
NAHID SADR, Université de Sherbrooke

Index-mixed copulas

Copulas provide a framework for modeling dependence between random variables. They are particularly important in multivariate statistics and risk management, as they help model the relationship between variables while accounting for their marginal distributions. In this talk, we aim to introduce the basics of copula theory, how copulas relate to multivariate joint distributions via the celebrated Sklar's theorem, and compare some families of copulas studied in the literature that are used in theory and practice to capture different dependence scenarios. Afterwards, our research on a new class of copulas named index-mixed copulas is introduced, and its properties are investigated. Index-mixed copulas are constructed from given base copulas and a random index vector, and show a rather remarkable degree of analytical tractability. The analytical form of the copula and, if it exists, its density is derived. As the construction is based on a stochastic representation, sampling algorithms can be given. Properties investigated include bivariate and trivariate margins, tail dependence, measures of concordance such as Spearman's rho or Kendall's tau, and concordance orderings. A particularly interesting feature of index-mixed copulas is that they allow one to provide an interpretation of the well-known family of Eyrard-Farlie-Gumbel-Morgenstern (EFGM) copulas, which are popular for their analytical tractability. Through the lens of index-mixing, one can see EFGM copulas can only model a limited range of concordance and are tail independent, but this is not the case for index-mixed copulas in general.