

INFN School of Statistics 2019



Sunday, June 2, 2019 - Friday, June 7, 2019

Hotel Ariston, Paestum

Scientific Program

Probability theory

Introduction to probability theory (axioms, Pascal and birthday problems), random variables, probability functions (mass and density functions), probability distributions, moments (mean, variance), correlation, covariance, and independence

Distribution of functions of random variables (mostly sums)

Conditional probability, Bayes theorem, representation theorem, derivation of binomial distribution, derivation of Poisson distribution from binomial and from a birth process

Statistical inference

Parameter estimates, properties of estimators

Maximum likelihood method

Pearson and Neyman chi-squares

Hypothesis testing and interval estimation

hypothesis tests

asymptotic formulae for upper limits and significance evaluation

treatment of nuisance parameters

the look-elsewhere effect

Statistical software tools

Overview of the main statistical tools

RooFit, RooStats

Hands-on exercises

Multivariate analysis

Introduction to multivariate analysis

Supervised learning: classification and regression

The bias-variance decomposition

Optimism, information criteria and cross-validation

The modelling process: exploratory data analysis, feature engineering and model tuning

Machine learning

Artificial Neural Networks

Deep Learning

Hands-on session: hackaton

Lecturers:

Glen Cowan, Royal Holloway, University of London

Sergei Gleyzer, University of Florida

Eilam Gross, Weizmann Institute of Science

Mario Pelliccioni, INFN Torino

Harrison Prosper, Florida State University, Tallahassee

Aldo Solari, University of Milano-Bicocca