INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Machine Learning 2 – 5A
Embedded AI for IoT

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Course objectives
Last year – 4A-IR/AE : Machine Learning

At the end of this module, the student will

1. have understood and be able to explain :
   - The characteristics of supervised and unsupervised learning problems,
   - The main basic methods and algorithms to deal with these problems,
   - 4IR : additional unsupervised learning methods,
2. be able to use these methods through the scikit-learn Python library to solve practical problems.

Course objectives
This year – 5A : Embedded AI for IoT

At the end of this module, the student will

1. have understood and be able to explain :
   - **The specificities of AI at the edge,**
   - **The main optimization methods enabling the embedding of AI algorithms.**
2. be able to use these methods through **Python libraries to solve practical problems with IoT data**.

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Section 1

Introduction : Embedded AI for IoT

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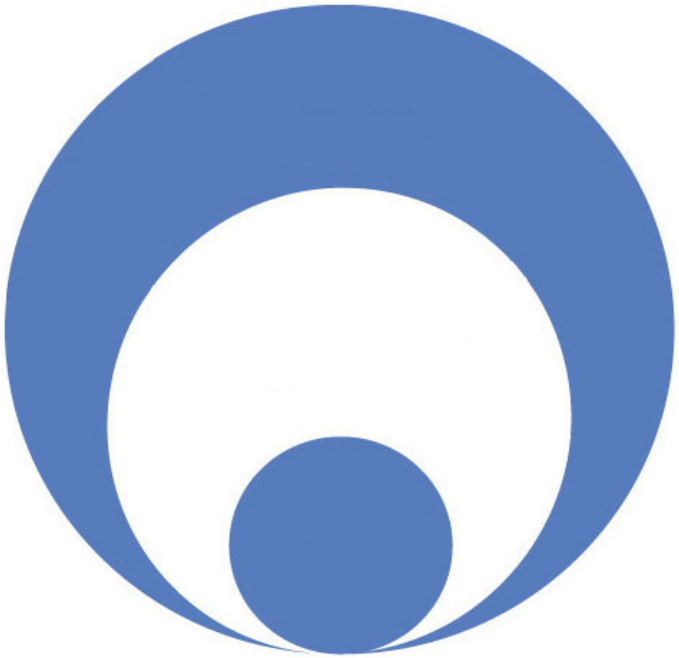
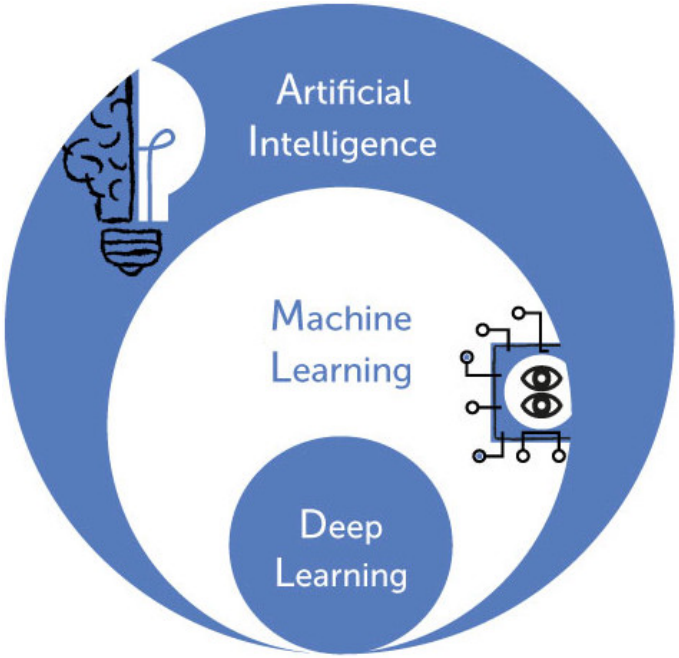
Embedded **AI** for IoT
Artificial intelligence (AI) and machine learning (ML)



How do you place *Machine Learning*, *Deep Learning*, and *Artificial Intelligence* here ?

Embedded **AI** for IoT
Artificial intelligence (AI) and machine learning (ML)



Machine learning is a "Field of study that gives computers the ability to learn without being explicitly programmed."

Arthur Samuel (1959)

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T , as measured by P, improves with experience E ."

Tom Mitchell (1998)

Embedded **AI** for IoT
Applications of ML : which at the edge ?

Biology

Natural Language Processing

Computer Vision

Embedded **AI for IoT**
Applications of ML : which at the edge ?

