UNIVERSITÀ DEGLI STUDI FIRENZE

FLORENCE center for DATA SCIENCE

ABSTRACTS

4th Seminar D^2 Seminar Series

Florence Center for Data Science 'Double' Seminar Series

Anna Gottard - Department of Statistics, Computer Science, Applications "G. Parenti", University of Florence

Title: Circular data, conditional independence & graphical models

Abstract: Circular variables, arising in several contexts and fields, are characterized by periodicity. Models for studying the dependence/independence structure of circular variables are under-explored. We will discuss three multivariate circular distributions, the von Mises, the Wrapped Normal and the Inverse Stereographic distributions, focusing on their properties concerning conditional independence. For each of these distributions, we examine the main properties related to conditional independence and introduce suitable classes of graphical models. The usefulness of the proposal is shown by modelling the conditional independence among dihedral angles characterizing the three-dimensional structure of some proteins.

Costanza Conti - Department of Industrial Engineering, University of Florence

Title: Penalized hyperbolic-polynomial splines
(Joint work with: Rosanna Campagna, Universit`a degli Studi della Campania “L. Vanvitelli”)

Abstract:
The advent of P-splines, first introduced by Eilers and Marx in 2010 (see [4]), has led to important developments in data regression through splines. With the aim of generalizing polynomial P-splines, in [1] we have recently defined a model of penalized regression spline, called HP-spline, in which polynomial B-spline functions are replaced by Hyperbolic-Polynomial bell-shaped basis functions. HP-splines are defined as a solution to a minimum problem characterized by a discrete penalty term. They inherit from P-splines the advantages of the model, like the separation of the data from the spline nodes, so avoiding the problems of overfitting and the consequent oscillations at the edges. HP-splines are particularly interesting in different applications that require analysis and forecasting of data with exponential trends. Indeed, the starting idea is the definition of a polynomial-exponential smoothing spline model to be used in the framework of the Laplace transform inversion as done in [2,3]. We present some recent results on the existence, uniqueness, and reproduction properties of HP-splines, also with the aim of extending their usage to data analysis.

[1] C. Conti, R. Campagna, Penalized exponential-polynomial splines, Appl. Math. Letters, 118, (2021) 107--159
[2] R. Campagna, C. Conti, S. Cuomo, Computational Error Bounds for Laplace Transform Inversion Based on Smoothing Splines, Appl. Math. Comput., 383, (2020) 125--376
[3] R. Campagna, C. Conti, S. Cuomo, Smoothing exponential-polynomial splines for multiexponential decay data, Dolomites Research note on Approximation (2019) 86--10
[4] P.H.C. Eilers and B.D.Marx, Splines, knots, and penalties, WIREs Comp. Stat., 2, (2010) 637-653.