

STATISTICS FOR ENGINEERS

Luigi Salmaso, Marta Disegna, Rosa Arboretti

Program:

The course is an introduction to statistical methods most frequently used for experimentation in Engineering. Lectures are planned both in the classroom and in computer lab also for an introduction to the use of the following statistical software:

- R
- MINITAB (licensed to University of Padova)
- RapidMiner

Topics:

1. Elements of univariate statistical methods:
 - a. Elements of descriptive statistics: frequency, indices of synthesis (position, variability and shape) and graphical representations (histogram, boxplot, scatterplot).
 - b. Elements of probability theory: discrete and continuous probability distributions.
 - c. Elements of statistical inference: sampling distributions, point and interval estimation, hypothesis testing, One-way ANOVA.
2. Linear and non-linear regression models:
 - a. Simple and multiple linear regression model
 - b. Logit model
3. DOE: Introduction to Factorial Designs, Two level and general factorial designs. Tutorials in MINITAB.
4. Supervised Machine Learning algorithms for regression (multiple linear regression model - review) and classification (logistic regression).
Unsupervised Machine Learning algorithms. Introduction to RapidMiner, Applications. Introduction to R, Applications.

References:

1. Stark, P.B., 1997. SticiGui: Statistics Tools for Internet and Classroom Instruction with a Graphical User Interface.
2. Montgomery DC, Design and Analysis of Experiments, 2010, Wiley.
3. Lattin J, Carroll JD, Green PE, Analyzing Multivariate Data, 2003, Duxbury Applied Series.
4. Adhoc material by Lecturer.

Examination and grading:

Attendance is required for at least 2/3 of the lecture hours. Final evaluation will be based on the discussion of a case study within the individual PhD project.

Practicalities related to the course

<i>Title of the lecture</i>	<i>Professor</i>	<i>Date and place</i>
Elements of univariate statistical methods; Intro to inferential statistics	Salmaso, Disegna, Arboretti	Friday the 2 nd February 2024 9:30am - 1:30pm, 2:30pm - 4:30pm Online
Inferential statistics	Salmaso, Disegna, Arboretti	Friday the 9 th February 2024 9:30am - 1:30pm, 2:30pm - 4:30pm Online
Supervised Machine Learning algorithms	Salmaso, Disegna, Arboretti	Summer School: Tuesday the 25 th of June 2024
Unsupervised Machine Learning algorithms	Salmaso, Disegna, Arboretti	Summer School: Wednesday the 26 th of June 2024
DOE with applications	Salmaso, Disegna, Arboretti	Summer School: Thursday the 27 th of June 2024
DOE with applications	Salmaso, Disegna, Arboretti	Summer School: Friday the 28 th of June 2024

Detailed structure of the Summer School in Monguelfo 2024

Tuesday 25/06/23

14:00-15:00: Welcome in "Villa San Giuseppe". At 14:45 someone will be waiting for you at the reception to walk together to the "casa Paul Troger".

15:00-15:30: Introduction to the Summer School in "casa Paul Troger"

15:30-18:00: Supervised Machine Learning algorithms for regression (multiple linear regression model - review) and classification (logistic regression).

19:30: Dinner

Wednesday 26/06/23

7:00-8:30: Breakfast

9:00-11:15: Unsupervised Machine Learning algorithms

11:30-12:30: Project Presentation + Help

12:45-13:45: Lunch
14:00-15:45: Linear/non-linear regression model, Supervised and Unsupervised ML
16:00-17:00: Project Presentation + Help
17:30-19:00: Social Event
19:30: Dinner

Thursday 27/06/23

7:00-8:30: Breakfast
9:00-12:30: DOE
12:45-14:15: Lunch
14:30-18:30: DOE
19:30: Dinner

Friday 28/06/23

7:00-8:30: Breakfast
9:00-11:45: DOE - Applications
11:45-12:15: Food & Drinks
12:15-13:00: Quiz
13:15-14:30: Lunch

GENERAL INFORMATION

All lessons will be delivered in “casa Paul Troger/ Paul Troger Haus” (Via Paul Troger, 31 Monguelfo-Tesido) while meals and accommodation will be at “Villa San Giuseppe” (via del Sole, 1 Monguelfo-Tesido).

Payment can be made directly in “Villa San Giuseppe”, no need to pre-paid anything in advanced.

To/For “casa Paul Troger”:

- by Bus: nr 441 and nr 438 (plan your journey here <https://www.suedtirolmobil.info/en/>)
- by walk (15-20 minutes)
- by car (4 minutes)

Before the beginning of the Summer School, please install the following three software:

- R: <https://cran.r-project.org>
- BlueSky: <https://www.blueskystatistics.com/Default.asp>
- MINITAB:
<https://www.dropbox.com/sh/gevaevizq4l6rn/AAB0r4kZZklRuxpAiwG4WKusa?dl=0>