

## AI ADVANCED

Background knowledge in informatics or mathematics is required.

Target group: MINT teachers and secondary school students (e.g. technical high school) with some background and a lot of interest in the field but also apprentice and re-train people who are already in daily business.

The objective is to create elite, highly educated graduates in this subject. The goal is to enable people to ***understand technology*** and ***implement applications***.

The graduate of the **AI Advanced** training...

### 1. Is familiar with different AI areas and frameworks and is aware of ethical, social and legal implications of AI systems.

- I can understand technical, social, economic ethical and legal implications of the application of AI on a broader basis.
  - Ethics and technological impact and risk assessment,
- I am able to describe the different AI areas and their fundamental challenges and questions behind.
  - Natural Language Processing – the ability of computers to communicate with people in natural language.
    - Speech/voice recognition and natural language processing: how to process speech (auditory input) and language
  - Computer Vision: how to process visual input; the analyzing of images to find features of the images; object recognition
  - Machine Learning
  - Big Data
  - Knowledge based systems – Systems that contain a ‘database’ of knowledge and can help in finding information, making decisions and planning.
    - Knowledge Representation and Reasoning: how to represent the world and reason about it efficiently
  - Planning
  - Common sense knowledge
- I am aware of the most common frameworks in those AI areas

### 2. Masters the required mathematical basics and is able to understand and describe basic AI concepts.

- I am aware of the fundamental mathematical concepts and I am able to solve specific tasks by using those concepts.
  - Probability/statistics (Bayesian network/graphical model, neural nets)
  - Calculus (derivatives for gradients)
  - Basic Algorithms (complexity comparison)
  - Logic (both first order and propositional)
  - Computer science (relations, programming, databases, etc.)

- Study of algorithms (completeness, optimality, etc.)
  - Discrete mathematics
  - Linear algebra (vector, matrices, multidimensional spaces, solving equations, etc.): e.g. for supervised/unsupervised learning, ...
- I can describe the basic AI concepts and I am able to solve certain tasks by using those concepts.
    - problem solving by search (discrete mathematics, completeness, optimality, ...)
    - logic and reasoning (logic)
    - data driven (statistic)
    - artificial neural networks
- 3. Is able to describe problems, which require an AI-related solution, in a formal way, and furthermore, is able to efficiently solve those problems by applying adequate algorithms.**
- I am able to analyze and understand a problem.
  - I am able to select appropriate representations for the problem.
  - I am able to use this representation to represent the problem.
  - I can solve the problem by applying an adequate algorithm.
- 4. Knows the fundamental properties of problems, representations and algorithms.**
- I know the fundamental properties of representations and algorithms.
    - runtime, memory, completeness, correctness
  - I can derive the properties of a given problem.
    - complexity, predictability
- 5. Is able to analyze, configure, maintain and integrate an existing AI tool and is able to systematically design and practically implement an AI system for a given application.**
- I can understand and apply AI tools which already exist.
    - e.g. applying AI libraries, frameworks, combining technologies,...
  - I can extend already existing tools
    - e.g. road traffic regulation for autonomous cars