Analyzing dependent data with vine copulas

Date: Sunday, 1 December 2019
Time: 9am – 5pm
Cost: AU$200 (IBS Member), AU$250 (Non-member), AU$100 (Concession)
Location: University of Adelaide, Waite Campus, Room TBA
URL: https://ausbiometric2019.org/workshops/

This course is designed for graduate students and researchers, who are interested in using copula based models for multivariate data structures. It provides a step to step introduction to the class of vine copulas and their statistical inference. This class of flexible copula models has become very popular in the last years for many applications in diverse fields such as finance, insurance, hydrology, marketing, engineering, chemistry, aviation, climatology and health.

The popularity of vines copulas is due to the fact, that it allows in addition to the separation of margins and dependence by the copula approach, tail asymmetries and separate multivariate component modeling. This is accommodated by constructing multivariate copulas using only bivariate building blocks, which can be selected independently. These building blocks are glued together to valid multivariate copulas by appropriate conditioning. Thus also the term pair copula construction was coined by Aas et al. (2009). This approach allows for flexible and tractable dependence models in dimensions of several hundred, thus providing a long desired extension of the elliptical and Archimedean copula classes. It forms the basis of new approaches in risk, reliability, spatial analysis, simulation, survival analysis and data mining to name a few.

The course starts with background on multivariate and conditional distributions and copulas. Basic bivariate dependence measures are then discussed. Bivariate parametric classes of elliptical, Archimedean are introduced and graphical tools for the identification of sensible bivariate copula models to data are developed. The decomposition and construction principle of vines is first given in three dimensions and then extended to the special cases of draw able (D-) and canonical (C-) vines. Finally, the general case of regular (R-) vines is developed. Simulation algorithms and parameter estimation methods will be constructed. Model selection methods for vine models are considered. The short course closes with a case study. Computations are facilitated using the freely available package VineCopula of Schepsmeier et al. (2017) package in R (see R Core Team (2017)). Further resources on vine models can be found under vine-copula.org.

Ref:
Aas et al. (2009).
R Core Team (2017).
Schepsmeier et al. (2017).
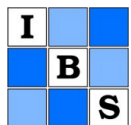
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Claudia Czado is professor of Applied Mathematical Statistics at Technical University of Munich, Germany. The research activities of Professor Claudia Czado are in statistics. Her special interests lie in the modeling of complex dependencies including regression effects and time/space structures. For this she uses a copula approach and especially the flexible class of vine copulas. This allows for different non-symmetric dependencies for pairs of variables. For model selection and estimation in high dimensions computer-aided methods are developed. Applications are in finance, insurance and engineering.

After studying mathematics in Göttingen, Professor Czado obtained her doctorate in 1989 at Cornell University, USA, in Operations Research and Industrial Engineering. She then became an Assistant Professor and in 1995 Associate Professor of Statistics at York University, Toronto, Canada. In 1998 she was appointed to the Technical University of Munich, Germany, in the field of Applied Mathematical Statistics. Professor Claudia Czado is the author or co-author of more than 120 publications. She is also co-founder/coordinator of the junior research program "Global Challenges for Women in Math Science" at the Technical University of Munich.