



THE ONLINE, OPEN AND FLEXIBLE HIGHER EDUCATION CONFERENCE

Enhancing European Higher Education

'Opportunities and impact of new modes of teaching'

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*A Learning Analytics Methodology for Student Performance
Assessment in a Distance and Open Education Environment*
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Educational Content
Methodology &
Technology Laboratory

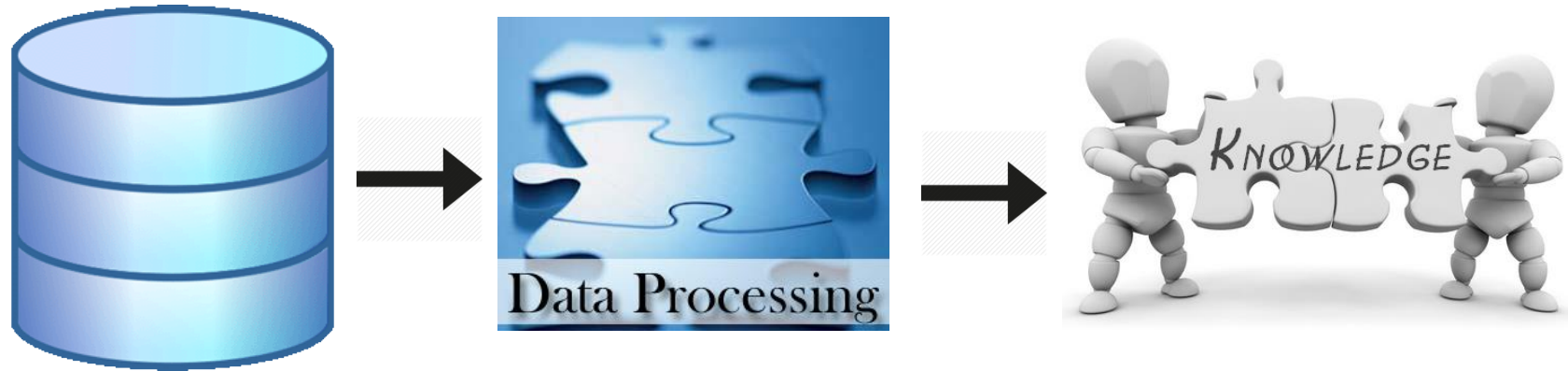


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Outline

- ▶ Learning Analytics
- ▶ The HOU Ecosystem
- ▶ Data and Methods
- ▶ Experiments
- ▶ Results
- ▶ Conclusions

Data Science



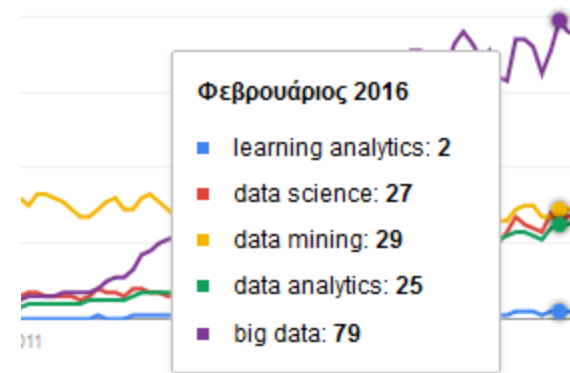
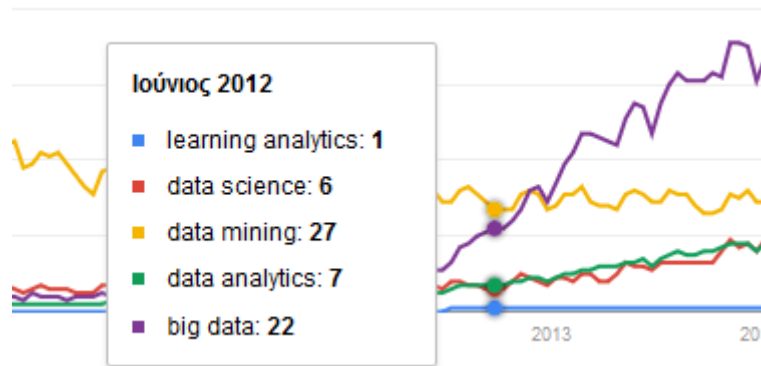
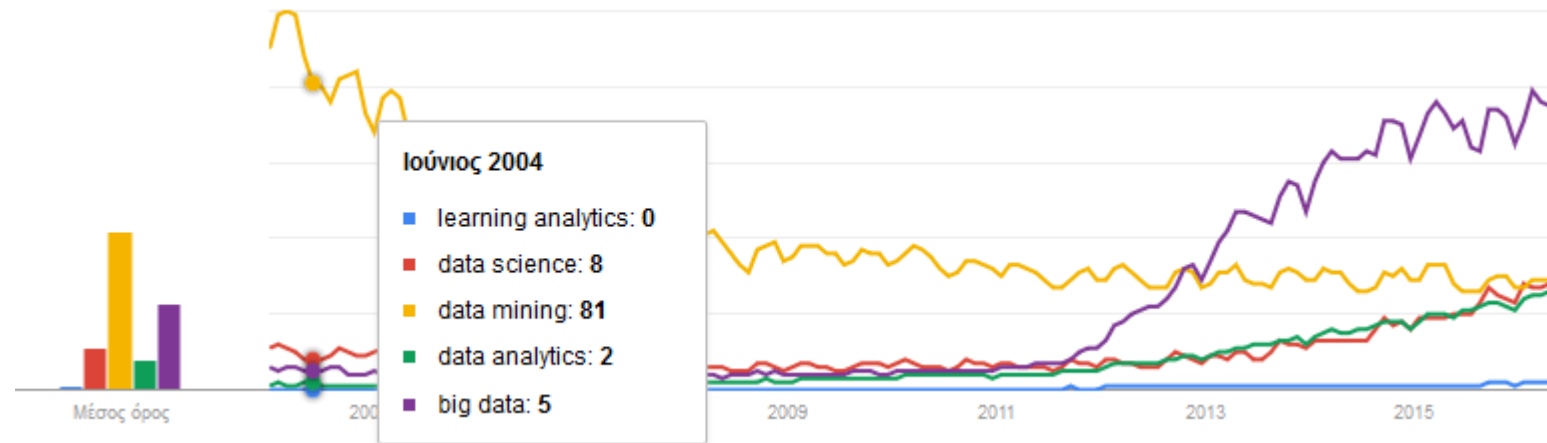
An interdisciplinary field about processes and systems to extract knowledge or insights from data in various forms

