Module	**Neural Networks and Deep Learning**
Code	MSLS_V5_6
Degree Programme	Master of Science in Life Sciences (MSLS)
ECTS Credits	3 ECTS
Workload	2 h lectures a week, 1 h exercises a week 60 h: 28 h contact lessons; 14 h guided exercises; 18 h self-study
Module Coordinator	**Name** Dr. Martin Schüle **Phone** +41 (0)58 934 57 84 **Email** martin.schuele@zhaw.ch **Address** ZHAW Zürcher Hochschule für Angewandte Wissenschaften Life Sciences and Facility Management Schloss 1 8820 Wädenswil
Lecturers	• Dr. Martin Schüle
Entry Requirements	The course requires a solid background in mathematics, as usually taught at the Bachelor's level, especially in: • statistics • probability theory • basic linear algebra The module and associated practical exercises will be taught using Python and Tensorflow. Familiarity with basic programming in Python is required.
Learning Outcomes and Competences	The objective of the module is to provide the students with a working knowledge of current artificial neural network (ANN) and deep learning (DL) techniques and apply them to problems in the field of life sciences. After completing the module, students will be able to: • judge on the advantages and disadvantages of different ANN and DL architectures and corresponding applications • adapt and apply suitable ANN and DL techniques to problems in life sciences • learn about new methods in the field on their own • reflect the usage of ANN and DL in a life sciences context

Module Content	The module covers the following topics: • Biological basis of ANN • Basic mathematical concepts of ANN • Basics of ANN: Perceptron, Multilayer Perceptron, backpropagation • Basics of DL: Introduction to Tensorflow, optimizers, regularization methods • Specific DL models: Autoencoder, CNN, RNN, LSTM, attention models • Case studies in life sciences
Teaching / Learning Methods	• Lectures ~30% • Guided exercises ~20% • Self-study ~50%
Assessment of Learning Outcome	• Project work during the semester (40%) • Final exam (written) (60%)
Bibliography	Lecture notes will be provided. Important additional literature will be provided on Moodle.
Language	English
Comments	The module is coordinated with the module “Machine Learning and Pattern Recognition” and the module “Advanced Deep Learning”.
Last Update	06.09.2022