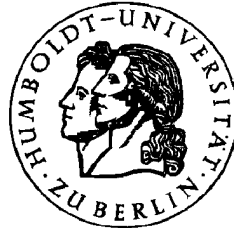


Computer–Assisted Statistics Teaching in Network Environments

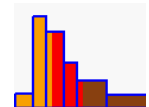
Marlene MÜLLER



August 1998 (revised March 2000)

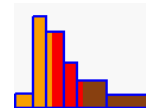
Institut für Statistik und Ökonometrie
Wirtschaftswissenschaftliche Fakultät
Humboldt–Universität zu Berlin, Germany

<http://ise.wiwi.hu-berlin.de/~marlene/x4interactive/>



Outline

- Introduction
 - Introductory statistics
 - Advanced statistics courses
- The software: XploRe
- Teaching material on the Web
- Interactive routines in the Java applet version
- Interactive displays in the Unix environment



Introduction

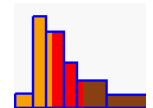
Profiles for computer–assisted teaching

- **Introductory courses**

Students learn the basic elements and methods

- **Advanced courses**

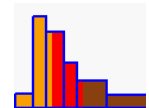
Students deal with particular statistical problems.



Introductory statistics

- only a few computer-based examples
 - computer-assisted teaching is meant to complement the course (300 students per year!)
- ⇒ computer programs are primarily presented by the teacher
- ⇒ main object is to study properties of statistical objects (e.g. variables, distributions) and methods (e.g. linear regression)
- ⇒ material should be easily accessible (WWW), mostly hardware independent, and easy to use

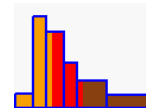
Statistics I, II



Advanced statistics courses

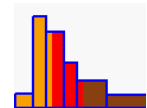
- software is directly used by students
 - course scripts in electronic form are available
- ⇒ students apply “serious” statistical methods to real world examples
- ⇒ students get an introduction into programming the methods themselves

Applied Multivariate Statistical Analysis,
Non- and Semiparametric Modelling



General Software Requirements

- for introductory courses, routines should be mostly self-explaining,
- for advanced courses, several levels of complexity should be possible: from simple and easy-to-modify macros to full-featured applications,
- easy to access software,
- network capabilities, in particular WWW integration.

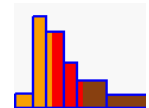


Special Software Requirements

- state-of-the-art statistical methods,
- graphics: 2D and 3D,
- user interaction
- (high level) programming language.

...

- easy to learn/program,
- computational speed.



WWW interfaces to Stat/Math Software

- **Rweb**

<http://www.math.montana.edu/Rweb>

- **StatServer (S-Plus)**

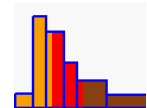
<http://www.mathsoft.com/statserver>

- **XploRe (Java version)**

<http://www.xplore-stat.de>

- **MathXplorer/JS (MathViews)**

<http://www.mathwizards.com/products/MathXplorerJ>



Statistics over the WWW

- **WebStat**

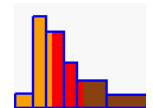
<http://www.stat.sc.edu/~west/webstat/>

- **Statlets**

<http://www.statlets.com>

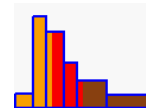
- **GASP** Globally Accessible Statistical Procedures

<http://www.stat.sc.edu/rsrch/gasp/>



Web Enhanced Courses

- **Stat 101, 201, West Virginia University**
(Java, XLisp-Stat)
<http://www.stat.wvu.edu/SRS>
- **GAUSS Programming for Econometricians**
<http://eclab.econ.pdx.edu/gpe>
- **Applied Multivariate Statistical Analysis (XploRe)**
<http://ise.wiwi.hu-berlin.de/statistik/multi.html>
- **Non- and Semiparametric Modelling (XploRe)**
<http://ise.wiwi.hu-berlin.de/statistik/npm.html>
<http://ise.wiwi.hu-berlin.de/statistik/spm.html>

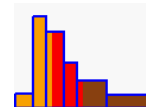


XploRe

<http://www.xplore-stat.de>

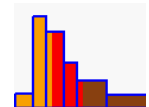
- interactive computational environment for statistics
- can be used either as standalone version as well as within a local network or the Internet

Schmelzer, Kötter, Klinke & Härdle (CompStat 1996)



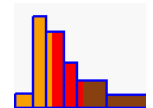
XploRe flavours

- (1) generic (standalone) versions
for Unix/X11 (Solaris/Sparc, Linux/PC, other Unices)
and for MS Windows (95/NT for PC)
- (2) Java client version
The server might run on a remote machine. The
XploRe Java client runs under Java 1.1.
- (3) Java applet version at the XploRe Web site
(<http://www.xplore-stat.de/java/java.html>)
- (4) CGI interface version



