



<b>Module</b>	<b>Neural Networks and Deep Learning</b>
<b>Code</b>	MSLS_V5_6
<b>Degree Programme</b>	Master of Science in Life Sciences (MSLS)
<b>ECTS Credits</b>	3 ECTS
<b>Workload</b>	2 h lectures a week, 1 h exercises a week 60 h: 28 h contact lessons; 14 h guided exercises; 18 h self-study
<b>Module Coordinator</b>	<p><b>Name</b> Dr. Martin Schüle</p> <p><b>Phone</b> +41 (0)58 934 57 84</p> <p><b>Email</b> martin.schuele@zhaw.ch</p> <p><b>Address</b> ZHAW Zürcher Hochschule für Angewandte Wissenschaften Life Sciences and Facility Management Schloss 1 8820 Wädenswil</p>
<b>Lecturers</b>	<ul style="list-style-type: none"> <li>• Dr. Martin Schüle</li> <li>• Prof. Dr. Thomas Ott</li> </ul>
<b>Entry Requirements</b>	<p>The course requires a solid background in mathematics, as usually taught at the Bachelor's level, especially in:</p> <ul style="list-style-type: none"> <li>• statistics</li> <li>• probability theory</li> <li>• basic linear algebra</li> </ul> <p>The module and associated practical exercises will be taught using Python and Tensorflow. Familiarity with basic programming in Python is required.</p>
<b>Learning Outcomes and Competences</b>	<p>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.</p> <p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> <li>• judge on the advantages and disadvantages of different ANN and DL architectures and corresponding applications</li> <li>• adapt and apply suitable ANN and DL techniques to problems in life sciences</li> <li>• learn about new methods in the field on their own</li> <li>• reflect the usage of ANN and DL in a life sciences context</li> </ul>

<b>Module Content</b>	<p>The module covers the following topics:</p> <ul style="list-style-type: none"> <li>• Biological basis of ANN</li> <li>• Basic mathematical concepts of ANN</li> <li>• Basics of ANN: Perceptron, Multilayer Perceptron, backpropagation</li> <li>• Basics of DL: Introduction to Tensorflow, optimizers, regularization methods</li> <li>• Specific DL models: Autoencoder, CNN, RNN, LSTM, attention models</li> <li>• Case studies in life sciences</li> </ul>
<b>Teaching / Learning Methods</b>	<ul style="list-style-type: none"> <li>• Lectures ~30%</li> <li>• Guided exercises ~20%</li> <li>• Self-study ~50%</li> </ul>
<b>Assessment of Learning Outcome</b>	<ul style="list-style-type: none"> <li>• Project work during the semester (40%)</li> <li>• Final exam (written) (60%)</li> </ul>
<b>Bibliography</b>	<p>Lecture notes will be provided. Important additional literature will be provided on Moodle.</p>
<b>Language</b>	English
<b>Comments</b>	The module is coordinated with the module "Machine Learning and Pattern Recognition" and the module "Advanced Deep Learning".
<b>Last Update</b>	09.08.2021