

# Symmetric Bernoulli distributions and minimal dependence copulas

Alessandro Mutti

Politecnico di Torino  
Vicolo Cesare Balbo 16E, 12048 Sommariva Del Bosco  
Italy

Joint work with: P. Semeraro

The key result of this paper is to find all the joint distributions of random vectors whose sums  $S = X_1 + \dots + X_d$  are minimal in convex order in the class of symmetric Bernoulli distributions. The minimal convex sums distributions are known to be strongly negatively dependent. Beyond their interest per se, these results enable us to explore negative dependence within the class of copulas. In fact, there are two classes of copulas that can be built from multivariate symmetric Bernoulli distributions: the extremal mixture copulas, and the FGM copulas. We study the extremal negative dependence structure of the copulas corresponding to symmetric Bernoulli vectors with minimal convex sums and we explicitly find a class of minimal dependence copulas. Our main results stem from the geometric and algebraic representations of multivariate symmetric Bernoulli distributions, which effectively encode several of their statistical properties.