XploRe Based Teaching Material on the Web

- <http://ise.wiwi.hu-berlin.de>
- <http://www.xplore-stat.de>



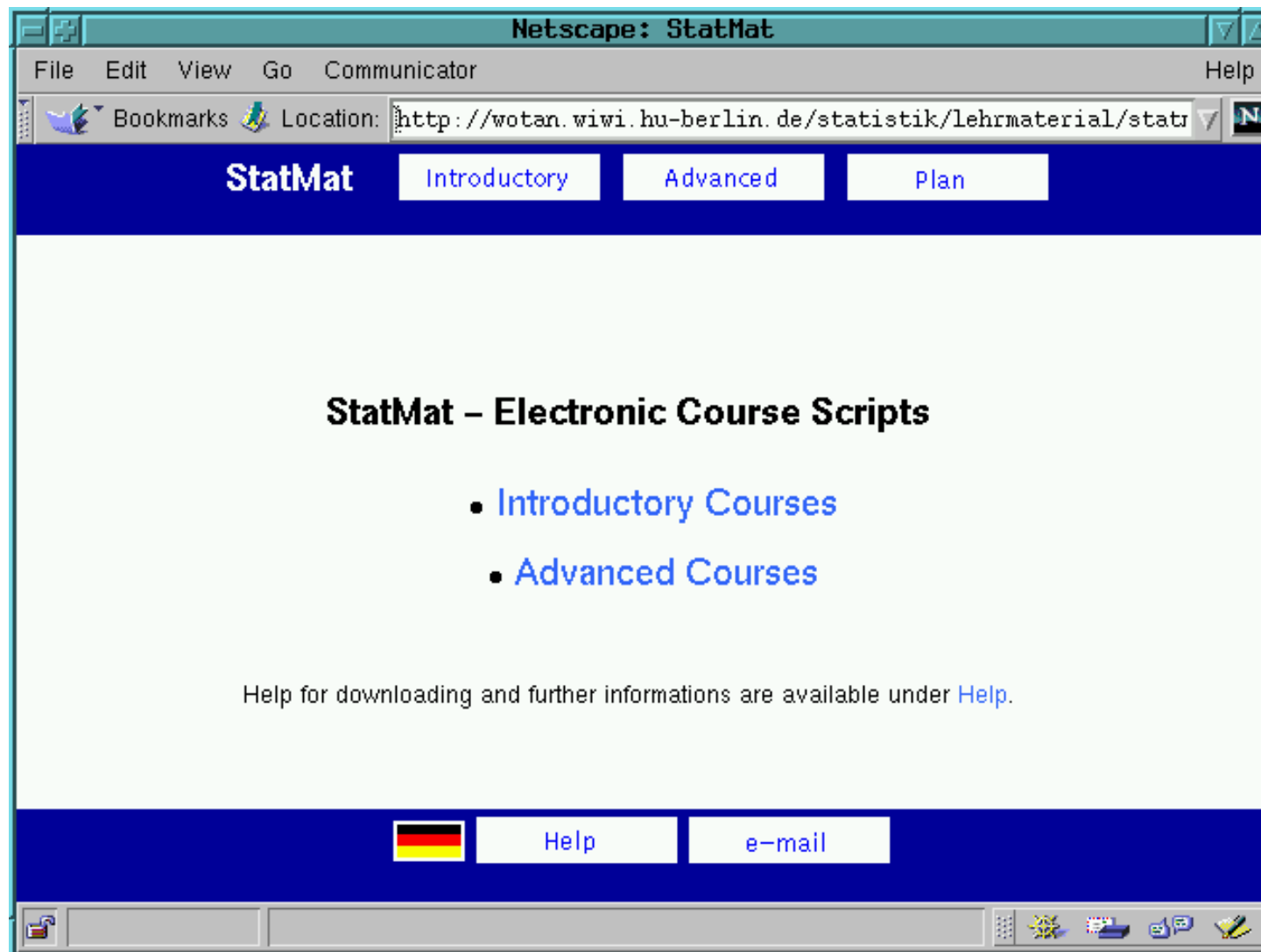
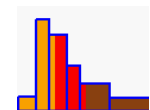


Figure 1: Web pages with course material



Electronic Scripts with hyperlinks

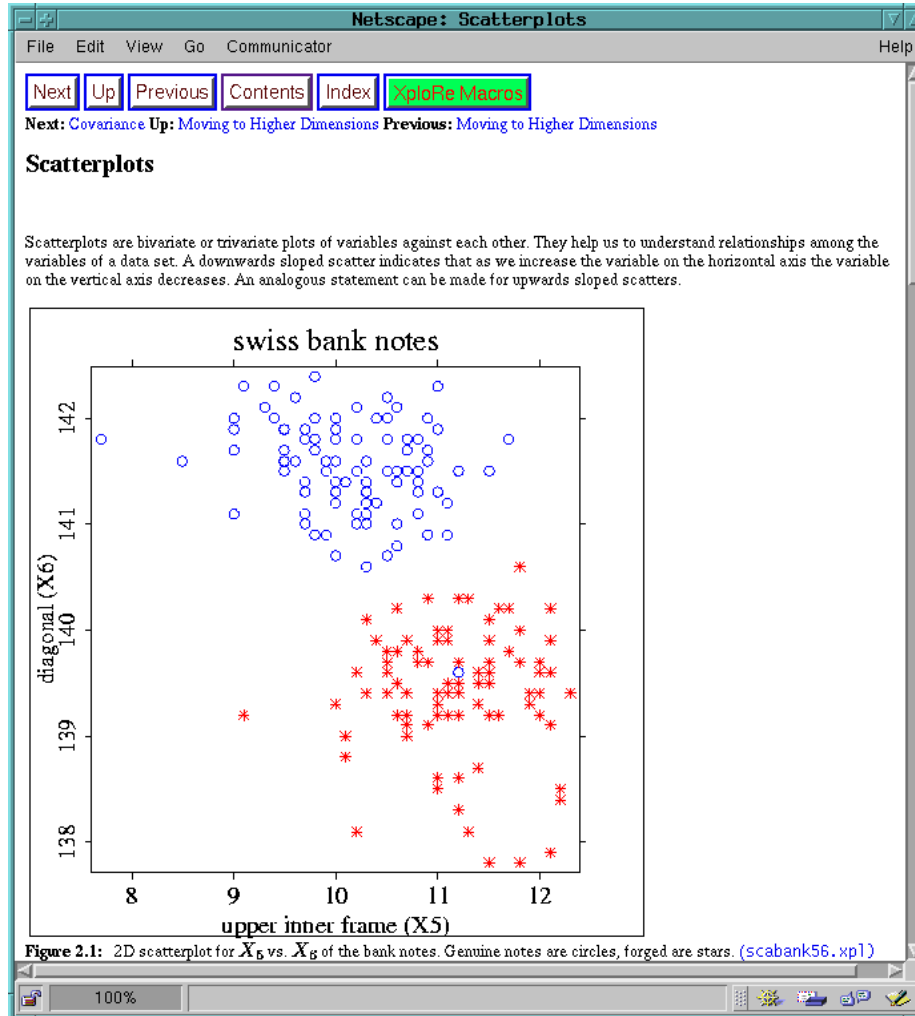
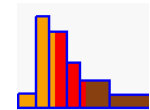


