# A fast, optimal spatial-prediction method for massive datasets

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**Abstract**

This paper considers a class of multi-resolution tree-structured models that are spatially shifted versions of each other and proposes a new spatial-prediction method that averages over the optimal spatial predictor produced from members of this class of models. As a consequence, the resulting predicted surface is smooth, even when the predictors generated separately from individual multi-resolution tree-structured models are not. We call the new predictor the multi-resolution spatial (MuRS) predictor and develop a computationally efficient algorithm for it. The algorithm can handle massive datasets even when some observations are missing. Moreover, the MuRS predictor can be shown to be the minimum mean-squared-error predictor for a large class of covariance functions. Total-column-ozone data remotely sensed from a satellite are analyzed using the new methodology.