A continuation of some of the data analysis fields such as statistics, machine learning, data mining, and predictive analytics, similar to Knowledge Discovery in Databases (KDD).

EDM, Learning Analytics & Big Data

- ▶ Educational Data Mining (EDM): a research field concerned with the application of data mining, machine learning and statistics to information generated from educational sources
- ▶ Learning analytics: collection, measurement, analysis and reporting of data about learning and how it is best facilitated, in order to understand and assess the effectiveness of the learning environments and students' pathways and enhance the learning experience
- ▶ Big Data: data sets which are so large or complex making traditional data processing applications inadequate to deal with them

Recent trends



The case of the Hellenic Open University

- ▶ The only Greek Public University officially established in 1997 that exclusively offers distance education courses
- ▶ Consists of four Schools: Social Sciences, Applied Arts, Science & Technology, and Humanities
- ▶ Offers 33 undergraduate and postgraduate courses to adult learners
- ▶ Each course consists of modules which comprise of up to three lessons
- ▶ Each module includes five optional face-to-face tutorials that take place in as many as 9 cities all over the country
- ▶ Students have to submit 4-6 written assignments throughout the 10-month academic year period at the end of which they participate in a compulsory written exam

HOU Student Platforms

- ▶ The Student Information System (open.eap.gr)

Contains information concerning the students' records, the distribution of students into groups for each tutorial, the schedule of the tutorials, student grades obtained in written assignments and exams, etc.

- ▶ The Learning Management System (study.eap.gr)

Based on the Moodle platform, offers services to students and tutors: students have submit their written assignments and tutors give feedback, annotate and grade them; asynchronous discussion groups and online fora are also available

- ▶ The digital material repository (apothesis.eap.gr)

Students have access to supplementary or alternative educational material

- ▶ The web conferencing platform (centra.eap.gr)