Figure 2: Electronic course script with link to XploRe routines



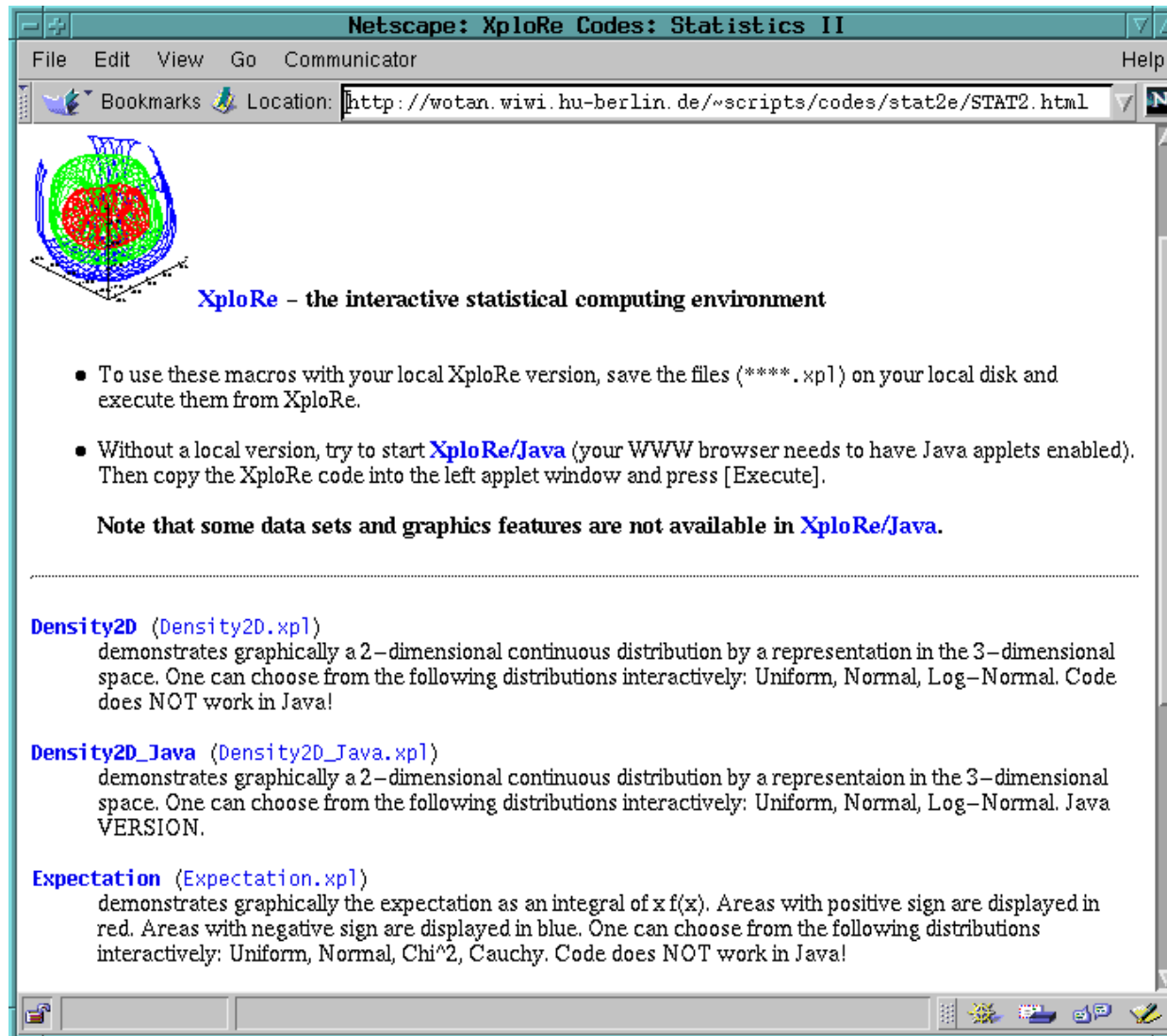
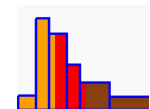


