Mathematical and Statistical Techniques

Master in Astrophysics, Particle Physics and Cosmology

Barcelona, autumn 2022

X. Luri, L. Garrido

Part one: fundamentals of probability theory and statistics

- General review of probability theory

- Monte-Carlo

- Statistical Inference and significance test

Assignments: 1 set of problems + 2 exercises to be simulated in a computer (you can use your preferred language, only a random number generator is needed)

Part two: Multivariate Analysis and statistical treatment techniques

Introduction to multivariate analysis, statistical treatment techniques: concepts and main techniques, hands-on work using specialized software. Data Mining concepts.

- o Data analysis and representation
- o PCA
- o Clustering
- o Discriminant analysis
- o Neural Networks
- o Estimation of the PDF
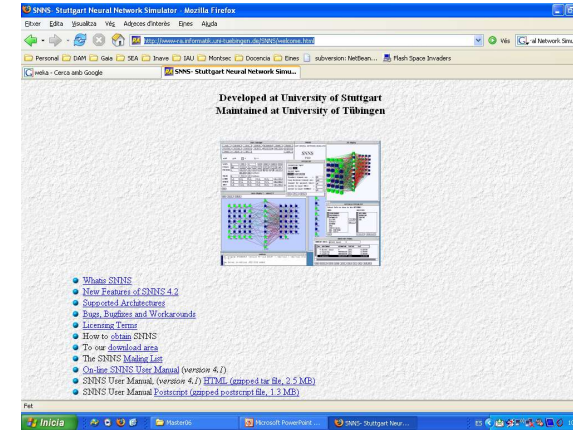- o Overview of Data Mining
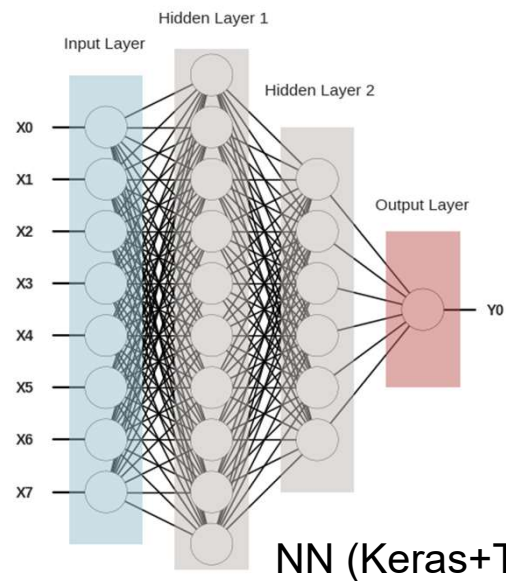
3 data análisis assignments

Part two: tools

Weka

JNNS

Python

NN (Keras+Tensorflow)

Course Material: Campus virtual

http://campusvirtual.ub.edu

Calendar and evaluation

6 credits

     Part 1: weeks 1-6

     Part 2: weeks 7-12

There will be no final exam for this course.

The average of the 6 problem assignments that will be given during this course, will compose the final global grading.