Module title	**Machine Learning and Pattern Recognition**
Code	CO2
Degree Programme	Master of Science in Life Sciences
Group	Computation
Workload	3 ECTS (90 student working hours: 42 lessons contact = 32 h; 58 h self-study)
Module Coordinator	**Name**: Dr. Matthias Nyfeler **Phone**: +41 (0) 58 934 51 16 **Email**: matthias.nyfeler@zhaw.ch **Address**: ZHAW Life Sciences und Facility Management, Schloss 1, 8820 Wädenswil
Lecturers	Matthias Nyfeler
Entry requirements	The module requires a solid background in mathematics at Bachelor's level. Specifically, familiarity with: • Statistics, • probability theory, and • linear algebra. Familiarity with basic programming is required (data input/output, data structures, control structures). The module and associated practical exercises will be taught using Python. Familiarity with Python is required, including basics of plotting and visualization. Students will be provided with preparatory material. It is recommended that students have studied the module "D1 Handling and Visualizing Data" beforehand.
Learning outcomes and competences	After completing the module, students will be able to: • understand the motivation and main concepts behind machine learning • apply classification and regression techniques • know the advantages and drawbacks of individual machine learning algorithms, and make informed decisions about their application • design and validate data science experiments • solve practical problems using machine learning techniques in the context of life sciences. The objective of the module is to provide the students with the knowledge of the state-of-the-art machine learning techniques and apply them to problems of computational life sciences.
Module contents	The module covers the following topics: 1. The Importance of Machine Learning 2. Theoretical Foundations 3. Handling Data for Machine Learning 4. Practical Aspects of Machine Learning Projects 5. Feature Engineering 6. Types of Machine Learning Tasks 7. Basic Machine Learning Algorithms 8. Algorithms for Supervised Learning 9. Model Development 10. Outlook: Machine Learning and Artificial Intelligence

Teaching / learning methods	The module will consist of lectures and practical exercises. In addition to lectures, students will be required to self-study selected topics and present the project results. The presentations and accompanying code will be graded.
Assessment of learning outcome	1. Entry exam on preparatory exercises (written, closed book): 10% 2. Graded exercises during the course: 40% 3. Data challenge project work (report to be handed in 3 weeks after the course): 50%
Format	7-weeks
Timing of the module	Autumn semester, CW 45-51
Venue	Blended learning format. Presence sequences take place in Olten
Bibliography	Students will be provided with a script which includes references to additional texts. A good reference book is this one: “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow - Concepts, Tools and Techniques to Build Intelligent Systems” by Aurélien Géron A mathematical preparation course (used for the entry exam): https://moodle.zhaw.ch/course/view.php?id=5368 An introductory Python tutorial (used for the entry exam): https://acg-team.github.io/docs/intro_to_python/ The script and supporting material will be provided on Moodle.
Language	English
Links to other modules	The module is coordinated with the cooperation module “D3 Modelling and Exploration of Multivariate Data” and the ZHAW specialisation module “Neural Networks and Deep Learning”
Comments	-
Last Update	06.03.2026