School of Mathematics

ST3007 (ST370) — Multivariate Linear Analysis and Applied Forecasting 2009-10
(JS & SS Mathematics
SS Two-subject Moderatorship)

Lecturer: Dr. Rozenn Dahyot & Dr. Brett Houlding

Requirements/prerequisites: Basic Statistics and Mathematics

Duration: 2 terms, 11 weeks per term

Number of lectures per week: 2 lectures plus 1 laboratory hour per week.

Assessment: Compulsory module assignments, worth 40% of the final mark. The assignment marks will be divided equally, with 20% from each part.

End-of-year Examination: 3 hour examination worth 60%. The examination paper will consist of two sections corresponding to the two parts, with 3 questions per section. Students will be required to complete 2 questions from each section.

Description:

This description is from the description for 2008–09 (when the module was called ST370). Some changes can be expected for 2009–10.

See the Website `https://www.cs.tcd.ie/Rozenn.Dahyot/RzDST370.html` for further information.

Aims

This module is divided into two parts — Applied Forecasting (AF) and Multivariate Linear Analysis (MLA). Each part runs for 12 weeks. In the first semester (Dr. Rozenn Dahyot) several methods of forecasting will be examined, including exponential smoothing and its Holt-Winters extension, auto-regression, moving average, and further regression based methods that take into account seasonal trends of lagged variables. The module will be practical, and will involve every student in extensive analysis of case study material for a variety of time series data.

In the second semester (Dr. Brett Houlding) classical multivariate techniques of discriminant analysis, principal component analysis, clustering and logistic regression are examined. There is a strong emphasis on the use and interpretation of these techniques. More modern techniques, some of which address the same issues, are covered in the SS module Data Mining.

Learning Outcomes

When students have successfully completed this module they should be able to:

- Define and describe the different patterns that can be found in times series and propose the methods that can be used for their analysis.
- Program, analyse and select the best model for forecasting.
- Define and describe various classical dimension reduction techniques for multivariate data.
- Implement clustering and/or classification algorithms and assess and compare the results.
- Interpret output of data analysis performed by a computer statistics package.

Syllabus

Exploratory Data Analysis;

Classical multivariate techniques: discriminant analysis, principal component analysis, clustering and logistic regression;

Introduction to forecasting; auto-regressive models, data transformations, seasonality, exponential smoothing, performance measures.

Use of transformations and differences.

Textbooks:

1. Forecasting - Methods and Applications, S. Makridakis, S. C. Wheelwright and R. J. Hyndman, Wiley

2. Introduction to Multivariate Analysis, C. Chatfield and A. Collins, Chapman & Hall

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