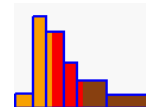
Figure 3: XploRe routines on the Web



```

; -----
; Library      AMSA
; -----
; See_also    createdisplay setmaskp show setgopt
; -----
; Macro       scabank56
; -----
; Description  scabank56 computes a two dimensional
;              scatterplot of X5 vs. X6 (upper inner
;              frame vs. diagonal) of the Swiss bank
;              notes ("bank2.dat")
; -----
;
x=read("bank2")           ; reads the bank data
Scatterplot=createdisplay(1, 1)
layout=3*matrix(100)|12*matrix(100)
color=1*matrix(100)|4*matrix(100)
xx=x[,5:6]               ; variables 5 and 6
setmaskp(x56, color, layout, 8) ; mask vector
show(Scatterplot, 1, 1, xx) ; 2D plot of variables
setgopt(Scatterplot, 1, 1, "title", "swiss bank notes")

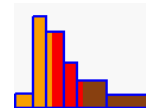
```



Interactive routines in the Java applet version

XploRe tools

- readvalue:
A input box to enter and modify parameters.
- selectitem:
A selection box to choose from a number of options.



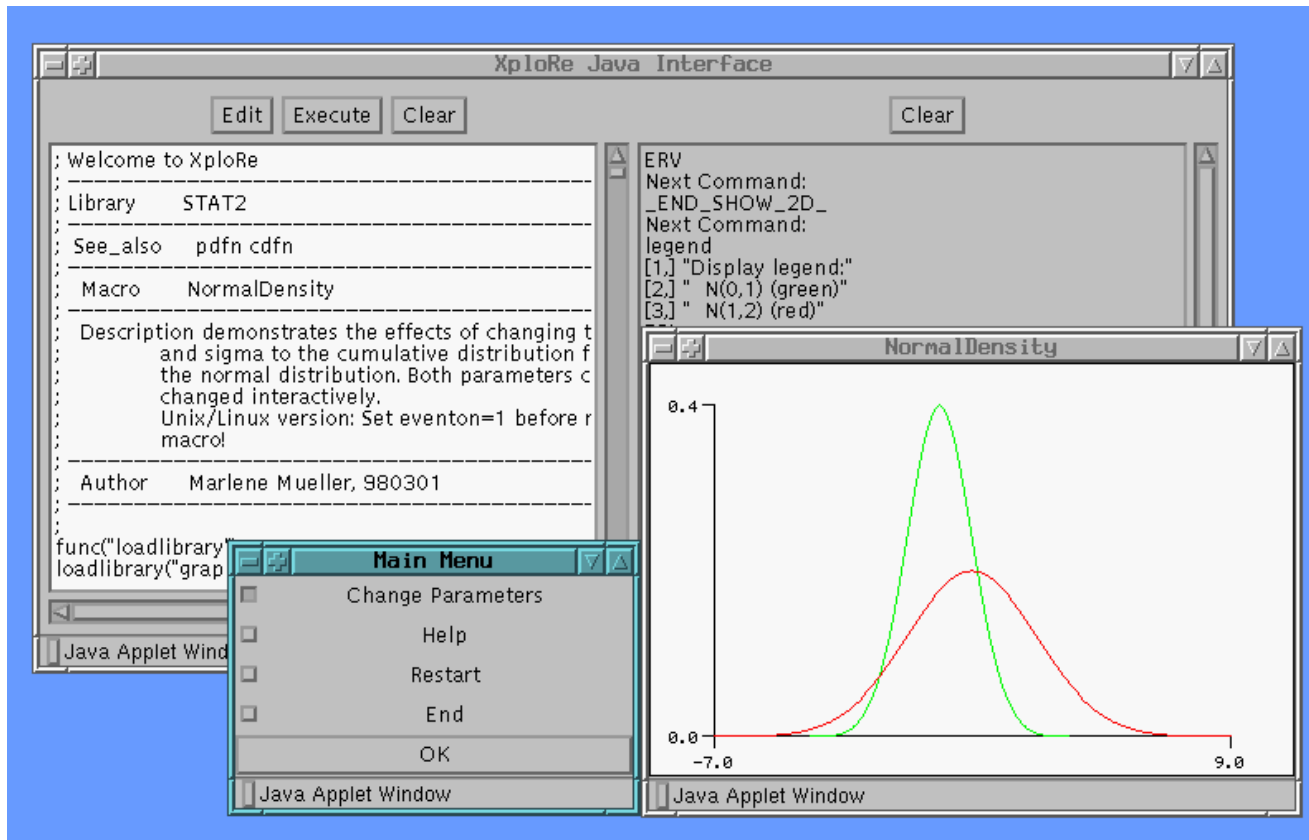
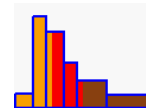


