



## PhD Program in Plant Sciences: Statistical Modelling

**Lecturer:** Dr. Barbara Templ, Prof Matthias Templ  
**Location:** ETH Zentrum, tbd  
**Dates:** 17.-19.03.2025  
**Credit Points:** 1 ECTS

### Course Objectives

This comprehensive course is designed to equip participants with a deep understanding of linear regression and related advanced techniques using the statistical software R. Over three intensive days, we will cover essential concepts, hands-on exercises, and practical applications, ensuring that participants leave with the knowledge and skills needed to confidently apply these methods in real-world scenarios.

Day 1: Introduction to Linear Regression and OLS Estimation - participants will delve into the fundamentals of linear regression, gaining insights into its principles and application. We will explore Ordinary Least Squares (OLS) estimation as a cornerstone technique for parameter estimation. Additionally, we will examine various goodness-of-fit measures and hypothesis testing to assess model accuracy.

Day 2: Model Diagnostics, Robust Regression, and Variable Selection - participants will learn how to identify and address potential issues in their models. Robust regression techniques will be introduced to handle outliers and non-normally distributed data. Furthermore, we will explore variable selection methods to refine and optimize models.

Day 3: Outline on advanced regression topics: Nonlinear Regression, Splines, and General Additive Models These techniques are essentially used to uncover non-linearities and improve the linear model through the insights gained from the non-linear techniques. Participants will showcase their newfound knowledge and insights in presentations.

**Prior Knowledge:** Basic knowledge of the R language would be ideal, but is not essential. Participants without prior knowledge in R will be sent some preparatory material in advance. Please demand it.

**Number of Participants:** Participation is limited to maximum 16 people.

### Individual Performance and Assessment:

In order to obtain the credit points, participants are required to attend all course days and hand in an assignment to be carried out at home. The details will be explained during the course. The assignment is due no later than one week after the course has ended.

### Special note

Students are required to bring their own computers, with the latest version of R downloaded from <https://cran.r-project.org/>. As an editor for R, we recommend to install the free desktop version of <https://www.rstudio.com> as well.