行政院國家科學委員會專題研究計畫　成果報告

爪哇程式統計軟體，數位化學習，診斷以及強穩統計方法

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行政院國家科學委員會專題研究計畫成果報告

Java Web Start Statistical Software, e-learning, regression diagnostics and robustness

計畫編號：NSC94-2118-M-029-008

執行期限：2005 年 8 月 1 日至 2006 年 7 月 31 日

主持人：**魏文翔, 東海大學統計系**

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一、中文摘要

‧Java 統計軟體

我們完成了兩套基礎統計的方法及繪圖的套裝程式，並將這兩套程式與一具有圖型使用者介面的軟體Java結合在一起，這些結果一被Computational Statistics條件接受，另一則投到某一期刊。

‧迴歸診斷及強穩統計方法

我們試圖對資料的影響度提出一整合的理論，並將強穩統計方法推廣至不同的統計模式。

‧電子化學習

我們將原有的線上案例研究加以擴充，另增加關於迴歸以及變異

數分析的模組。此外，對於迴歸分析以及多變量分析的線上課程講義亦加入網站中。

Abstract

Java Statistical Software:

JavaStat and StatGraphics, implemented using Java, are open-source, platform-neutral libraries for performing basic statistics. Commonly used statistical methods and plots in a variety of areas are implemented in the libraries within a framework designed to be easy to use, extend, and integrate with other user-friendly software. The associated UML (Unified Modeling Language) representations for modeling the object-oriented packages in the libraries are also provided. The current features of the two libraries are described. In addition, based on the two libraries, a developing statistical data analysis software, JavaStatSoft, can provide a user-friendly GUI.

Regression diagnostics and robustness

The influence function, which is the first derivative of a statistical functional, is generalized to higher order partial derivatives of a statistical functional. The second order influence function is referred to as the interaction influence function. The interaction influence function can be also used to identify the influential subsets and to develop a robust least square estimate. Numerical examples and simulation results illustrate the techniques. The definition of the interaction influence function associated with a group of observations is also described. Several applications are

given for a variety of statistical models.

E-learning:

We developed a statistical on-line case study that incorporates a game and humor. In addition, the on-line course notes for regression analysis and multivariate analysis at college level have been implemented.

二、緣由與目的

Java Statistical Software:

JavaStat and StatGraphics, implemented using Java, consist of basic modules that provide the user-level functionality for basic statistics. JavaStat and StatGraphics can be incorporated with a statistical software which provides the user-friendly GUI and highly interactive environment. The Java code in the two libraries is currently licensed under the terms of the GNU General Public License. JavaStatSoft, a developing statistical data analysis software based on the classes in JavaStat and StatGraphics, can provide a user-friendly GUI. The aim of the software is to offer a freely accessible alternative to commercial statistical software. In addition, several commonly used patterns have been used in JavaStatSoft. These patterns not only help programmers organize or polish the codes but also provide the other programmers a blueprint for examining codes, analyzing application development, and communicating software design.

Regression diagnostics and robustness

Since neither diagnostics nor robust methods alone are as useful as the

appropriate combination of both. The more the influence of the observations are learned, the more likely a sensible robust method could be developed. The goal of this project is to characterize the influence of the observations and develop a sensible robust method .

E-learning:

The aim of this web-based case is to train students to search for data via the Internet and solve problems involving confidence intervals and hypothesis tests on a population mean, a population proportion, two population means, regression analysis and one-way ANOVA. The on-line case can be attached to an existing E-learning system.

三、結果與討論

Java Statistical Software:

The packages, JavaStat and StatGraphics, implemented using Java, are open-source, platform-neutral library for performing basic statistics. One paper for the use of the packages along with the other issues has been submitted to some journal. The other paper for design patterns used in JavaStatSoft and a new framework was conditional accepted by the journal, Computational Statistics.

Regression diagnostics and robustness

A general definition of the interaction influence of a group of observations is proposed. The extensions to a variety of statistical models, including generalized linear models, proportional hazards model, M-estimator and principal component analysis, are also given.

E-learning:

A statistical on-line case study with more modules, including the ones for regression analysis and one-way ANOVA, have been implemented. In addition, the course notes for regression analysis and multivariate analysis at college level have been added to the web site.

四、計劃成果自評

Java Statistical Software:

Our result has been conditionally accepted in the journal, Computational Statistics, 2006. The article can be found by http://web.thu.edu.tw/wenwei/www/papers/revisedArticle1.pdf.

The other paper has been submitted to some journal and can be found by http://web.thu.edu.tw/wenwei/www/papers/submittedArticle1.pdf .

Regression diagnostics and robustness

The paper is still under revision. We hope a unified influence theory associated with robustness and other issues can be proposed.

E-learning:

The learning system has been implemented in the websites:

http://web.thu.edu.tw/wenwei/www/cgi/ (Chinese).

and

http://web.thu.edu.tw/wenwei/www/cgi-bin/ (English).

The on-line case study has been implemented in the website:

http://www2.thu.edu.tw/~keira/