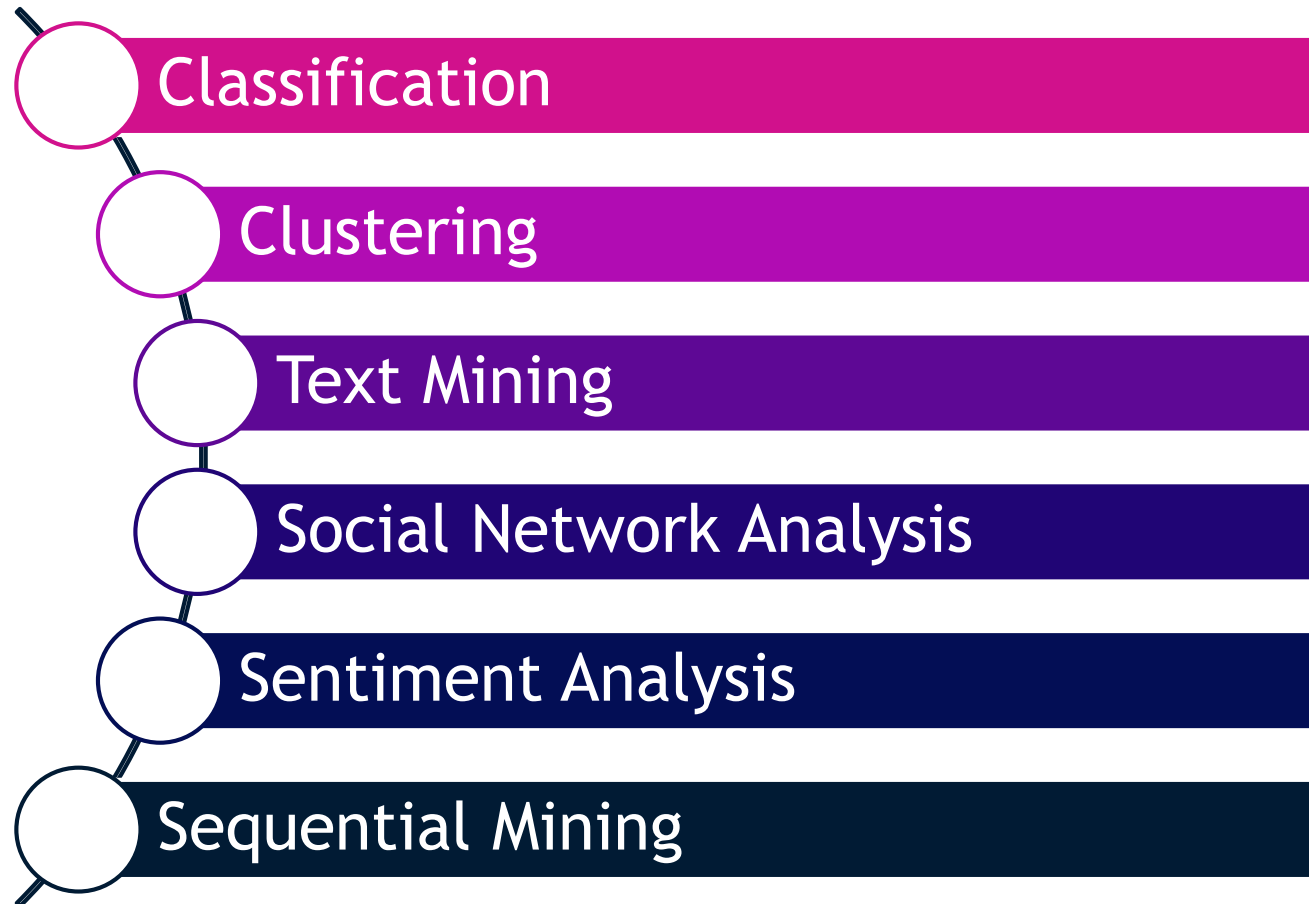
Offers synchronous teleconferencing facilities for students and tutors

HOU available data

A vast amount of valuable educational and administrative data:

- ▶ log files
- ▶ activity reports
- ▶ forum posts
- ▶ participation in counselling group sessions
- ▶ written assignments' grades
- ▶ final exams' grades
- ▶ services and tutors evaluation from students
- ▶ student admissions' data

Methodology



The PLS60 Module Case Study

“PLS60 - Specialization in Software Engineering” is a second year module of the graduate course Master’s in Information Systems of the School of Science and Technology

- ▶ The program aims to provide students with specialized knowledge in Information and Communication Technologies
- ▶ Students have to successfully complete four modules in addition to submitting and successfully defending a thesis
- ▶ Module PLS60 covers subjects from Database Theory, Data Mining techniques, Operating Systems and Modern programming paradigms
- ▶ Students have to successfully submit 6 written assignments and pass the final written examination in each module

Data Sets

Admission Data

- 794,800 student applications, submitted for 83 different modules, during a 10-year period (2003 - 2013)
- 362,311 different applicants, applied once a year in multiple modules
 - geographical analysis
 - analysis of the applications that the university received the last decade
 - analysis of the applications based on the age and the sex of the applicants

Forum Data

- 61 students participated in module PLS60
- A thorough analysis of their learning activities
- combined data from their applications
 - log files from the online forum
 - graduation grades and performance
 - messages posted in the corresponding online discussion forum

