

The Statistical Lab - Teaching and Learning Statistics

(Albert Geukes, Christian Grune, Negar Razi)

OVERVIEW & FUNCTIONALITY

The Statistical Lab as a working and learning environment supports teachers and students in elementary statistics' studies. It facilitates working with abstract statistical questions by offering a graphical user interface. The Lab supports students and teachers in:

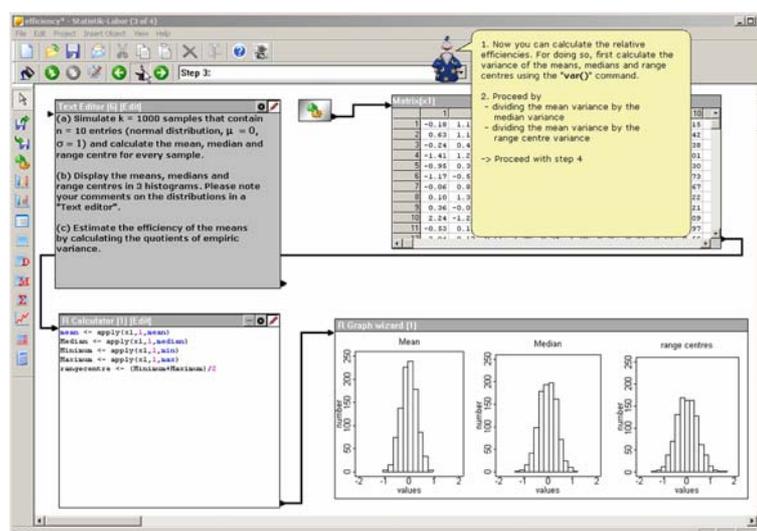
- creating and solving statistical exercises
- carrying out statistical calculations and analysis
- exploring different computational approaches for statistical problems
- easily visualizing data
- composing statistical reports

The Statistical Lab has been designed for usage throughout the entire teaching process. It can be used for data presentation, for individual learning at home, and as working environment in courses and workshops. The Lab has also been applied as examination tool.

The Statistical Lab can be extended and flexibly adjusted to meet specific needs by using the statistical programming language R: The Lab provides the "R Calculator" as co-operative interface to R. This interface is based on release level 1.4.1 of R and leaves R unchanged.

IDEA & CONCEPT

The Statistical Lab has been created to sustainably improve the statistical education at universities. One of its most important aims is to promote and support creative thinking by utilizing constructive elements in a step-by-step solution process.



The Statistical Lab consequently focuses on manipulation and analysis of real data instead of one-dimensional methods, symbols, formulas and abstract equations. Authentic statistical questions can easily be processed. The open structure of the working space supports individual approaches to these problems. Understanding theoretical problems is made easier

by interactive statistical experiments and simulations, which can be adapted to the individual needs of teachers and students.

Most steps of data analysis are made visible by user interface objects. These objects can be datasets, frequency tables or graphical diagrams. In addition to these standard objects, the Statistical Lab offers numerous possibilities for individual experimentation. Almost every R function and user-made extensions (so called userlibs) can be accessed via an interface to R.

HISTORY & FUTURE DEVELOPMENT

The Statistical Lab's core functionality has been continuously developed since 1997 at Free University of Berlin. A network of German universities (Free University, University Hamburg and University Bielefeld) has used the Lab since 1998 in the context of the project "DIALEKT: Statistik interaktiv!" in regular curricular activities. This project was supported by the German Research Network (DFN).

In 2000 a succeeding project started as a consortium of 10 German universities, again headed by the Center for Digital Systems (FU) and supported by the Federal Ministry of Education and Research: "Neue Statistik" (New Statistics). An early version of the Statistical Lab used a self-developed S-like "Lab Definition Language" (LDL) to enable statistical programming. In the context of "Neue Statistik" the Lab's statistical engine has been changed. Recent versions of the Lab, now implemented in Visual C, have an interface to an unmodified version of R 1.4.1. This interface enables statistical computing and user programming.

The change to R has been made for technical and "strategic" reasons: Since the early implementations of the Lab were based on Visual Basic, performance and stability were poor. Moreover, the growing demand among our project partners for an open statistical programming interface in order to expand the functional capabilities of the Statistical Lab was another strong motivation.

The project "Neue Statistik" ended in 2003. Together with old and new, national and international partners we are now going to establish the Statistical Lab in academic statistical education.

Future steps may consist of cooperation between the communities of the Statistical Lab and R in several fields. There can be found many points of common interests for professional statistical computing as well as for problem-based teaching statistics with real data. So it may improve both the usability and accessibility of R for beginners and make the Statistical Lab more powerful for experts' needs.

REFERENCES

Statistical Lab's Homepage
<http://www.statistiklabor.de>

Homepage of the project "Neue Statistik"
<http://www.neuestatistik.de>

Center of Digital Systems at FU Berlin
<http://www.cedis.fu-berlin.de>

Federal Ministry of Education and Research
<http://www.bmbf.de>

German Research Network (DFN)
<http://www.dfn.de>