Data mining, machine learning and deep learning

Synopsis :

Part I (main lecture) : Machine learning and deep learning.
Adeline Paiement, Université de Toulon

Data mining and machine learning have universal applications for extracting meaningful information from large and complex datasets. The aim of this course is to introduce and familiarise students of various backgrounds to these tools and to their possible applications in their own disciplines. The first part of the course will present the main concepts of data mining and machine learning, from data acquisition and preparation to the various possible analyses. The second part of the program will focus on the deep learning paradigm that attains state-of-the-art results in many fields. The theoretical grounds for the methods will be introduced and complemented by examples from a variety of disciplines, mainly within the physics and medical fields.

Part II (~2hrs) : Examples in astrophysics with a focus on the measurement of photometric redshifts.
Kai Polsterer, HITS gGmbH, Heidelberg, D]

Astronomical surveys are gathering huge amounts of data (the near-future LSST will observe half the sky every three days at several wavelengths). The recession velocities, known as redshifts, of the millions of galaxies in these surveys serve to characterize the evolution of structure in the universe, with implications on fundamental issues such as dark matter. Machine learning now makes it possible to estimate redshifts directly based on images, while automatically accounting for the fact that galaxies have different shapes and colors, and the images are contaminated by various sources of noise and defects.

Part III (~2hrs) : Examples in particle physics at CERN.
Maurizio Pierini, CERN, CH

Particle physics is another field of science that deals with avanlanches of data. Deep learning technologies are being developed for various applications. An overview of some of these will be presented, with a focus on one to gain insight into some of the tricks of the trade.

Public : PhD students of ED-182
        Other PhD students in sciences, motivated Master's students, researchers

Dates : 2019 - May 21, 22, 23, 24

   May 21 : 9h-12h30 + 14h-16h00 (with a break) - AP and KP
   May 22 : 10h-12h + 14h-16h00 (with a break) - AP and KP
   May 23 : 10h-12h - AP
   May 24 : 14h-16h (with a break) - MP

Place (TBC) : Strasbourg astronomical Observatory [+ IPHC Cronenbourg on 24/5 if convenient]

Contact : For registration : Ecole Doctorale 182 : pastordelvalle@unistra.fr
  or for more general questions : ariane.lancon@astro.unistra.fr