Description

The goals are, in 12h, to present the fundamentals of the Floating Point Arithmetic of modern processors and to present some classical Numerical linear algebra algorithms used in Machine Learning as a black box.

Learning Objectives and Outcomes

- To understand the Floating Point Arithmetic (FPA) and its consequences (Computer Arithmetic)
- To present a classical algorithm: Newton method to solve f(x)=0
- To present the Power Method and its application to the PageRank problem
- To present a fundamental Numerical linear algebra algorithm: SVD
- To present classical and non classical numerical optimizations algorithms
- To present some applications in ML

Course Schedule and Contents

Session#1
- Computer Arithmetic
  - Floating Point Arithmetic: the IEEE 754 Standard for Floating-Point Arithmetic
- How to solve an unidimensional equation f(x)=0 with the Newton method ?
- The Power Method and the PageRank Algorithm

Session#2
- Numerical optimization
  - From steepest descent to Conjugate gradient
  - Quasi Newton methods
  - Others methods
  - Applications

Session#3
- The Singular Value Decomposition (SVD)
  - Algorithms
  - Applications

Numerical Algorithms

Grading

Course Project: 100%

Policies

- I expect you to turn-in your reports on time to receive proper credit/grade.
- Any work submitted must be your own.
- I expect everyone to contribute equally to group assignments
- Attendance in every class is expected and class participation and discussion are strongly encouraged.
- Late work will not be accepted unless prior arrangements have been made directly with me.
- Cases will be decided on an individual basis.

Good Luck!