UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Ambient Intelligence and Domotics

2627-1-F9103Q043-F9103Q04302

Aims

The continuous and rapid development of sophisticated sensing devices and advanced AI methods makes it possible to realize intelligent environments that unobtrusively monitor and support people in their daily life. Such systems may operate indoors (e.g., smart homes, smart buildings) as well as outdoors (e.g., wearable devices, smart cities). The aim of this course is to teach how to design and implement intelligent systems in such Ambient Intelligence scenarios (e.g., Human Activity Recognition, Indoor Localization), considering both technological and methodological aspects.

Contents

The course will introduce context-awareness as a fundamental concept for Ambient Intelligence systems. The program includes a presentation of relevant technologies (e.g., sensing devices) as well as AI methods for Ambient Intelligence (e.g., human activity recognition).

Detailed program

- Introduction to ambient intelligence and context-awareness
- Internet of Things and Sensor Data Management
- Deep Learning for Time Series Analysis
- Indoor localization in Smart Environments
- Smart Energy Management in Smart Homes
- Human Activity Recognition with Mobile/Wearable Devices
- Human Activity Recognition in Smart Homes
- Advanced AI methods for Ambient Intelligence (e.g., federated learning, continual learning, transfer

learning, GNNs)
- Explainable AI for Ambient Intelligence
- Generative AI methods in Ambient Intelligenve

The lab lessons will propose practical hands-on on AI methods for Ambient Intelligence

Prerequisites

Python programming, basics of supervised and unsupervised deep learning.

Teaching form

Teaching with both theory (32 hours) and lab lessons (24 hours):

- 16 theory lessons (2 hours each) in presence
- 6 lab sessions (4 hours each) in presence

Textbook and teaching resource

The main teaching resources are the slides and online material provided by the teachers.
We will also provide relevant scientific papers for each covered topic.

Semester

Second semester

Assessment method

Written exam and individual project.

The written exam will be a combination of multiple choices and open questions on the theory part.
Students will be evaluated on their knowledge on the concepts introduced during the theory lessons.

The individual project will be chosen by the student in agreement with the teachers, and it will include the implementation of an AI method for Ambient Intelligence and its evaluation on a public dataset.
There will be a project discussion with an oral evaluation. Students will be evaluated on: a) the correctness of the code, b) their skills in pre-processing Ambient Intelligence datasets, c) their skill in applying and evaluating AI methods for Ambient Intelligence.

This course will not have mid-term exams.

Office hours

On appointment. Contact the teachers via email.

Sustainable Development Goals

QUALITY EDUCATION