1752       38053              19          0   79.0

Statistics
       id_assessment    id_student  date_submitted      is_banked  \
count  173912.000000  1.739120e+05   173912.000000  173912.000000
mean    26553.803556  7.051507e+05      116.032942       0.010977
std      8829.784254  5.523952e+05       71.484148       0.104194
min      1752.000000  6.516000e+03      -11.000000       0.000000
25%     15022.000000  5.044290e+05       51.000000       0.000000
50%     25359.000000  5.852080e+05      116.000000       0.000000
75%     34883.000000  6.344980e+05      173.000000       0.000000
max     37443.000000  2.698588e+06      608.000000       1.000000

               score
count  173739.000000
mean       75.799573
std        18.798107
min         0.000000
25%        65.000000
50%        80.000000
75%        90.000000
max       100.000000
```

[174]:
```
show_hist(studentAssessments, "date_submitted")
```



[170]:
```
show_hist(studentAssessments, "score", bins=50)
```