

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
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**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, 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 <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>