Software Tools

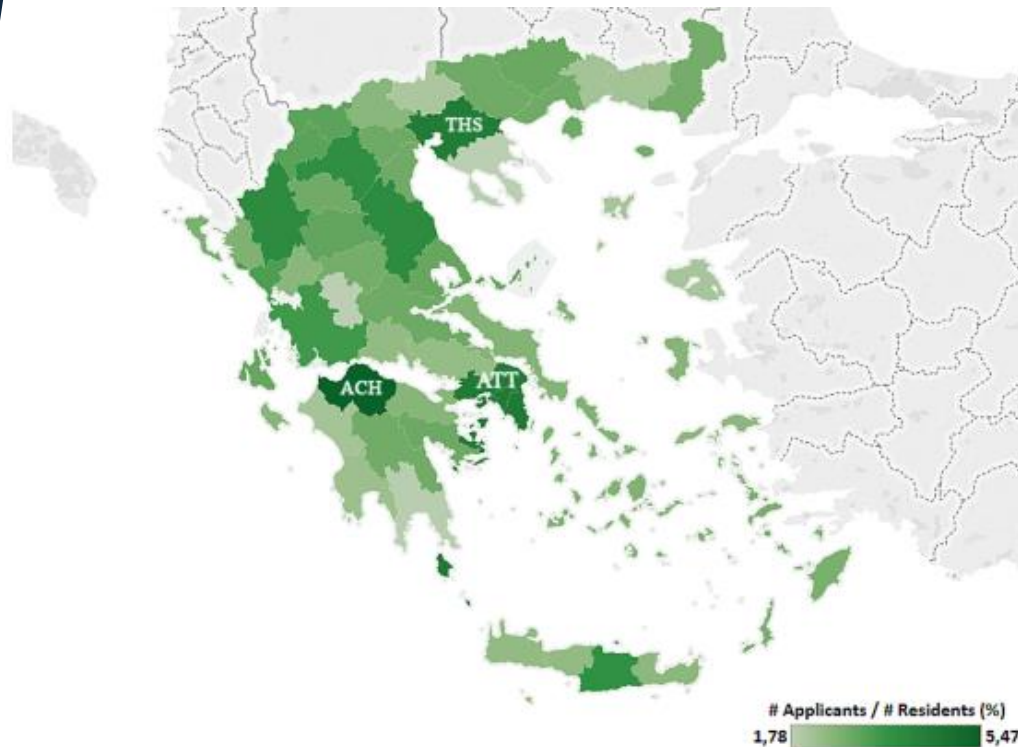
Data preprocessing
implemented in Python

Data stored into an SQL
database

Statistical analysis and
data mining performed
using R and Weka

Visualizations created
using Tableau v. 9.3

Admission data geographical analysis



The number of applicants per region

Three regions with the largest percentages:

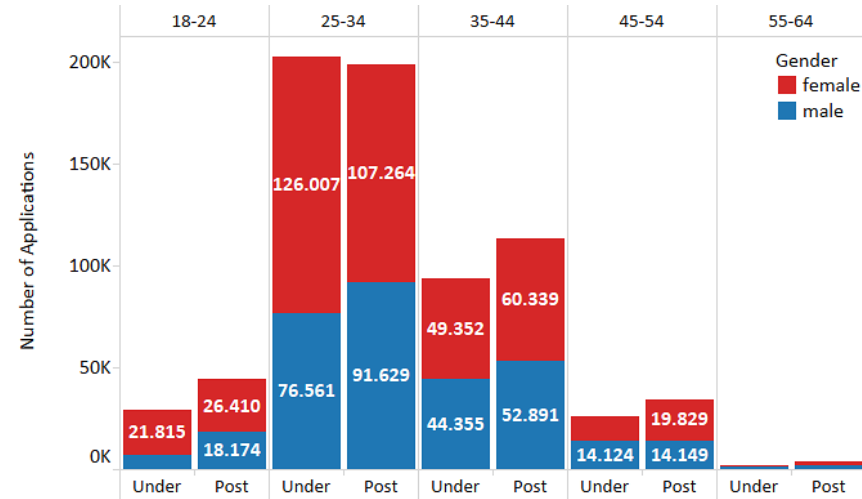
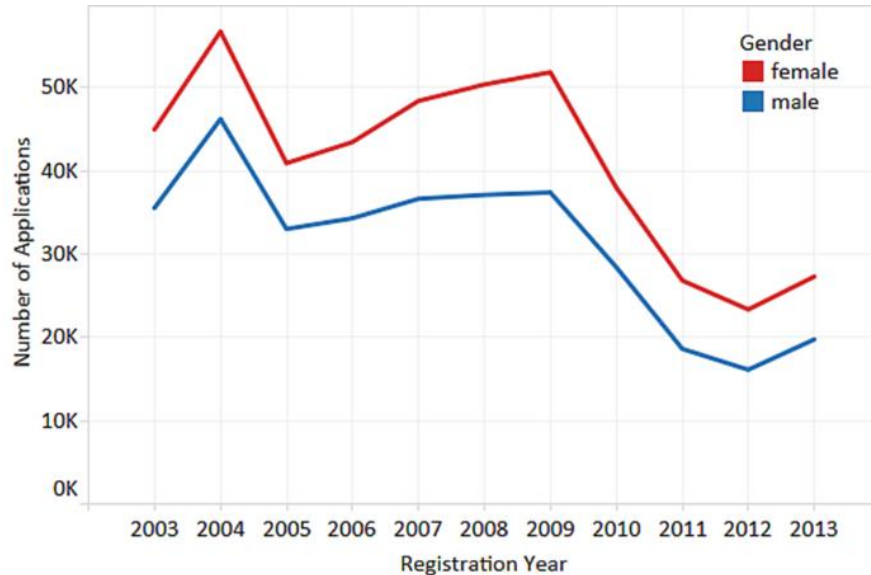
- ▶ Achaia (ACH, 5.47%)
- ▶ Attiki (ATT, 4.49%)
- ▶ Thessaloniki (THS, 4.45%)

