

Course Specification Document

Title	Advanced Applications in Artificial Intelligence
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Credits	4.5 ECTS
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Aims	This course aims to introduce the student to a range of advanced applications in the field of artificial intelligence, with a particular focus on the latest research in deep learning and its applications. The course also introduces the student to the intelligent applications that have not been covered in other specialized courses within the "Software Engineering and Artificial Intelligence" program, through interactive workshops and specialized lectures.
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Intended learning outcomes

On successful completion of this course, the student will be able to:

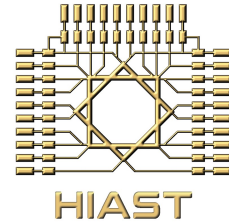
- Define the concepts of MetaLearning and Generative Artificial Intelligence.
- Identify issues of Virtual Reality and Augmented Reality and use ThreeJS tool to build their applications.
- Recognize methods for time series prediction.
- Understand and implement the concepts and the solutions of TinyML.
- Recognize the applications of artificial intelligence in software engineering and artificial intelligence applications for people with disabilities.
- Understand the fundamental concepts of robotics and the artificial intelligence methods used in dealing with its issues.
- Familiarize himself with deep learning techniques used in audio processing.
- Understand the methods for handling privacy issues in deep learning.
- Utilize CoppeliaSim simulator to apply artificial intelligence concepts in robotics.

Syllabus

- **Advanced concepts in machine learning:** Meta Learning, Generative AI.
- **Workshop on virtual reality and augmented reality:** Basic concepts of virtual and augmented reality, practical experiments using ThreeJS tool, surface recognition and object positioning control, image recognition and object association.
- **Time series forecasting:** Understanding the uniqueness of learning in time series, traditional time series prediction algorithms (ARIMA), deep learning methods for handling time series.
- **TinyML workshop:** Introduction to TinyML and its practical application in machine learning, challenges of TinyML and methods to address them.

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- **AI applications to software engineering problems:** Code generation systems and deep learning techniques to assist in their achievement, deep learning methods used to understand and represent software requirements, intelligent systems assisting in project management.
- **AI applications for people with disabilities:** Understanding AI applications in assistive systems for people with disabilities and the methods used to implement such applications.
- **Deep learning models for audio processing:** Pre-trained famous models for speech signal representation, deep networks used in speaker recognition tasks.
- **Workshop on AI applications in robotics:** Basic concepts in robotics and robot navigation problems, deep learning and reinforcement learning methods used in solving robot problems, practical application using CoppeliaSim robot simulator.
- **Privacy issues in deep learning:** Definition of privacy issues and their importance when dealing with personal data during training, machine unlearning problem and methods to achieve it in deep networks.