Figure 4: Normal densities in Java applet



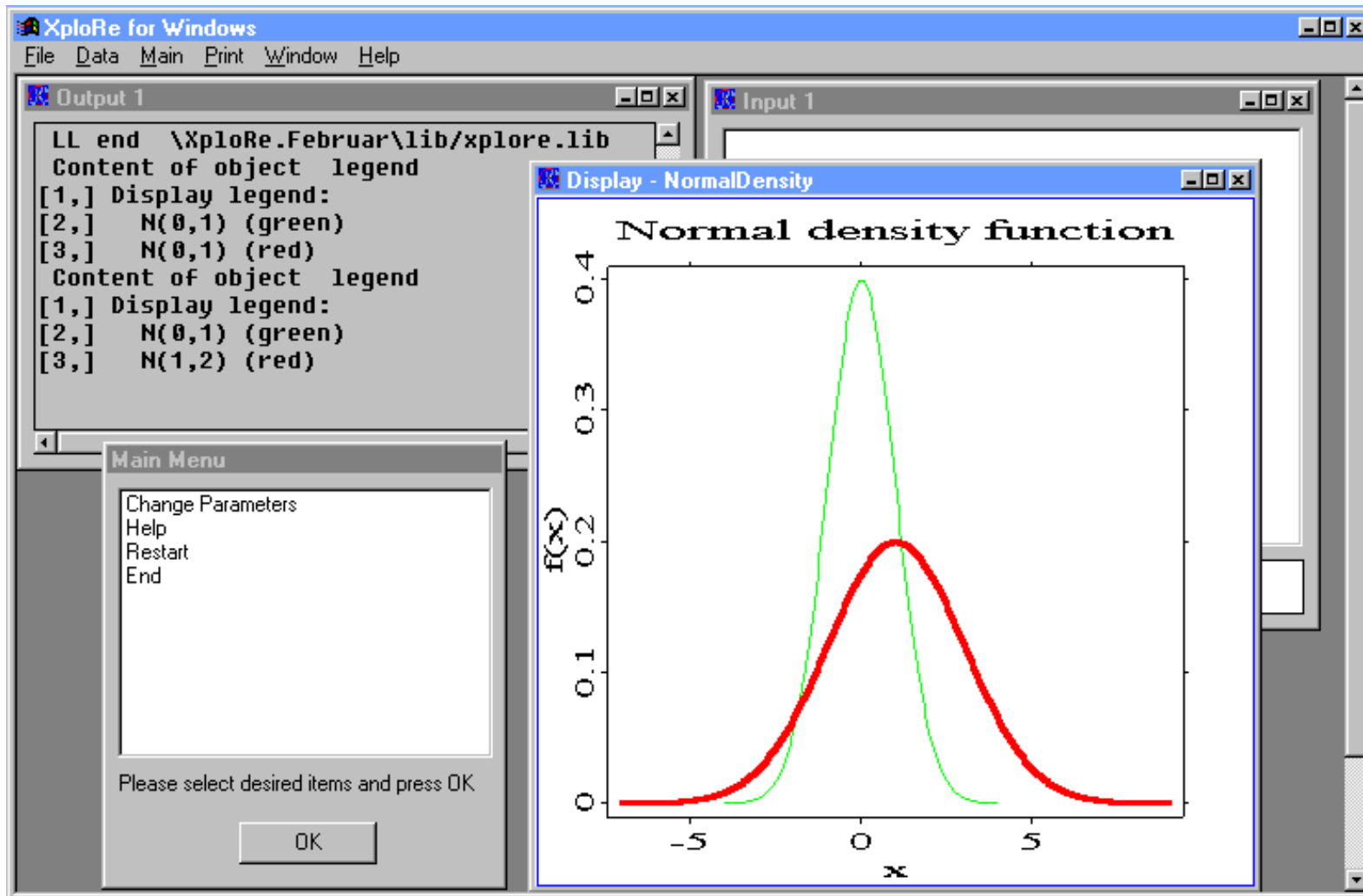
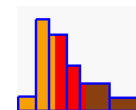


