# Information Theory and Data Science

Assignment no. 1

Mauro De Sanctis

### General Recommendations

The project should be carried out using Python. Good programming discipline should be applied. This means that the variable names should be logical, the code must be commented and it should be written in such a way that it is easy to follow and understand. Figures should have appropriate titles and axis labels. The software implementation should find a solution which minimizes the processing time over a set of equivalent methods.

### Project

- write a function called "entropy" which computes the entropy of a discrete random variable given its probability mass function $[p_1, p_2, ..., p_N]$.
- write a script called "test_entropy2" which computes the entropy for a generic binary random variable as a function of $p_0$ and plots the entropy function.
- write a function called "joint_entropy" which computes the joint entropy of two generic discrete random variables given their joint p.m.f.
- write a function called "conditional_entropy" which computes the conditional entropy of two generic discrete random variables given their joint and marginal p.m.f.
- write a function called "mutual_information" which computes the mutual information of two generic discrete random variables given their joint and marginal p.m.f.
- write the functions for normalized versions of conditional entropy, joint entropy and mutual information for the discrete case.