# DEEP TECH BRAIN: ARTIFICIAL INTELLIGENCE

# STUDY PLAN

Course type: Microcredential
Teaching modality: Distance learning
Language of instruction: English

Number of credits: 3

General features of the teaching methodology:

- 10 theoretical sessions of 1 hours delivered asynchronously (Lecture-style, contents presented orally by a professor without active student participation).
- 18 hours of computer-based practical sessions with exercises related to theoretical content.
- 2 hours of seminar-style sessions for application and discussion of case studies.

## TEACHING PLAN

**Contents:**
This course is structured into 5 theoretical thematic blocks, each with a specific practical activity, and an application seminar to consolidate learning.

**Thematic blocks:**

1. Introduction to Artificial Intelligence

   1.1: Definitions and Concepts (1h)

2. Data Types and Preprocessing

   2.1: Types of Data (1h)

   2.2: Preprocessing and Normalization (1h)

3. Key Machine Learning Algorithms

   3.1: Model Implementation and Evaluation: k-NN (1h)

   3.2: Decision Trees and Random Forests (1h)

   3.3: Support Vector Machines (SVM) (1h)

   3.4: Unsupervised Algorithms (1h)

4. Introduction to Deep Learning

   4.1: Artificial Neurons and Neural Networks (1h)

   4.2: Image Classification and Segmentation Models (1h)

5. Applications in Neuroscience

5.1: Data Specificities in Neuroscience (1h)

Seminar – Applications and Case Discussion (2h)

**Practices**:

- Practice type**:** Computer-based practical
    - P1: Introduction to Python Programming (2h)
    - P2: Exploratory Data Analysis and Preprocessing (4h)
    - P3: Algorithm Implementation, Validation, and Interpretation (8h)
    - P4: Image Segmentation with Deep Learning (2h)
    - P5: Scientific Article Analysis (2h)

**Objectives:**

- Understand the foundations and historical context of Artificial Intelligence.
- Identify and process the types of data relevant to neuroscience.
- Learn techniques for standardization and data integration.
- Become familiar with core Machine Learning algorithms.
- Design, implement, and validate AI models.
- Understand the basics of Deep Learning.
- Critically evaluate AI results.
- Explore AI applications in neuroscience.
- Consider the ethical implications of using AI in healthcare and research.

**EVALUATION**

- Continuous assessment (attendance + individual assignments): 40%
- Final multiple-choice test: 60%

**RECOMMENDED BIBLIOGRAPHY**

Ertel, W. (2024). *Introduction to Artificial Intelligence*. Springer Nature.

Kubat, M. (2021). *An Introduction to Machine Learning*. Springer Cham. https://doi.org/10.1007/978-3-030-81935-4

Colliot, O. (Ed.). (2023). *Machine Learning for Brain Disorders*. Springer. https://doi.org/10.1007/978-1-0716-3195-9