Figure 5: Normal densities in Windows version



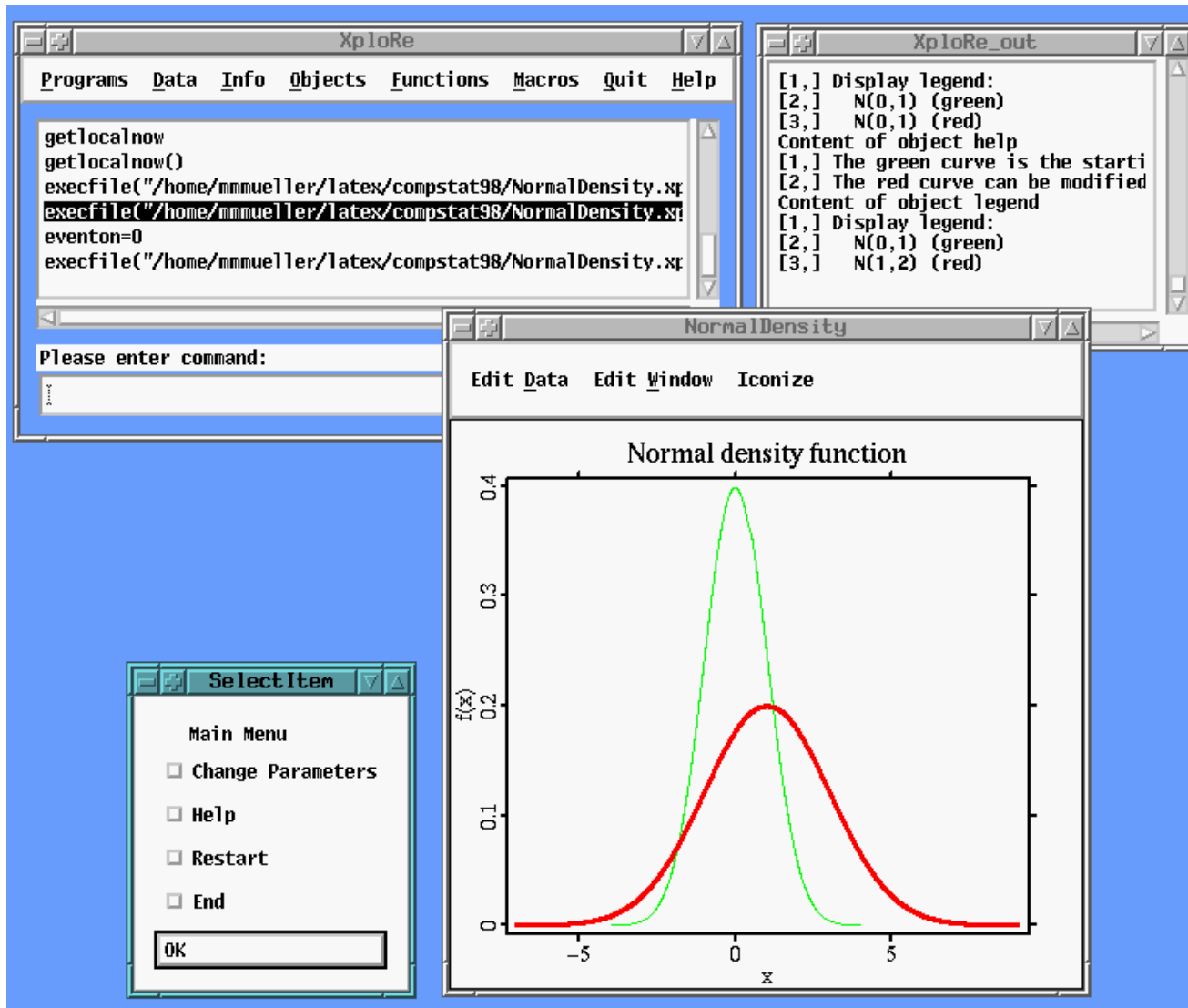
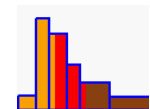


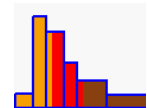
Figure 6: Normal densities in Unix version



Interactive displays in the Unix environment

basic XploRe command

- `readevent`:
Reads mouse clicks or keyboard events.



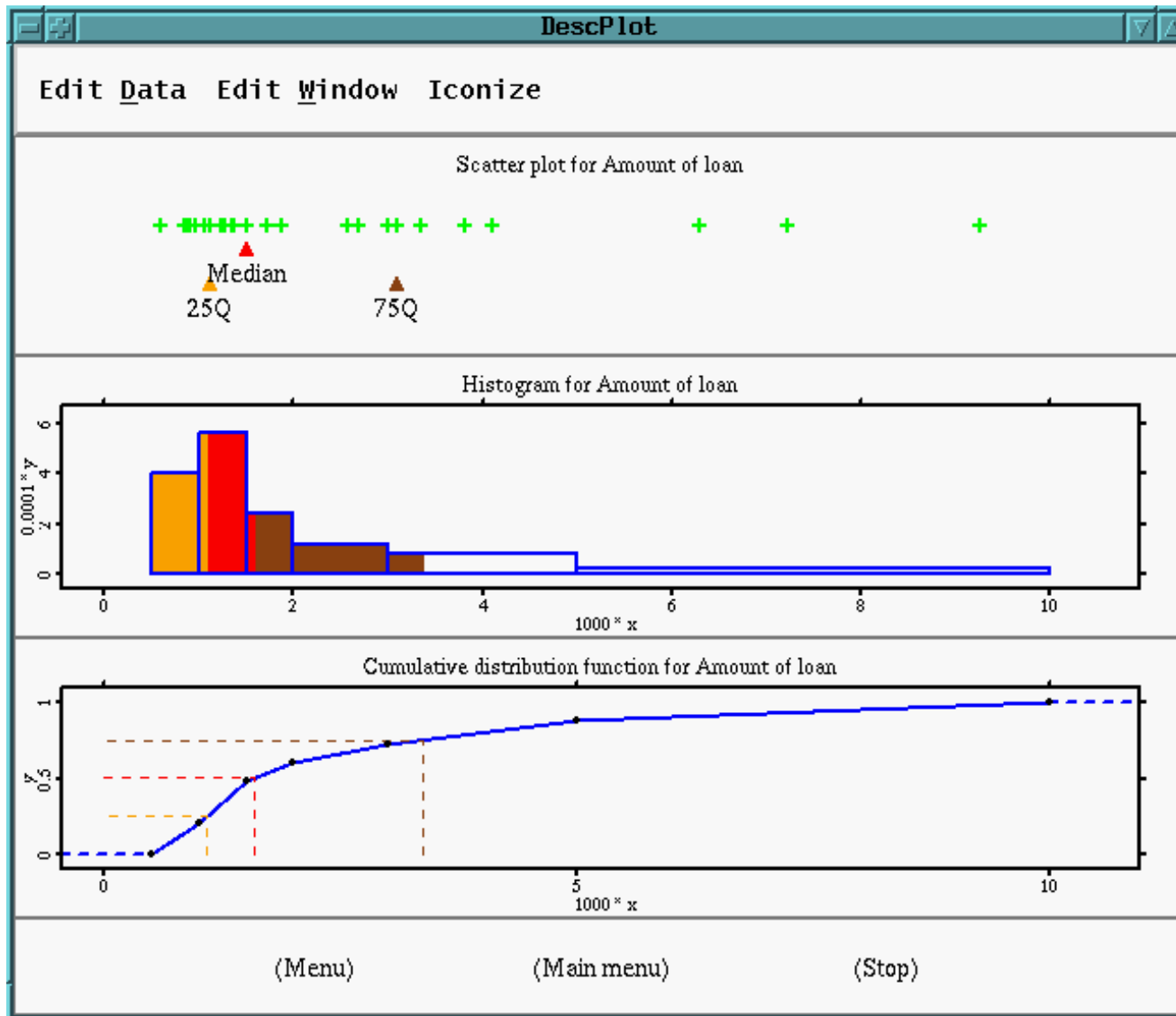
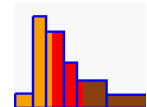


