

# **Applications of Artificial Intelligence and Machine Learning in Engineering**

## **Lecturers**

Prof. Paolo Andrea Carraro and Alessandro Pontefisso, University of Padova

Dr. Iryna Tretiak, University of Bristol

## **Topics**

The seminar will consist of a total of 10 hours (2 ECTS) and will be structured as follows: an initial 2-hour lecture (delivered by faculty members from the DTG research group on composite materials) and four 2-hour lectures (given by the visiting professor, Iryna Tretiak):

- Lecture 1 (2h): Introduction to Composite Materials
- Lecture 2 (2h): Introduction to Artificial Intelligence and Machine Learning  
Introduction to the fundamental concepts of AI and ML; overview of supervised and unsupervised algorithms; brief history and evolution of the field.
- Lecture 3 (2h): Neural Networks and Deep Learning  
Structure and functioning of neural networks; introduction to deep learning; capabilities and limitations.
- Lecture 4 (2h): Data Management in Machine Learning: Collection, Analysis, and Challenges  
Types of data relevant to engineering: sensors, time series, images.
- Lecture 5 (2h): Case Studies – Applications of AI in the Field of Composite Materials  
Presentation of research projects conducted by the visiting professor:
  1. Data scarcity in deep learning: combined use of real and synthetic data for predicting composite compaction.
  2. AI for AFP (Automated Fiber Placement): classification and prediction of defects.
  3. Impact of voids on the strength of composites: using AI to correlate internal defects and mechanical properties.

## **Timetable**

January 2026

## **Hours/credits**

10 hours/2 ECTS

## **Location**

Nuovo complesso Universitario di Viale Margherita, Viale Margherita 87, Vicenza

## **Lecture format**

The format will include traditional lectures, with Q&A sessions and interactive discussions with participants using digital classroom engagement tools.

**Admission**

Registration in the Stem website

**Examination**

To be defined