DSS Statistics Seminar
PhD program in Statistics

Dealing with varying dimension-wise tail weights in normal scale mixtures

29th NOVEMBER 2024
12.00 pm
ONLINE

Speaker
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We present the family of dimension-wise scaled normal mixtures (DSNMs). This family is designed to model the joint distribution of a d-variate random variable with real-valued components, extending the multivariate normal (MN) distribution in two directions. First, DSNMs have a more general type of symmetry with respect to the elliptical one. Secondly, the univariate marginals have similar heavy-tailed normal scale mixture distributions with (possibly) different tailedness parameters, allowing for dimension-specific excess kurtosis. This flexibility is achieved within an MN scale mixture framework by incorporating a d-variate mixing random variable with independent and similar components acting separately for each dimension. We explore several properties of DSNMs, including their joint density function, hierarchical and stochastic representations, relationships with other symmetric distributions, symmetry type, marginal distributions, no correlation implying independence, and moments of practical interest. For illustrative purposes, we describe two members of the DSNM family obtained in the case of components of the mixing random vector being either uniform or shifted exponential; these are examples of mixing distributions that guarantee a closed-form expression for the joint density of the DSNM. For the two DSNMs analyzed in detail, we introduce parsimony by allowing the d tailedness parameters to be tied across dimensions and describe algorithms, based on the expectation–maximization (EM) principle, to estimate the parameters by maximum likelihood. Finally, we apply DSNMs to real financial and biometrical data, demonstrating their advantages over existing symmetric heavy-tailed distributions in the literature.
Joint work with Luca Bagnato, Università Cattolica del Sacro Cuore.

Participate with zoom

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