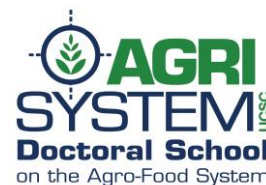# Towards Big Data - Informatic Tools for Data Manipulation, Part 2

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Course Aims

The course "Towards Big Data - Informatic Tools for Data Manipulation, Part 2" aims at providing the theoretical foundations needed to understand the basics of neural network models and deep learning for the analysis of large image, sequence and omics datasets.

Methodology

Artificial Intelligence is a key technology of our times. Neural networks and deep learning are the engine of artificial intelligence applications. The lectures are designed to allow participants to understand how neural network models work and to grasp the functioning of artificial intelligence and its applications to large datasets, with particular reference to omics data. Each theoretical lecture is accompanied by the corresponding practical session. The highly interdisciplinary and practical nature of the topics, combined with the use of freeware platforms and software, will enable participants to integrate their newly acquired knowledge into their daily research routines from the very first lesson.

Course description

1. Introduction to Deep Learning
2. Dense neural networks (DNN)
3. Convolutional neural networks (CNN)
4. Deep Learning models for image recognition
5. Deep Learning models for omics data
6. Practical sessions with Python and interactive notebooks on Google Colab

Recommended texts

- "Deep Learning for Life Sciences - with Python Notebooks for Examples and Exercises"; F. Biscarini & N. Nazzicari, 2025 Springer (https://link.springer.com/book/9783031968518)

- Nazzicari, N. and Biscarini, F., 2022. Stacked kinship CNN vs. GBLUP for genomic predictions of additive and complex continuous phenotypes. Scientific Reports, 12(1), p.19889. (https://www.nature.com/articles/s41598-022-24405-0)