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Properties of residuals for spatial point processes

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Abstract For any point process in $\mathbb{R}^d$ that has a Papangelou conditional intensity λ, we define a random measure of 'innovations' which has mean zero. When the point process model parameters are estimated from data, there is an analogous random measure of 'residuals'. We analyse properties of the innovations and residuals, including first and second moments, conditional independence, a martingale property, and lack of correlation. Some large sample asymptotics are studied. We derive the marginal distribution of smoothed residuals by solving a distributional equivalence.

Keywords Distributional equivalence · Georgii-Nguyen-Zessin formula · Gibbs point process · Set-indexed martingale · Papangelou conditional intensity · Pearson residuals · Scan statistic · Smoothed residual field