

Confidence intervals for multiple isotonic regression and other monotone models

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Abstract: "We consider the problem of constructing pointwise confidence intervals in the multiple isotonic regression model. Recently, Han and Zhang [cite{han2019limit}](#) obtained a pointwise limit distribution theory for the max-min block estimator [cite{fokianos2017integrated}](#) in this model, but inference remains a difficult problem due to the nuisance parameter in the limit distribution that involves multiple unknown partial derivatives of the true regression function.

In this paper, we show that this nuisance parameter can be effectively eliminated by taking advantage of information beyond point estimates in the max-min block estimator, by establishing a pivotal limiting distribution theory. This immediately yields confidence intervals for $f_0(x_0)$ with asymptotically exact confidence level and optimal length. The construction of the confidence intervals can be easily adapted to other common monotone models including, e.g., (i) monotone density estimation, (ii) interval censoring model with current status data and (iii) counting process model with panel count data. Extensive simulation results demonstrate the accuracy of the coverage probability of the proposed confidence intervals, giving strong support to our theory."