

BIO-322

Introduction to machine learning for bioengineers

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Cursus	Sem.	Type
Life Sciences Engineering	BA5	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Students understand basic concepts and methods of machine learning. They can describe them in mathematical terms and can apply them to real-world problems using the programming language R. They are familiar with some state-of-the-art machine learning tools for life sciences.

Content

- Basic concepts of machine learning
- Linear Regression
- Classification
- Resampling methods and cross-validation
- Linear Model Selection and Regularization
- Moving Beyond Linearity
- Artificial Neural Networks (Deep Learning)
- Tree-Based Methods
- Support Vector Machines
- Unsupervised Learning
- Some state-of-the-art machine learning tools for life sciences
- Data Analysis and Machine Learning with the Programming Language R

Learning Prerequisites**Required courses**

Algèbre linéaire, Analyse, Analyse numérique, Probabilités and statistics I & II

Learning Outcomes

By the end of the course, the student must be able to:

- Define basic concepts of machine learning.
- Apply machine learning tools to real-world problems.
- Propose machine learning approaches to analyse data sets in the life sciences.

Teaching methods

Lecture, programming labs and exercises.

Assessment methods

- Programming project during the semester
- Written final exam

Resources

Bibliography

"An Introduction to Statistical Learning, with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani online available at <http://faculty.marshall.usc.edu/gareth-james/ISL/>

Ressources en bibliothèque

- [An Introduction to Statistical Learning](#)