

Supplementary Course (EVA) at ZHAW School of Engineering

Title: Artificial Intelligence for Healthcare

Short Code: rEVA_AIHC

Credits	3
Profile	Computer Science (CS)
Responsible Institute /Centre	Institute of Applied Information Technology (InIT)
Responsible lecturer and contact information	Dr. sc. ETH Javier Montoya, mony@zhaw.ch
Type and duration of examinations	<ul style="list-style-type: none"> • Project-based assessment (individual or small group). • Written project report. • Oral presentation during the block course.
Start date and duration	Semester: Spring Detail: Guided self-study during the spring semester, followed by an on-site block course after the spring exam period.
Location	Winterthur/Zürich
Course type	Hybrid Block Seminar: <ul style="list-style-type: none"> • Guided self-study during the spring semester (pre-readings and preparatory assignments) • On-site block course after the spring exam period (5 full days, summer school format)
Language of instruction	English
Short description (max. 300 characters)	This module introduces artificial intelligence methods for healthcare applications, focusing on medical imaging, clinical data, and decision support systems. You'll learn to design, evaluate, and communicate AI-driven solutions for real-world healthcare tasks.
Contents and Learning Objectives	<p>Phase 1: Guided Self-Study (Spring Semester): Complete preparatory readings, and small assignments to establish a common technical foundation. This phase focuses on conceptual understanding and methodological preparation.</p> <p>Phase 2: Block Course (After Spring Semester Exams): An on-site block seminar combining lectures, hands-on exercises, group work, and project presentations, with emphasis on practical application and discussion of real-world healthcare use cases.</p> <p>Contents:</p> <ul style="list-style-type: none"> • Introduction to AI in Healthcare: <ul style="list-style-type: none"> ○ Healthcare data types: medical imaging, signals, clinical records ○ Clinical workflows and decision support systems

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	<ul style="list-style-type: none"> ○ Ethical and regulatory considerations • Machine Learning for Clinical Decision Support: <ul style="list-style-type: none"> ○ Supervised and unsupervised learning in healthcare ○ Model evaluation, robustness, and generalisation ○ Performance metrics in medical applications • Deep Learning in Medical Data: <ul style="list-style-type: none"> ○ Supervised and unsupervised learning in medical contexts ○ Foundation models and transfer learning in healthcare • Multimodal AI in Healthcare: <ul style="list-style-type: none"> ○ Integration of imaging, clinical data, and structured patient data. ○ Introduction to vision-language and multimodal models • Explainable AI (XAI) for Clinical Use: <ul style="list-style-type: none"> ○ Model interpretability and explainability ○ Human-in-the-loop systems and clinical trust • Translation to Practice: <ul style="list-style-type: none"> ○ Deployment considerations ○ Risk assessment and validation • Case Studies: <ul style="list-style-type: none"> ○ Clinical systems in digital health. <p>Learning Objectives:</p> <ul style="list-style-type: none"> • Understanding the role and limitations of AI in healthcare applications • Select and apply suitable machine learning and deep learning methods for healthcare data • Design and evaluate AI pipelines for clinical decision support • Assess model performance, robustness, and explainability • Understand ethical, legal, and regulatory requirements in healthcare AI • Communicate AI-driven solutions to both technical and non-technical stakeholders
Prerequisites	<p>Basic understanding of linear algebra and probability Programming experience in Python is recommended</p>
Literature	<ul style="list-style-type: none"> • Lecture notes, slides, and a curated code repository will be provided during the course. • Additional scientific articles and review papers will be made available as required.

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Special requirements	Personal laptop Python environment (e.g. Conda or Google Colab)			
Offer for profiles	Aviation (Avi)	<input type="checkbox"/>	Business Engineering (BE)	<input checked="" type="checkbox"/>
	Computer Science (CS)	<input checked="" type="checkbox"/>	Data Science (DS)	<input checked="" type="checkbox"/>
	Electrical Engineering (EIE)	<input type="checkbox"/>	Energy & Environment (EnEn)	<input type="checkbox"/>
	Mechanical Engineering (ME)	<input type="checkbox"/>	Mechatronics & Automation (MA)	<input type="checkbox"/>
	Medical Engineering (Med)	<input checked="" type="checkbox"/>	Photonics (Pho)	<input type="checkbox"/>
			Civil Engineering (CE)	<input type="checkbox"/>