Bayesian prediction for marked point processes

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Abstract

The doctoral thesis presented is devoted to problems of the Bayesian prediction for marked point processes under a precautionary loss function. Two nonparametric models were considered, both based on the interpretation of marked point processes as multidimensional point processes. One of the models concerns one dimensional marks, which makes the whole process a two dimensional point process. The exact model is given by a two dimensional Poisson process with a mean measure being a product measure of a known Radon measure and a random measure. Assuming that the distribution of the random measure is given by a gamma process, Bayesian and robust (conditional Γ-minimax) predictors are derived for the total value of future marks. The second model is related to processes with two dimensional marks, carrying informations about intensities and durations of events, which may be interpreted as pulse processes. Randomly occurring events trigger pulses of random duration and random, but constant in time, intensity. The model is specified by a three dimensional Poisson process with expectation measure being a product measure of a known Radon measure, a probability measure and a random measure, which distribution is given by a gamma process. Bayesian and conditional Γ-minimax predictors are derived for the total intensity of overlapping pulses taking into account different event sets describing the historical data from the observed processes. Using the expected loss value criterion, for both models simulation studies are conducted to compare the Bayesian and robust predictors with respect to the a priori assumptions and the amount of available data.