Figure 7: Descriptive statistics of Credit data



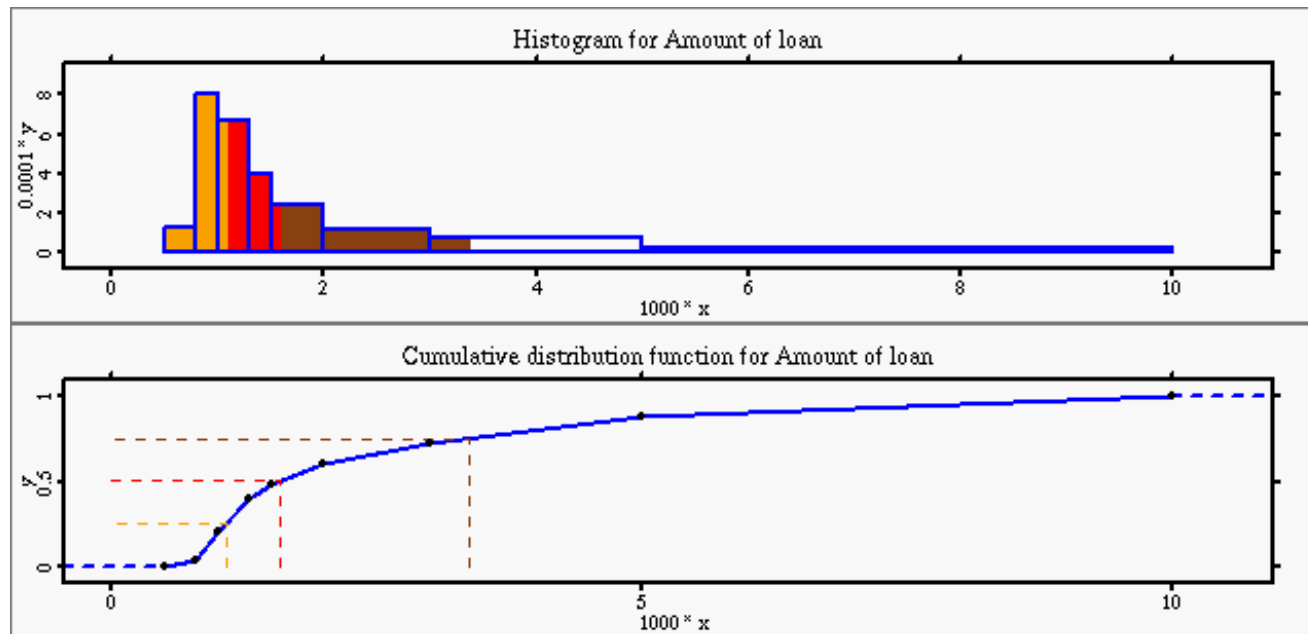
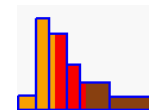


Figure 8: Descriptive statistics of Credit data with modified histogram and distribution function



