Course Information 2021-22

Course name:	Statistical Learning
Credits	6 EC
Time period	Semester 1/ Block 3
Lecturer and Coordinator	dr. Yi He (y.he2@uva.nl)
Tutor Team	dr. Jonas Meier (j.c.meier@uva.nl) dr. Yi He (y.he2@uva.nl)
Teaching Assistants (Computer Labs)	dhr. Benjamin van Casteren dhr. Wiebe van der Spek

Objectives

On completion of the course students will be able to:

- recognize the fundamental issues and challenges of statistical learning: data, model selection, model complexity, etc.;
- explain the strengths and weaknesses of many popular statistical learning approaches;
- implement various statistical learning algorithms in a range of real-world applications.

Contents

This is an introductory-level course in supervised learning, with a focus on regression and classification methods.

Topics:

- Bias-variance tradeoff and cross-validation;
- Model selection in high dimensional regression;
- Shrinkage (ridge and lasso) and dimension reduction methods
- Classification, discriminant analysis, logistic regression, and confusion matrix;
- Nonlinear models, splines and generalised additive models;
- Tree-based methods, random forests and boosting.

Teaching Method

Week 1–3:

- 2 x 2 hours lectures, 2 x 1 hour tutorials and 2 x 2 hours computer lab sessions.

Week 4

- 1 x 2 hours lecture, 1 x 1 hour tutorial and 1 x 2 hours computer lab session.

Study material:

James, G. et al. (2013).
An Introduction to Statistical Learning - with Applications in R.
Springer, first edtion, ISBN 9781461471370, ca. 430 pages (approximately €64)
(free PDF available on http://www-bcf.usc.edu/~gareth/ISL/)

Schedule

- Jan 10 *Bias-variance tradeoff and resampling*

Reading: 2.1.1, 2.2.1, 2.2.2, 5.1.1- 5.1.4, 5.2

First assignment available

- Jan 12 *High dimensional linear regression*

Reading: 3.1 – 3.4, 6.1

- Jan 17 *Shrinkage and dimension reduction methods*

Reading: 6.2 – 6.4

First assignment due on Jan 13

- Jan 19 *Classification*

Reading: 4.1 – 4.5

Second assignment available

- Jan 24 *Nonlinear models*

Reading: 7.1 – 7.7

- Jan 26 *Tree-based methods*

Reading: 8.1 – 8.2

Second assignment due on Jan 24

- Jan 31 *Course Review*

Assessment

- Two group assignments (20% x 2= 40%)
- A two-hour computer-based examination, proctored using Ans Delft (60%)

Students will pass the course if their average course grade is 5,5 or higher with a minimum grade of 5,0 for the written exam. The general rule is that students can only retake the written exam. The results obtained for the assignments will remain valid.

Examination dates:

Thursday 4 February 2022

Remarks:

Timetable on https://rooster.uva.nl/