Bootcamp: Linear Algebra for Machine Learning

Assignment 1

Prof. Moustapha Cisse and Tutors
Due 23 Feb. 2023, 9:00 a.m

Instructions:

- The work you hand in must be your own. You are permitted to collaborate with one another students only to the degree of giving ideas on how to solve a problem. Think through and write up your own solutions; copying from others is not permitted. In particular, the code you hand in must be your own.

- Put in enough (and only enough) detail so that someone else in the class could read and understand your solution. A solution which consists of simply a correct answer with no working are not satisfactory.

- The "math" part of the assignment may be done by hand (make sure it is neat and legible) or may be typed up.

- You should hand in a physical copy of your assignment if it is done by hand otherwise, send it together with the codes.

Question 1

Given $X_1, ..., X_n$ n iid random variables from Bernoulli distribution, i.e., $X_i \sim Bernoulli(p)$ with the probability mass function:

$$f(x) = p^x(1-p)^{1-x}$$

Use the Maximum likelihood Estimation (MLE) to prove that the sample mean $\hat{p} = \frac{1}{n}\sum_{i=1}^{n} x_i$.

Question 2

Describe the law of large number (Weak and strong) and the central limit theorem. Try to describe the theoretical statements and give examples/codes.