Intensity estimation for spatial point processes

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Abstract: This talk discusses some recent advances in non-parametric intensity function estimation for point processes. The first part deals with the classical setting of bandwidth selection for kernel estimators. More specifically, it discusses a method which is based on optimality criteria to be minimised, which are derived from the classical Campbell formula for point processes. This new method is fully nonparametric, does not require knowledge of higher-order moments, and is not restricted to a specific class of point process. The second part of the talk discusses a new approach to adaptive intensity estimation. Since adaptive intensity estimators tend to under-smooth the data in certain places, we propose an additional smoothing operation to be applied to such estimators, which is based on resampling the point pattern through independent random thinning. We refer to this operation as "resample-smoothing" and apply it to Voronoi intensity estimators – at a given location the Voronoi intensity estimator is equal to the reciprocal of the size of the Voronoi cell containing that location. Having presented the different methods and some of their properties, we study their performances through simulation studies.