Achaia is where HOU is located

Large percentages in large cities having public universities or private institutes

Small percentages in peripheral regions usually having no access to higher education

Students' Admission statistical analysis



The total number of applications per gender

A maximum peak in 2004, a minimum peak in 2012

A decreasing trend due to the financial crisis

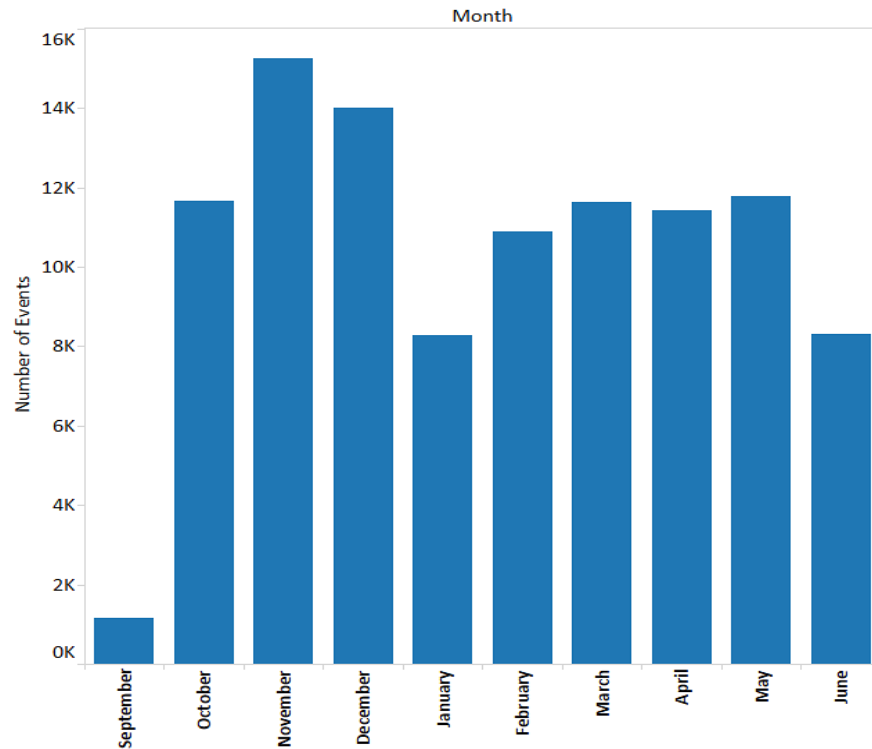
Constantly more applications from females than males

The number of applications made per age group, and the educational level for which they apply

The 25-34 age group held the majority of the applications.

