Separation of Amplitude and Phase Variation in Point Processes

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Abstract

The amplitude variation of a real random field $\{X(t)\}$ consists in its random oscillations in the y-axis, typically encapsulated by its (co)variation around a mean level. In contrast, phase variation refers to fluctuations in the x-axis, often caused by random time changes or spatial deformations. We consider the problem of identifiably formalising similar notions for (potentially spatial) point processes, and of nonparametrically separating them based on realisations of iid copies of the phase-varying point process. The key element of our approach is the use of the theory of optimal transportation of measure, which is proven to allow the consistent separation of the two types of variation for point processes over Euclidean domains.

Keywords: *Fréchet mean; Monge-Kantorovich Problem; Warping.*