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**
Lecture	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 data using a high-level programming language (julia/python/R).

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
- Unsupervised Learning
- Basics of Reinforcement Learning
- Some state-of-the-art machine learning tools for life sciences
- Data Analysis and Machine Learning with a high-level programming language (julia)

Learning Prerequisites

Required courses

Algèbre linéaire, Analyse, Analyse numérique, Probabilities 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 https://www.statlearning.com

Ressources en bibliothèque

- An Introduction to Statistical Learning

Websites

- https://bio322.epfl.ch

Moodle Link

- https://go.epfl.ch/BIO-322