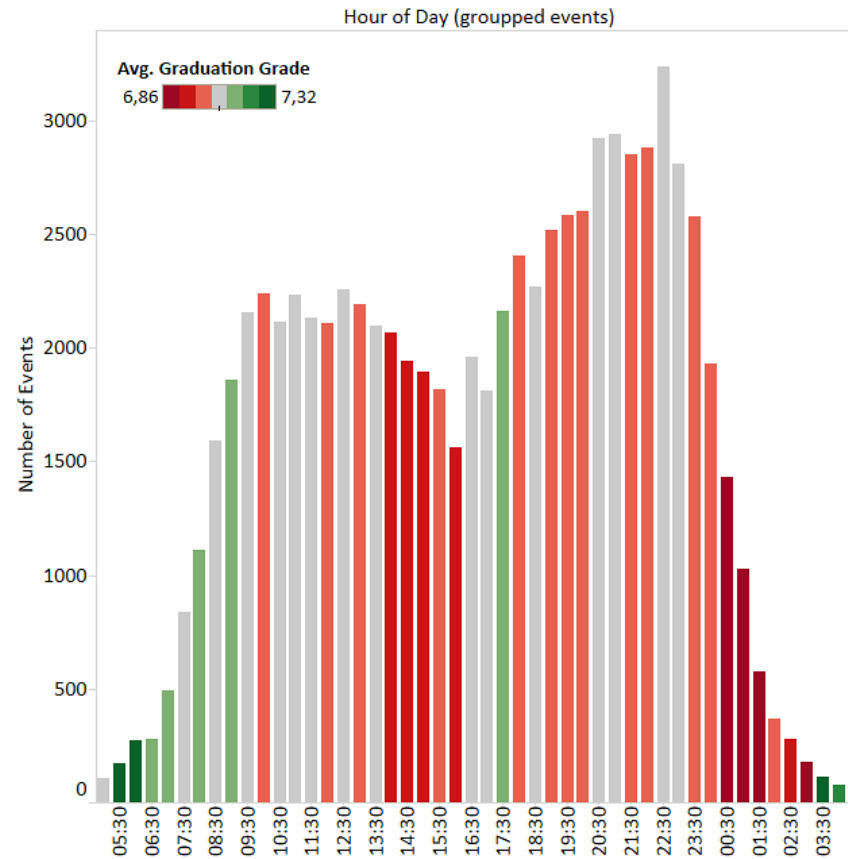
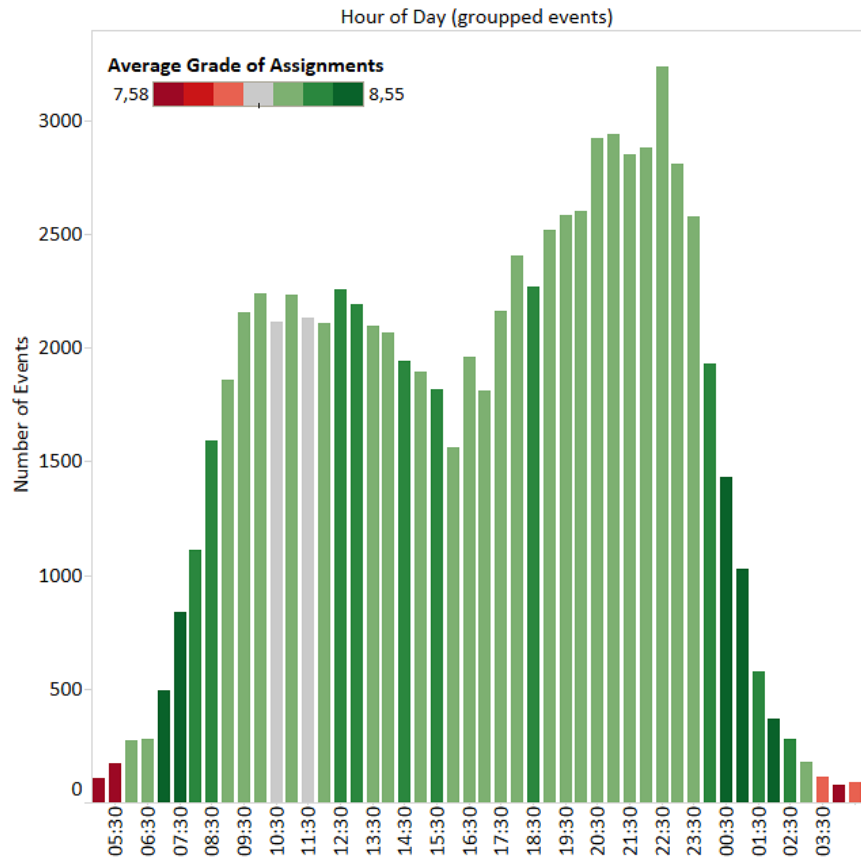
This is because public university studies are not always their first option or, they make studies after finding a job