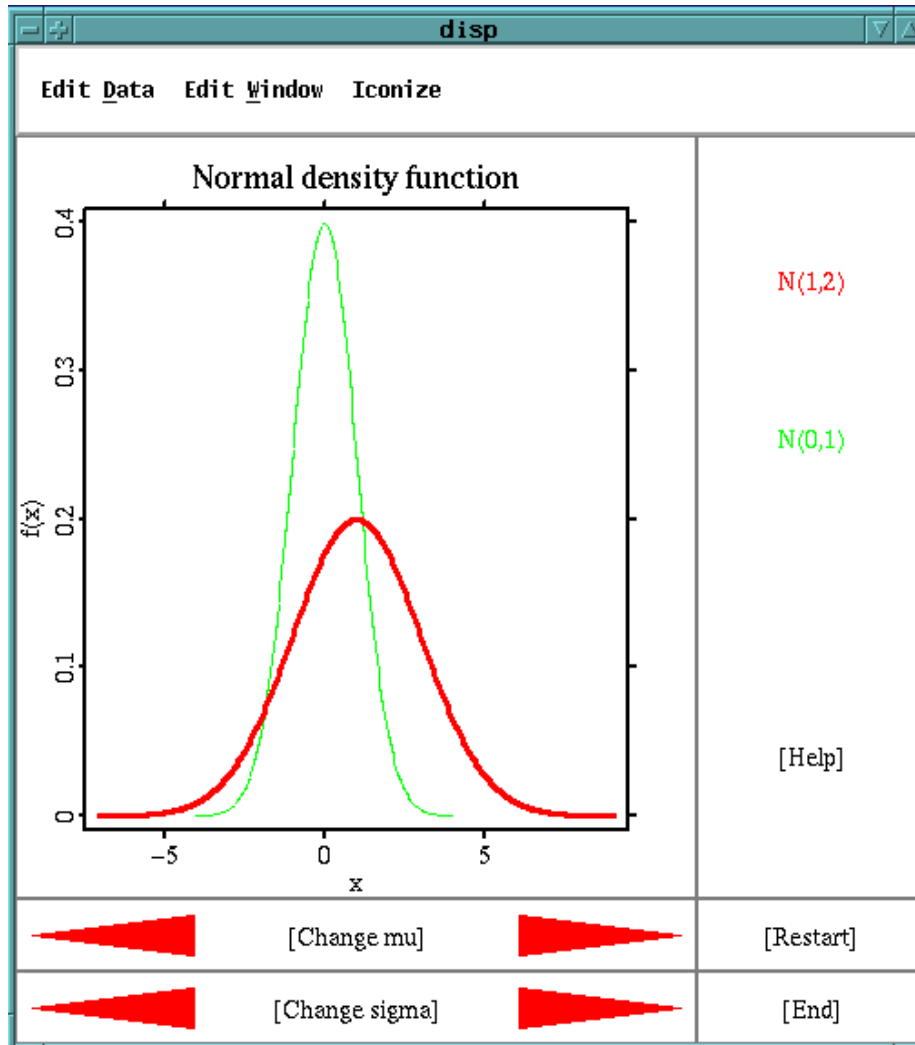
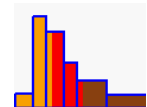


Figure 9: Normal densities in an interactive display



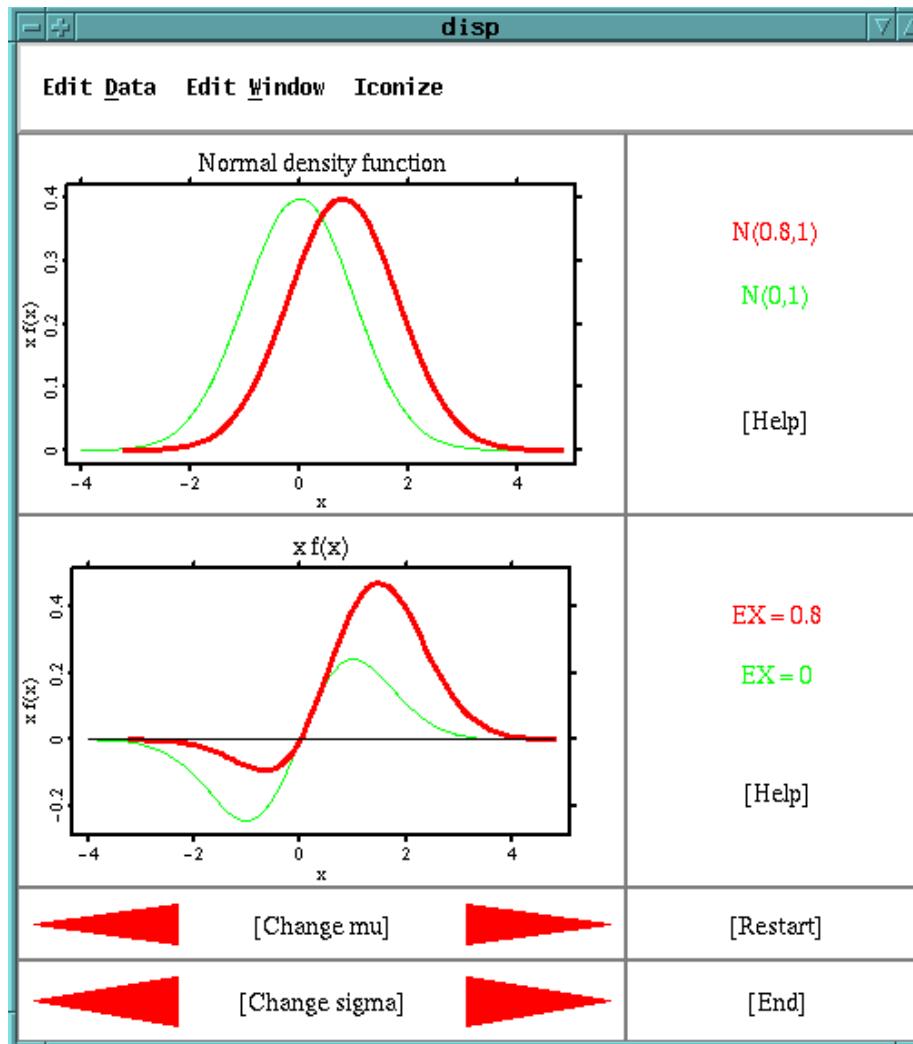


Figure 10: Normal expectations in an interactive display

