

Module Description

Predictive Modelling

General Information

Number of ECTS Credits

3

Module code

FTP_PredMod

Responsible of module

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Language

Explanations regarding the language definitions for each location:

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Berne	Lausanne		Lugano	Zurich	
Instruction	<input type="checkbox"/> E 100%	<input type="checkbox"/> E 100%	<input type="checkbox"/> F 100%	<input type="checkbox"/> E 100%	<input checked="" type="checkbox"/> E 100%	<input type="checkbox"/> D 100%
Documentation	<input type="checkbox"/> E 100%	<input type="checkbox"/> E 100%	<input type="checkbox"/> E % <input type="checkbox"/> F %	<input type="checkbox"/> E 100%	<input checked="" type="checkbox"/> E 100%	<input type="checkbox"/> E % <input type="checkbox"/> D %
Examination	<input type="checkbox"/> E 100%	<input type="checkbox"/> E 100%	<input type="checkbox"/> E 100% <input type="checkbox"/> F 100%	<input type="checkbox"/> E 100%	<input checked="" type="checkbox"/> E 100%	<input type="checkbox"/> E 100% <input type="checkbox"/> D 100%

Module category

- FTP Fundamental theoretical principles
- TSM Technical/scientific specialization module
- CM Context module

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competencies

Prerequisites, previous knowledge

Basic knowledge of statistics on the level of an introductory stochastics course. Linear algebra: matrix-vector calculations. Familiarity and experience with programming, in particular with scripting languages like Matlab, Python or R. We will provide the students with a self-test to assess their prior knowledge in statistics and scripting.

Brief course description of module objectives and content

This course will provide an introductory review of the basic concepts of probability and statistics to understand probability distributions and to produce rigorous statistical analysis including estimation, hypothesis testing, and confidence intervals. Students will be introduced to the basic concepts of predictive modelling which by definition is the analysis of current and historical facts to make predictions about future events. Students will learn several techniques that account for many business and engineering applications of predictive modelling. These include regression techniques, time series models, and classification methods. Applicability and limitations of these methods will be illustrated in the light of data sets and analyses using the statistical software R.

Aims, content, methods

Learning objectives and acquired competencies

Students are able to analyze data by means of regression analysis. They are familiar with important statistical forecasting methods and are able to calculate, evaluate and interpret predictions. They are able to choose an appropriate statistical method for a regression, classification or time series problem. They are able to evaluate and compare statistical models.

Contents of module with emphasis on teaching content

Fundamental concepts of probability and statistics (repetition of basic courses) : concept of random variable, important probability distributions, covariance, parameter estimation, hypothesis testing, and confidence intervals.

Regression analysis : Simple linear regression with parameter estimation, graphical model validation, transformation of variables, confidence and prediction intervals for parameters. Multiple linear regression with parameter estimation, statistical tests and confidence intervals for parameters, and variable selection.

Classification : Concepts of classification, logistic regression, CART, random forests and model evaluation by cross-validation.

Time series analysis : STL decomposition, MA with parameter estimation, confidence and prediction bands, AR models with parameter estimation, confidence and prediction bands, autocorrelation, and model selection.

Teaching and learning methods

Lecture and practical work on computer with the statistics software R.

Literature

Lecture notes will be available in addition to recommended book chapters.

Assessment

Certification requirements for final examinations (conditions for attestation)

No

Basic principle for exams:

**All the standard final exams for modules are written exams.
The repetition exams can be either written or oral.**

Standard final exam for a module and written repetition exam

Kind of Exam	written
Duration of exam	120 minutes
Permissible aids	<input type="checkbox"/> no aids <input checked="" type="checkbox"/> permissible aids: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Electronical aids: Statistical software R in Lernstick environment, calculator <input checked="" type="checkbox"/> Hardcopy form: Personal <u>handwritten summary of 20 pages</u> <input type="checkbox"/> _____

Special case: Repetition exam as an oral exam

If an oral exam is set (only possible for ≤ 4 students), the following applies:

Kind of Exam	oral
Duration of exam	30 minutes
Permissible aids	no aids