Forum log files analysis

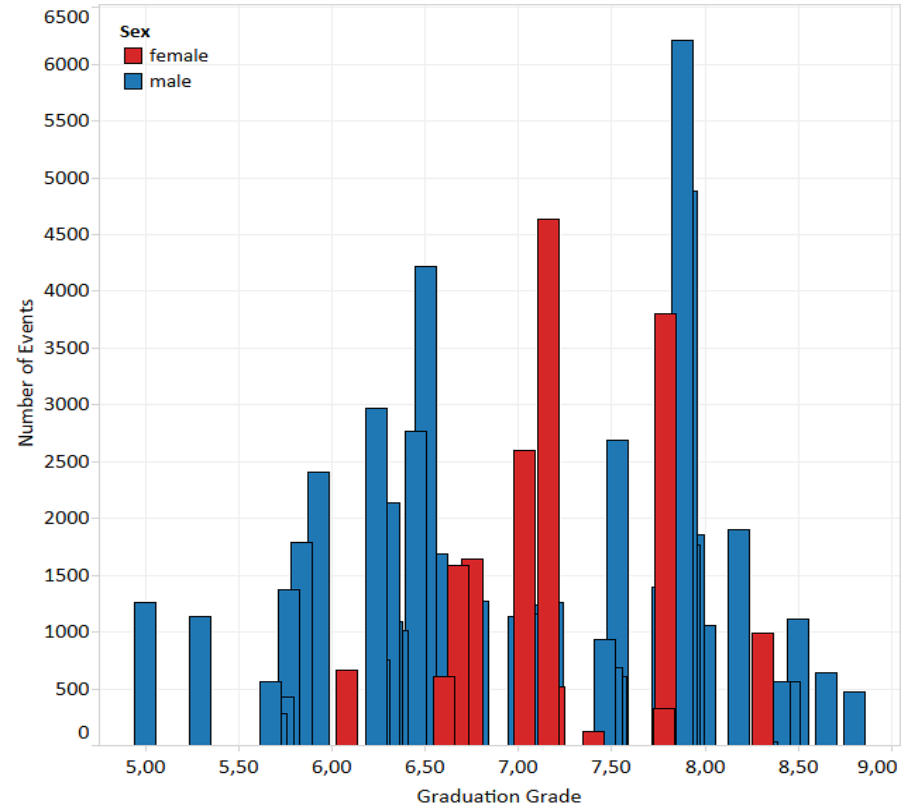
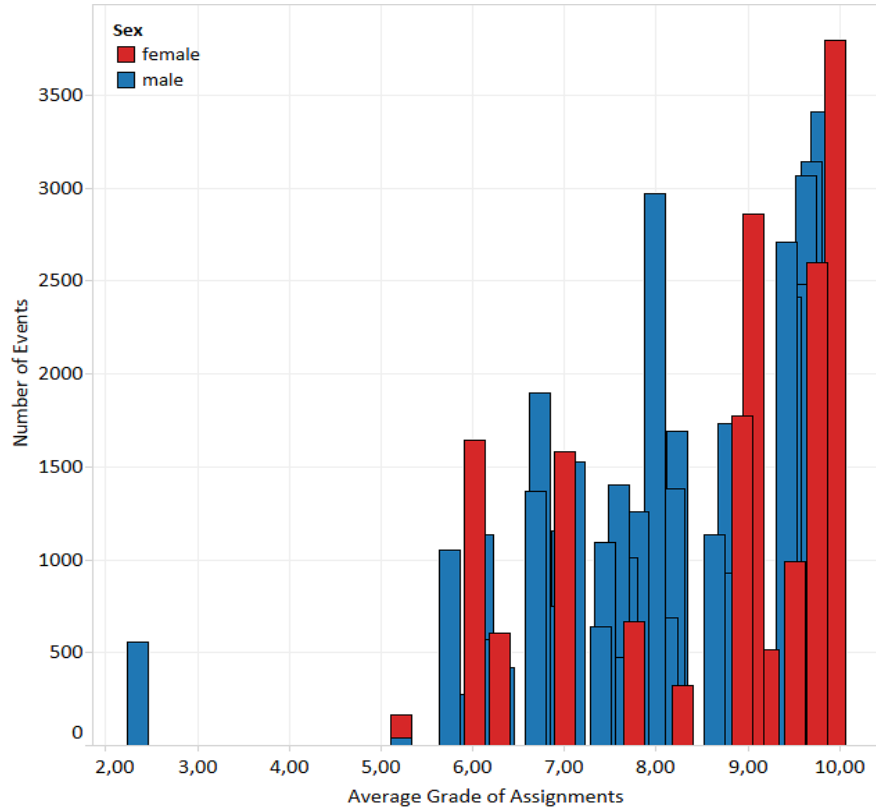


- ▶ An activity peak early in the academic year
- ▶ A descending trend before and after Christmas holidays
- ▶ A higher activity till May
- ▶ A lower activity in June, probably because students focus on studying for the final exams

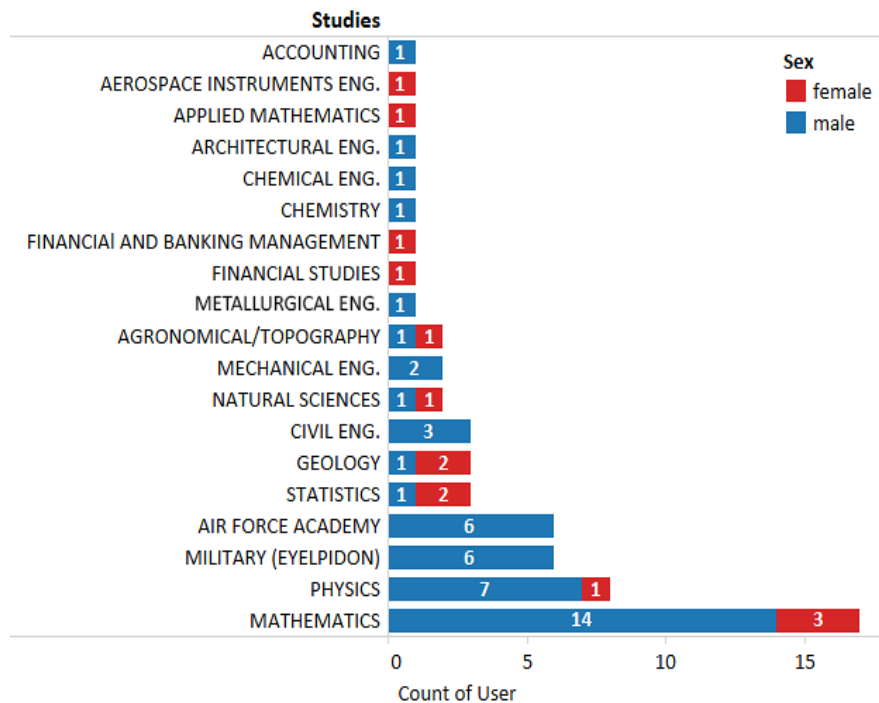
Distribution of the number of forum events



