

Supplementary Module of School of Engineering

Title: Quantum Machine Learning

Shortcut: EVA_QML

Number of credits	3 ECTS
Organizer	InIT Institute of Computer Science
Performance record	Oral presentations
Start date	Spring semester
Implementation mode	14 x 3L Lectures + Exercises
Language	English
Abstract (max. 300 Chars)	<p>The goal of this course is to explore the intersection of quantum computing and machine learning to apply quantum algorithms for pattern recognition, optimization, and predictive analytics. Quantum machine learning algorithms have the potential to unlock new insights from large datasets, accelerate model training processes, and enable more accurate predictions in various domains.</p>
Module content and learning objectives	<p>Learning objectives:</p> <ul style="list-style-type: none"> • Understand the quantum advantage applied to machine learning. • Learn to implement quantum machine learning models in real-life cases. • Execute programs on an IBM quantum computer. <p>Module content:</p> <ul style="list-style-type: none"> • Quantum basics, key differences between classical and quantum machine learning, quantum advantage. • Experimenting with different data types (tabular, text, image, speech) and implementations of quantum ansätze. • Constructing a basic hybrid classical-quantum neural network, modifications of hybrid architecture. • Tricks for training quantum neural networks (non-linearity, overfitting etc.). • Solve a specific problem in a team. • Presentations of results.

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Preconditions	<ul style="list-style-type: none">• Machine learning concepts (deep learning is an advantage but not obligatory).• Basic knowledge in matrix manipulation / linear algebra.
Literature	Lecture material
Specific regulations	N/A
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