Abstract

Title: Multiscale Change Point Inference

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We introduce a new estimator SMUCE (simultaneous multiscale change-point estimator) for the change-point problem in exponential family regression. An unknown step function is estimated by minimizing the number of change-points over the acceptance region of a multiscale test at a given level alpha. The probability of overestimating the true number of change-points K is controlled by the asymptotic null distribution of the multiscale test statistic. Further, we derive exponential bounds for the probability of underestimating K. By balancing these quantities, alpha will be chosen such that the probability of correctly estimating K is maximized. All results are non-asymptotic for the normal case. Based on these bounds, we construct honest confidence sets for the unknown step function and its change-points. It is shown that SMUCE asymptotically achieves the optimal detection rate of vanishing signals in a multiscale fashion. We illustrate how dynamic programming techniques can be employed for efficient computation of estimators and confidence regions. The performance of the proposed is illustrated by simulations and in several applications including ion channel recordings and photoemission spectroscopy. Finally we discuss possible extensions, such as FDR based multiscale change point inference.