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Statistical training for a large number of students

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Abstract

At the University of Natural Resources and Life Sciences in Vienna the number of newly enrolled students increased from 696 to 3025 within the last 13 years, but the scientific staff of the statistical institute remained unchanged and consists of 4 people. About 60% of these students have to pass an introductory course in statistics at the Institute of Applied Statistics and Computing. So, depending on the branch of study, 200 to 500 students have to be supervised. As it is hardly possible to train such a high number of students, an online program was developed. It allows ongoing control of knowledge without excessively burdening the scientific staff. In addition, a program was developed, which creates test tasks for a final multiple choice test. These tasks are randomly selected from an appropriate database. Test results are automatically evaluated and graded. As this specific way of education is practiced for about 15 years, capabilities, advantages and disadvantages can be evaluated.

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Keywords: high number of students; online teaching; knowledge control.

1. Introduction

At the University of Natural Resources and Life Sciences in Vienna almost every student has to pass an introductory statistics course. About 60% of these students are supported by the Institute of Applied Statistics and Computing. So in 2015 about 1800 of new enrolled students and several others who did not pass the exam in previous years have to be supervised by the staff of the institutes. As the scientific staff of the institute consists of 4 permanently appointed persons only and additionally to basic statistical education several advanced statistical

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courses have to be given, introductory and some advanced courses are based on a combination of online and offline tools. The goal of this kind of instruction is on the one hand to keep the level of statistical knowledge high for students, on the other hand, to keep the burden of teaching low for the staff of the institute. The following description of the statistics course is based on lectures for students of "Landscape Architecture and Landscape Planning".

2. Audience of statistics course

Until 2013 students attend this course in their first semester of studies. About 350 (60% female, 40% male) were enrolled to the course. 25% of all participants abandoned the course within the first 5 weeks because they left university. The drop out rate for the remaining students was about 7% to 9% and rather stable over the last 10 years. Now this course takes place in the fifth semester. The number of supervised students by the author in 2015 was 230. Roughly 30% to 40% of students attend the lecture physically until the end of the semester. There is no obligation to attend the lecture because about 50% of students have a job beside their studies (The lecture takes two hours per week during the whole semester).

3. Short outline of statistics course

Ten years ago students had to pass 3 written tests and an oral exam. As this was very time consuming, an online program was developed for ongoing evaluation. Additionally an offline program creates multiple choice tests for the final examination and grading. Students have to complete 10 online tasks at home. Three of these tasks have to be completed by the use of a statistical package (SAS or R). Finally they have to pass a written test, consisting of 2 parts. Part 1 concerns statistical basics. In part 2 some data sets are provided and students have to determine which method to use to solve a certain statistical problem or they have to interpret results of certain statistical methods.

3.1. Data generation

Data generation for online tasks is done by Fortran programs. The basics of these data are real experiments which were conducted partly at our university. Based on the ACR-random number generator (Hörmann, 1990) data which are similar to these real experiments outcome is generated. So each student gets an individual data set with unique data values and data description. Besides data generation the program also creates corresponding solutions to these tasks. Data and solutions are stored in several tables of a MySQL-database.

3.2. Online-program

The online program is based on HTML and PHP – pages. To get access to data and tasks students have to register with their name and matriculation number. Then they have to complete 10 online tasks (so they do not need to be at the university physically). Each of these tasks is activated during a limited time slot (which corresponds to the actual content of the lecture). Within this period results can be entered into an input screen and are checked in respect to accuracy. The program displays whether results are right or wrong. Errors and mistakes can be corrected without any restriction within the set time window. As soon as students are satisfied, they have to store their results.For training purposes it is possible to enter a number between 1 and 100 as a matriculation number. Then students get access to free exercises without any time restriction. These exercises are very similar to those that must be solved obligatory. This feature offers a way to train skills for solving problems in connection with a specific online task. Approximately 10 % of students make use of this possibility at least once.

Figure 1 shows the start screen. If the time window is open for the program selected, it is possible to create a data set for a specific task or to enter results for this task. Without any time restriction one can control achieved scores or can practice his skills for the final test.