HSLU Lucerne University of Applied Sciences and Arts

AI Application in Data Science and Engineering

eit Tech Talent
Funded by the European Union

Quality Checked

Warsaw School of Computer Science

2 ETCS

FH Zentralschweiz

AI Application in Material Science and Engineering

Course overview

This 2 ECTS microcredential course introduces key concepts, methods, and ethical considerations in machine learning (ML), with real-world examples and applied techniques. Modules include:

- Introduction to ML Concepts: Everyday examples: speech recognition, image classification; Core ideas behind how ML systems learn and improve.
- Data Preparation & Processing: Cleaning, normalization, and standardization techniques; Feature engineering and selecting relevant input variables.
- Modelling & Evaluation: Overview of algorithms: decision trees, neural networks, SVMs; Evaluation methods: cross-validation, ROC curves, performance metrics.
- Deploying ML Models: Implementing models in real-world systems; Scaling, monitoring, and addressing deployment challenges.
- Ethics & Accountability: Fairness, bias, and transparency in ML decision-making; Case studies on real-world impacts and responsible use.

Learning objectives

By the end of this course, participants will be able to:

- Recognize and explain key machine learning concepts and their practical applications.
- Apply data preparation techniques, including cleaning, normalization, and standardization.
- Use a range of ML algorithms on datasets and implement appropriate evaluation methods.
- Understand deployment processes, including scaling, monitoring, and ethical considerations.
- Develop complete ML workflows, from data processing to model training and validation.
- Design ethical guidelines for fair and transparent use of machine learning models.

Learning format

- Hands-on and example driven
- Balanced focus on technical skills and ethical awareness.
- Online final exam (pass/fail) to confirm practical understanding.

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More information and registration

21.07.2025

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AI Application in Medical Science and Engineering

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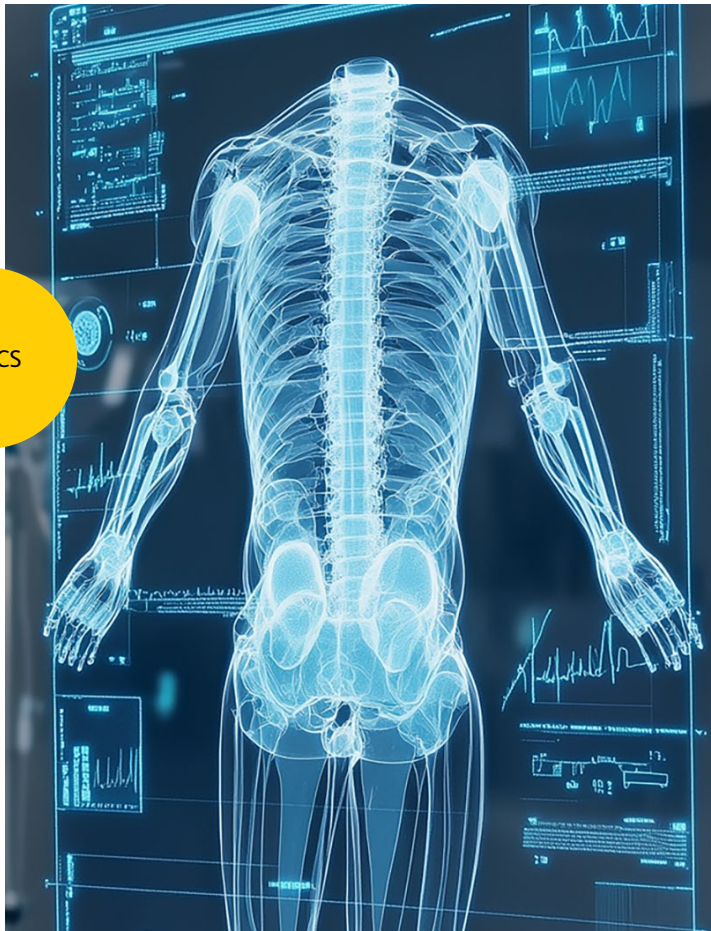

FH Zentralschweiz

AI Application in Medical Science and Engineering

Course overview

This 2 ECTS microcredential course introduces key concepts and applications of artificial intelligence (AI) in healthcare, combining theory with hands-on practice. Modules include:

- Introduction to AI: Core concepts: AI, Machine Learning, Deep Learning, Generative AI; Differences and real-world medical applications.
- AI in Healthcare:: Use cases: medical image analysis, telemedicine, therapy recommendations, conversational agents, AI-assisted hearing devices; Real-world case studies and research insights.
- Challenges in Healthcare AI: Data scarcity, quality and annotation issues; Standardization and privacy concerns; Critical discussion through practical examples.
- Model Evaluation and Selection: Performance metrics: accuracy, precision, recall, F1 score, Dice coefficient; Overfitting, underfitting, K-Fold Cross-Validation, hyperparameter tuning.
- Neural Networks and Training: Perceptrons, activation functions (Sigmoid, Softmax, ReLU); Gradient Descent, CNNs, Transfer Learning.

Learning objectives

By the end of this course, participants will be able to:

- Identify key AI concepts such as artificial neurons and convolutional neural networks (CNNs).
- Describe how AI is applied in medical imaging, diagnostics, patient recommendations, conversational systems, medical audio, and text analysis.
- Implement simple AI models for image classification and segmentation with modern frameworks from
- scratch and with transfer learning.
- Compare different AI models and assess their performance using key metrics.
- Understand the limitations and challenges of AI in healthcare.
- Experiment with AI tools for automated diagnostics and patient interaction.

Learning format

- Practical exercises using Python and Jupyter Notebooks.
- Designed for learners of all levels.
- Online final exam (pass/fail) to confirm practical understanding.

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AI Application in Material Science and Engineering

Course overview

This 2 ECTS microcredential course provides a practical introduction to machine learning (ML) and its application in material science and engineering. Modules include:

- Material Science Fundamentals:
  Core properties and microstructure of metals; Real-world use cases in energy, aerospace, and biomedical applications.
- Damage & Corrosion Mechanisms:
  Fatigue and crack propagation under cyclic loads; Corrosion processes and their environmental influences.
- Machine Learning Foundations:
  Model training and validation techniques; Algorithms such as decision trees, logistic regression, and neural networks.
- AI Tools & Reproducibility:
  Python programming with Scikit-learn, NumPy, and TensorFlow; Reproducible workflows using Git, GitHub, and Jupyter Notebooks.
- Applied AI in Engineering:
  Use of AI in damage detection, crack monitoring, and predictive maintenance; Final project applying ML to material-related scenarios.

Learning objectives

By the end of this course, participants will be able to:

- Describe typical metallic materials and their behavior under mechanical and environmental stress.
- Explain key machine learning concepts such as supervised learning, model training, and evaluation.
- Build and test simple AI models in Python using real or simulated datasets.
- Use tools like Git, Jupyter Notebooks, and Google Colab to document and reproduce analyses.
- Understand how AI can support monitoring, prediction, and decision-making in material engineerin.g
- Critically assess limitations and ethical considerations of AI use in engineering contexts.

Learning format

- Hands-on and example driven.
- Balanced focus on technical skills and ethical awareness.
- Online final exam (pass/fail) to confirm practical understanding.

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