Biquadratic quasi-interpolating copulas with applications

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We show that Bernstein-Bézier analysis is a useful tool for constructing piecewise polynomial copulas – a special class of surface with the so-called 2-increasing property, and a particular boundary behavior. The word copula derives from the Latin noun *cupula*, which means "small cup". It captures the dependence structure among random variables, irrespective of their marginal distributions. In other words, copulas enable marginal distributions and dependence structure to be modeled separately. This property makes copulas popular in recent years in the area of risk modeling for insurance and finance. First we apply Bernstein-Bézier techniques to reconstruct the linear B-spline copulas of [1]. Using the same techniques, we further construct a new class of differentiable biquadratic quasi-interpolating copulas that have continuous second order mixed derivatives. We test the performance of the empirical biquadratic quasi-interpolating copulas, and show that they perform better than the empirical linear B-spline copulas in nonparametric estimation of the copulas.

Joint work with: Min Ji, Liang Dong.

References

[1] X. Shen, Y. Zhu, L. Song, G. Monge. Linear B-spline copulas with applications to nonparametric estimation of copulas. *Computational Statistics and Data Analysis*, 52: 3806-3819, 2008.