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Forecasting histogram time series with k-nearest neighbours methods

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Abstract-

Histogram time series (HTS) describe situations where a distribution of values is available for each instant of time. These situations usually arise when contemporaneous or temporal aggregation is required. In these cases, histograms provide a summary of the data that is more informative than those provided by other aggregates such as the mean. Some fields where HTS are useful include economy, official statistics and environmental science. This article adapts the k-Nearest Neighbours (k-NN) algorithm to forecast HTS and, more generally, to deal with histogram data. The proposed k-NN relies on the choice of a distance that is used to measure dissimilarities between sequences of histograms and to compute the forecasts. The Mallows distance and the Wasserstein distance are considered. The forecasting ability of the k-NN adaptation is illustrated with meteorological and financial data, and promising results are obtained. Finally, further research issues are discussed.

Index Terms- Density forecast; Finance; Nonlinear time series models; Non-parametric forecasting; Symbolic data analysis; Weather forecast

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