Biology

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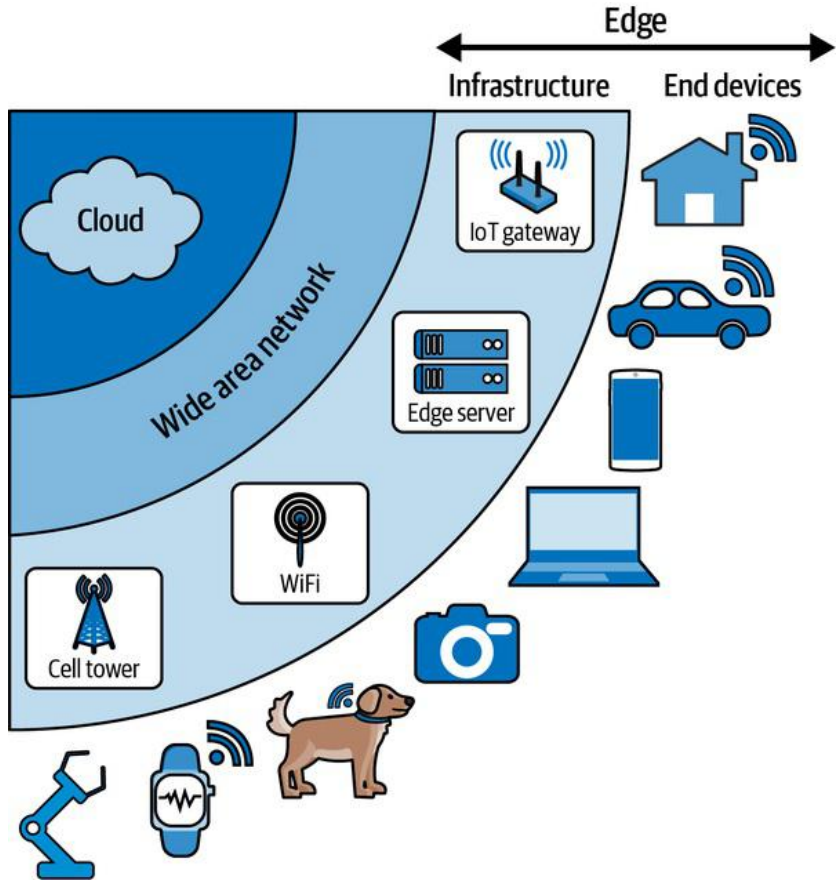
Embedded AI **for IoT**
AIoT / Edge AI

Buzz words

AIoT = AI + IoT

Edge AI = AI + Edge



Remark : do you know what was the first IoT device ?

Embedded AI **for IoT**
AIoT / Edge AI

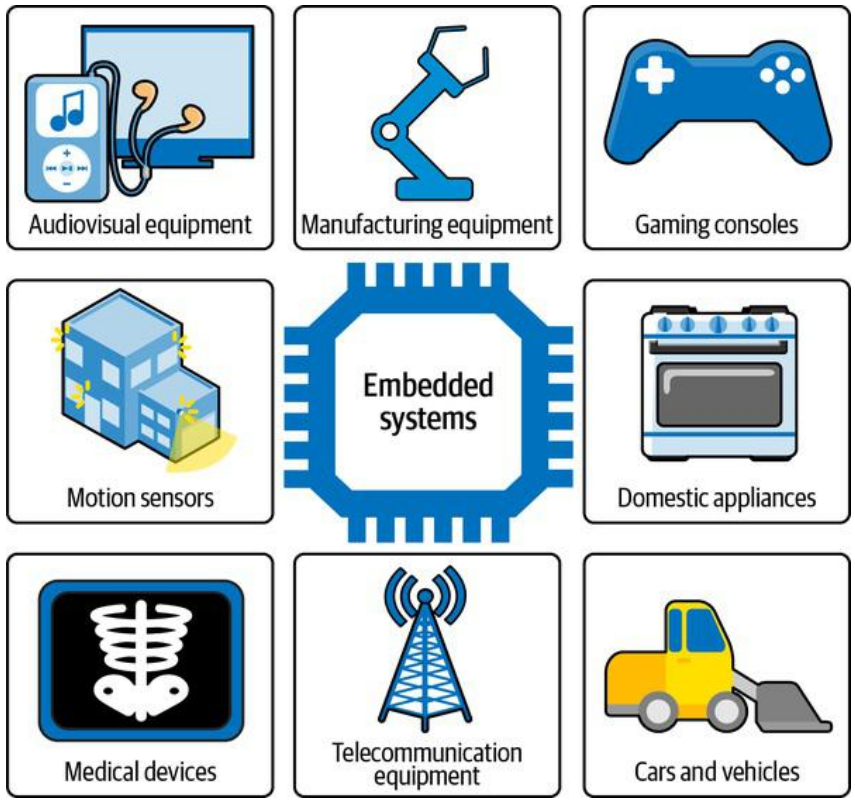
ARPANET (80s)

Internet (90)

Embedded AI for IoT
Frugal AI / Tiny ML

Constraints **(lecture 5)**

- Low resources : memory, computations, instructions, etc.
- digital signal processing,
- data transmission.



Question : where should we run our machine learning algorithm ?

Embedded AI for IoT
Example applications

Example 1

"OK Google"

Example 2

Clinical Decision-Making

Example 3

Human activity recognition (HAR) : fall detection