Distribution of grades



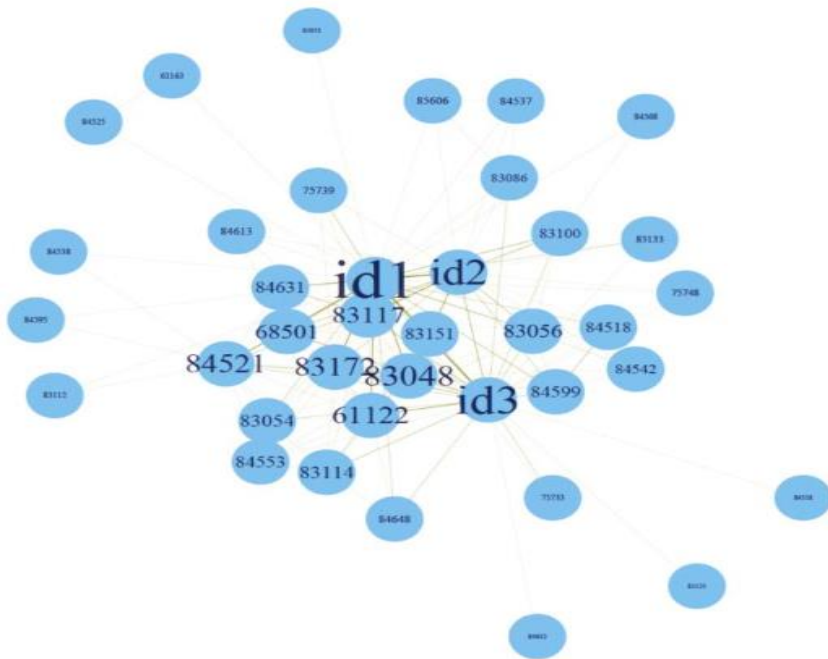
Analysis of undergraduate studies



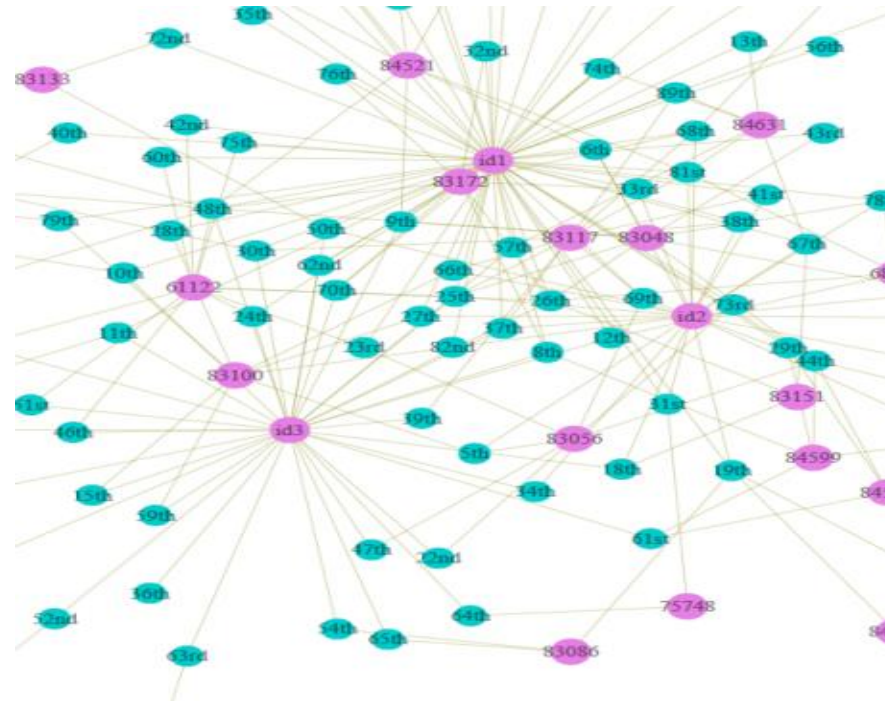
The distribution of the undergraduate studies of the students.

- ▶ The colour shows details about the sex
- ▶ The count shows the number of students for each Study.
- ▶ The most of Students origins from Theoretical Sciences as well as Military Studies

Social Network Analysis



Students and Tutors' interaction in online forum.
The size of nodes indicates the degree of participation.



The threads each student (turquoise color) participates in along with the number of different students involved in each thread (purple color).

Conclusions

- ▶ Higher number of applications from urban centers
- ▶ Decreasing number of applications in recent years due to economic crisis
- ▶ Peak age group of the applicants is 25-34 age group
- ▶ Varying forum activity depending on the season
- ▶ A direct relationship between time of forum activity and average graduation grade