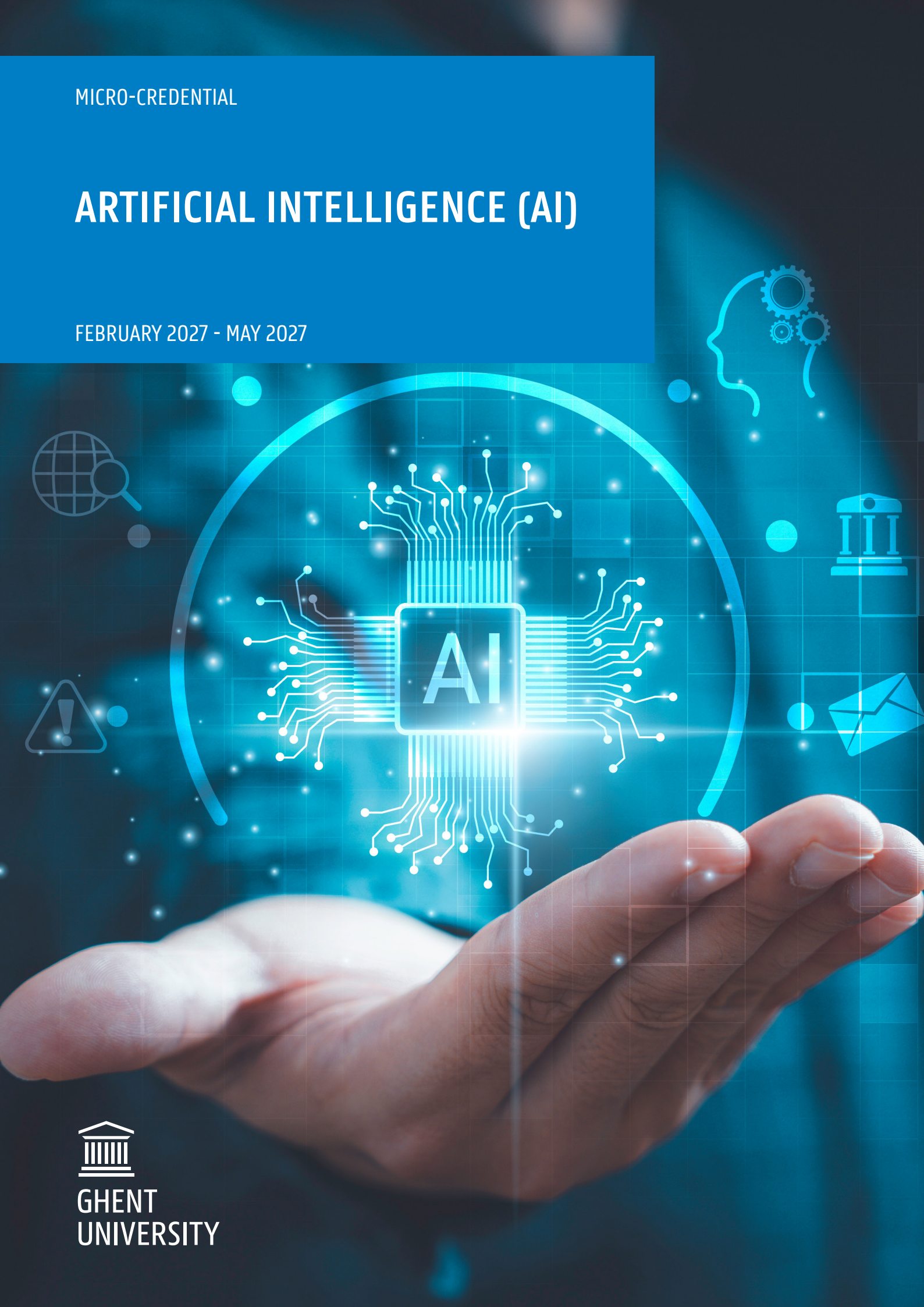
MICRO-CREDENTIAL

ARTIFICIAL INTELLIGENCE (AI)

FEBRUARY 2027 - MAY 2027



GHENT UNIVERSITY

Micro-credential Artificial Intelligence

This course aims at providing insight in the fundamental concepts of the theory and applications in the broad Artificial Intelligence discipline. An overview of the most commonly used methods and models is presented, of which a number are treated in depth. Especially, focus is put on the topic Machine Learning (particularly neural networks and deep learning) and data driven model building, including Bayesian learning. We start from the theory of supervised learning with basic linear regression and linear classification problems gradually building towards more complex supervised learning tasks. Then we turn to unsupervised learning, and particularly dimensionality reduction and clustering. The course also places machine learning into a broader perspective of Artificial Intelligence, where we also investigate problem solving agents (search and game playing), decision problems (including Markov decision processes), and basics of reinforcement learning.

In this way, by the end of the course, all the concepts and topics covered are brought together to tackle the most challenging problems of autonomous decision-making and rational action under uncertainty.

The theoretical classes are complemented by exercises, including computer-based exercises and demonstration sessions

PROGRAMME

⇨ Module 1: Introduction: survey of AI

- Survey of AI
- Fundamental machine learning concepts (dataset, training set, validation set, dimensionality, overfitting, bias and variance, cross validation)
- The rational agent concept
- Introduction to search problems and games

⇨ Module 2: ML: Regression and Classification

- Logistic regression
- Classification
- Clustering
- Construction of data driven models
- White-box models and parameter estimation
- Black-box models (Perceptron and neural networks)

⇨ Module 3: ML: Reasoning under uncertainty

- Bayesian reasoning and learning
- Bayesian networks and inference
- Design Of Experiment

⇨ Module 4: Societal context

- Ethical dimension
- Limitations of AI/ML
- Illustrations

⇨ Module 5: Search problems

- Informed search; local search
- Games (minimax, expectimax)

⇨ Module 6: Decisions and actions

- Rationality, Decision networks
- Markovian Decision Problems (MDP)
- Reinforcement Learning (RL)

⇨ Module 7: More advanced AI

- Reasoning over time; Prediction; Viterbi
- Fundamentals on Hidden Markov Models and Dynamic Decision networks
- Examples from Robotics and/or Computer vision and/or NLP

TARGET AUDIENCE

This course is targeted at professionals who are involved in, or impacted by, the development and deployment of intelligent systems and wish to deepen their understanding of Artificial Intelligence. It is designed for those seeking to advance their skills in designing, evaluating, and implementing AI techniques for automatic data analysis, such as classification and clustering, as well as for more complex tasks involving decision support and automation.

LECTURER-IN-CHARGE

Prof. Aleksandra Pizurica, Department of Telecommunications and Information Processing, Ghent University

COMPETENCES

⇨ Having an overall view on the different generic problem classes in the AI discipline
⇨ Having insight in the fundamentals and concepts underlying commonly used solution techniques in this discipline, especially focussing on data driven model construction (white box as well as black box)
⇨ Having a thorough understanding of search strategies, focussing on decision problems (Markovian Decision Problems and the connection to Reinforcement ⇨ ⇨ ⇨ Learning, planning problems in dynamical environments).
⇨ Solving specific problems in AI using the methods of this course (and extending these methods as needed in terms of applicability and context), as well on paper as in Python.
⇨ Being able to assess the limitations and ethical consequences of AI-techniques.

PRACTICAL INFO

⇨ **FEE** 393 €
⇨ **LOCATION** Universiteit Gent, Campus Ledeganck, Gent & Campus Technologiepark Zwijnaarde
⇨ **TIME** February 2027 – May 2027

For the full program & all info go to ⇨ **WWW.UGAIN.UGENT.BE/MCAI**