Irène Gijbels · Alexandre Lambert · Peihua Qiu

Jump-preserving regression and smoothing using local linear fitting: a compromise

Abstract This paper deals with nonparametric estimation of a regression curve, where the estimation method should preserve possible jumps in the curve. At each point x at which one wants to estimate the regression function, the method chooses in an adaptive way among three estimates: a local linear estimate using only data-points to the left of x, a local linear estimate based on only datapoints to the right of x, and finally a local linear estimate using data in a two-sided neighbourhood around x. The choice among these three estimates is made by looking at differences of the weighted residual mean squares of the three fits. The resulting estimate preserves the jumps well and in addition gives smooth estimates of the continuity parts of the curve. This property of compromise between local smoothing and jump-preserving is what distinguishes our method from most previously proposed methods, that mainly focused on local smoothing and consequently blurred possible jumps, or mainly focused on jump-preserving and hence led to rather noisy estimates in continuity regions of the underlying regression curve. Strong consistency of the estimator is established and its performance is tested via a simulation study. This

I. Gijbels (✉)
Department of Mathematics, Katholieke Universiteit Leuven,
W. de Croylaan 54, 3001 Heverlee (Leuven), Belgium
E-mail: irene.gijbels@wis.kuleuven.be

A. Lambert
Institut de Statistique, Université Catholique de Louvain,
Voie du Roman Pays, 20, 1348 Louvain-la-Neuve, Belgium
E-mail: alambert@stat.ucl.ac.be

P. Qiu
School of Statistics, University of Minnesota,
389 Ford Hall, 224 Church Street SE,
Minneapolis, MN 55455, USA
E-mail: qiu@stat.umn.edu

study also compares the current method with some existing methods. The current method is illustrated in analyzing a real dataset.